**CoastalPlain_EIS, BLM_AK <blm_ak_coastalplain_eis@blm.gov>**

# [EXTERNAL] Scoping comments from NVVTG AVC VVC

1 message

**Tonya Garnett** <tonyagarnett@hotmail.com> Tue, Jun 19, 2018 at 6:39 PM
To: BLM_AK CoastalPlain_EIS <blm_ak_coastalplain_eis@blm.gov>
Cc: "mnewman@narf.org" <mnewman@narf.org>, "robrosey@gmail.com" <robrosey@gmail.com>, Charlene Stern <charlenestern@gmail.com>

Hello,

We are submitting the attached scoping comments and cover letter from the Native Village of Venetie Tribal Government, Arctic Village Council, and Venetie Village Council.

Mahsi'
Tonya Garnett
Executive Director
Native Village of Venetie Tribal Government

**2 attachments**

**NVVTG Scoping Comments_06.19.18.pdf**
1128K

**NVVTG  Scoping Comments Cover Letter.pdf**
332K

**Native Village of Venetie Tribal Government**
**P.O. Box 81080**
**Venetie, AK 99781**
**907-849-8165**

June 19, 2018

*Submitted via email*

Nicole Hayes
Attn: Coastal Plain Oil and Gas Leasing Program EIS
222 West 7th Ave., Stop #13
Anchorage, Alaska 99513
Blm_ak_coastalplain_EIS @blm.gov

**Scoping Comments re: Notice of Intent to Prepare an Environmental Impact Statement for the Coastal Plain Oil and Gas Leasing Program**

Dear Ms. Hayes,

Please find attached to this letter the comments of the Native Village of Venetie Tribal Government, the Venetie Village Council, and the Arctic Village Council in response to the Bureau of Land Management's April 20, 2018 public notice: Notice of Intent to Prepare an Environmental Impact Statement for the Coastal Plain Oil and Gas Leasing Program, Alaska, 83 Fed. Reg. 17562 (Apr. 20, 2018).

Mahsi' (Thank you),

Tonya Garnett

Tonya Garnett
Executive Director
Native Village of Venetie Tribal Government

# Comments of
# The Native Village of Venetie Tribal Government
# The Venetie Village Council, and
# The Arctic Village Council

# On

# The Bureau of Land Management's

# Notice of Intent to Prepare an Environmental Impact Statement for the Coastal Plain Oil and Gas Leasing Program, Alaska, 83 Fed. Reg. 17562 (Apr. 20, 2018)

**Submitted June 19, 2018**

## I. General Comments

This comment is being submitted jointly by the Native Village of Venetie Tribal Government, the Venetie Village Council, and the Arctic Village Council (collectively, "the Tribes"). The Tribes collectively represent the Gwich'in tribal members living in Arctic Village and Venetie. They are the modern successors of our traditional governments and each is recognized as a sovereign Indian Tribe having a government-to-government relationship with the United States.[1] The Native Village of Venetie is the present owner of the 1.8 million acres that once constituted the Venetie Indian Reserve. Our Tribal members continue to live a subsistence way of life in the villages of Venetie and Arctic Village; both of which are located far from Alaska's road system.

At the outset, the Tribes wish to unequivocally state their opposition to the Bureau of Land Management's ("BLM") proposed oil and gas leasing program.[2] The Coastal Plain of the Arctic National Wildlife Refuge ("the Refuge") is one of the most important natural, cultural, and subsistence resources to the Tribes and to all Gwich'in people as a whole. This is reflected in the Gwitch'in name for the Coastal Plain: Izhik Gwats'an Gwandaii Goodlit, or "the sacred place where life begins." Oil and gas development in this area is wholly incompatible with the Gwitch'in worldview. The caribou that calve on the Coastal Plain are the primary source of our Tribal members' subsistence harvests—the keystone species that has made it possible for us to live within our traditional areas from prehistory to the present. Any impacts to those animals, from changes in migration patterns, lower fertility rates, and loss of habitat, will be felt by our Tribal members in Arctic Village and Venetie.

## II. Trust Responsibility and Government-to-Government Consultation

The BLM, like all other federal agencies, owes a trust responsibility to our Tribes, as well as all the federally recognized tribes of the Yukon Flats region. Part of that trust responsibility includes the BLM's affirmative duty to "protect the subsistence resources of Indian communities."[3] In Alaska, this duty is particularly important given the unique history and laws surrounding Alaska Native tribes.[4] The legal status of Indian tribes creates an important requirement for the federal government to consult directly with tribal governments when contemplating actions that may affect tribal lands, resources, members, and welfare. Specifically, Executive Orders 13,084 and 13,175 make this requirement explicit by mandating that all executive agencies recognize tribes' sovereign status. These orders also require agencies to establish policies and procedures to foster meaningful tribal involvement and government-to-government consultation between agencies and tribes where such decisions impact tribal interests.[5]

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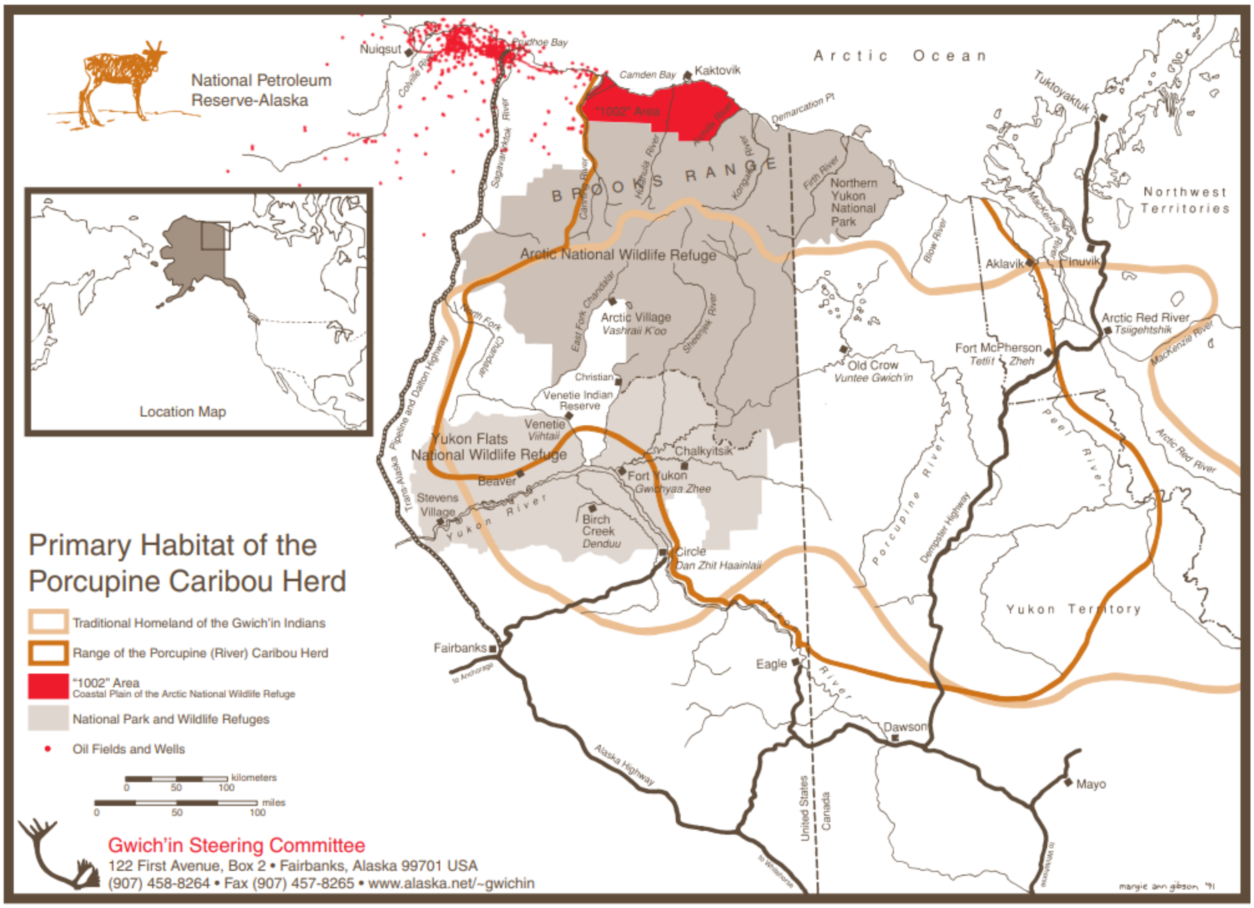
[1] *See* 83 Fed. Reg. 4,235, 4,239-40 (Jan. 30, 2018).
[2] *See* 83 Fed. Reg. 17,562 (Apr. 20, 2018).
[3] *People of Togiak v. United States*, 470 F. Supp. 423, 428 (D.D.C. 1979) (internal citations omitted).
[4] David S. Case & David A. Voluck, ALASKA NATIVES AND AMERICAN LAWS 42 (3d. ed. 2012) (discussing the atypical history of the United States' Alaska Native policy and the importance of federal statutes in developing a trust responsibility in the absence of formal treaties).
[5] Exec. Order No. 13,084, 63 Fed. Reg. 27,655 (May 19, 1998) (requiring "regular and meaningful involvement" by Tribal governments in agency actions affecting tribal interests); Exec. Order No. 13,175, 65 Fed. Reg. 67,249 (Nov. 9, 2000) (requiring "government-to-government" consultation and coordination with tribes when actions affect Tribal interests).

While the BLM is in the early stages of conducting government-to-government consultation with our Tribes, it is imperative that the BLM continue to meets its trust obligations to all federally recognized Tribes affected by the proposed oil and gas leasing program. In the Yukon Flats region alone, there are ten Gwich'in communities: Arctic Village, Beaver, Birch Creek, Canyon Village, Chalkyitsik, Circle, Fort Yukon, Rampart, Stevens Village, and Venetie. While the present locations of these Tribes may be geographically distant from the Coastal Plain, the cultural and subsistence connections these Tribes ascribe to the area remain intact. Indeed, as the Gwich'in Steering Committee demonstrates in the map below, the traditional territory of these Native people intimately includes the range of the Porcupine Caribou Herd:




As the National Environmental Policy Act ("NEPA") process moves forward, the BLM must consult, on a government-to-government basis, with all Tribes of the Yukon Flats. Additionally, the BLM should expand its list of hearing communities for the draft environmental impact statement ("EIS") to include all villages in the region. Without such outreach, the Tribes believe the BLM will fail to meet the mandate of Exec. Order 13,175 to perform its administrative obligations to consult and coordinate "with tribes when actions affect Tribal interests."

## III. Cultural Resources

The term "Neets'ąįį Gwich'in" refers to the descendants of those families who traditionally occupied the territory south of the Brooks Range between the Chandalar and Coleen Rivers.

Although the Neets'ąįį Gwich'in have existed for countless generations, it was not until the early 1900s that their presence was documented in a published account.

The Neets'ąįį are a subset of the larger Gwich'in Nation whose territory extends from what is now known as the northeastern Interior of Alaska to the Yukon and Northwest Territories of Canada. The term "Gwich'in" refers generally to a people; however, when coupled with place-name identifiers, it literally translates to the people of a certain location. At present, the Gwich'in occupy twelve villages located along the Yukon, Chandalar, Porcupine, Black, Arctic Red, Mackenzie, and Peel Rivers and their tributaries. Prior to settling into permanent villages, the Neets'ąįį lived in widely scattered camps, moving in relation to seasonal subsistence resources. Today, the Neets'ąįį are centralized in two villages, Vashrąįį K'ǫǫ (Arctic Village) and Vįįhtąįį (Venetie), located within the boundaries of the 1.8 million-acre Venetie Indian Reserve.

The experiences of the Neets'ąįį Gwich'in, as compared to other Alaska Native groups, are unique in some important respects. Most notably, the Neets'ąįį hold fee simple title to 1.8 million-acres that make up the Venetie Indian Reserve, and have rejected both municipal governments and Native corporation structures. Today, the communities of Vashrąįį K'ǫǫ and Vįįhtąįį are independently governed by their respective Tribal governments, the Arctic Village Council and the Venetie Village Council. The land base is jointly managed by a third entity, the Native Village of Venetie Tribal Government.

For most of our history, Neets'ąįį people lived in scattered camps moving in relation to seasonal resources. Traditional housing models such as *neevyaa zhee* (caribou skin tents) and, later, canvas tents were designed to be transportable enabling families to move between customary use areas. Life "in those days" cycled through periods of abundance and scarcity. A prominent theme of Neets'ąįį oral history is the struggle against starvation. Each season posed unique challenges that often required Neets'ąįį families to continually evaluate and adjust their plans. Sometimes this meant camping together and other times apart. Sometimes it meant moving to areas that were known to be productive in terms of harvesting and other times it meant taking calculated risks in terms of where and when to move.

The pattern of life for Neets'ąįį people in a pre-settlement context generally followed the four seasons: *shin* (summer-time), *khaiits'à'* (fall-time), *khaii* (winter-time), and *shreenyaa* (spring-time). It is important to mention that not all camps followed the same patterns of movement. Different families had their own customary use areas for hunting, trapping, and fishing. While most families operated from a seasonal blueprint, plans had to be continually adjusted to account for changes in weather, resource availability and other external factors.

Around the turn of the Twentieth Century, certain locations became more prominent in terms of supporting several Neets'ąįį families at a given time. Despite the emergence of various semi-permanent settlements, the Neets'ąįį planning model changed little in the first few decades of the Twentieth Century. Most families, in fact, continued to move frequently between trap-lines and hunting and fishing camps.

Since contact, the traditional territory of the Neets'ąįį has been threatened by numerous forces including encroachment, ownership transfers, and resource extraction. In a (post)colonial context, the Neets'ąįį have frequently found themselves to be in value-conflict with others, particularly on issues relating to the use and management of lands and resources.

Before it evolved into a more-permanent settlement, Arctic Village or Vashrąįį K'ǫǫ (meaning "creek along a steep bank") was known as a traditional fishing spot. Vashrąįį K'ǫǫ was chosen as the site for a permanent settlement because of the supply of both animals and fish. The first cabin was built at Vashrąįį K'ǫǫ in 1909. Although the appearance of cabins suggested a transition to a permanent settlement, many years would pass before Vashraii K'oo would become a year-round place of residence. Most Neets'ąįį families would continue to maintain seasonal camps or traplines along the Koness, Sheenjek, Wind and other rivers. Venetie or Vįįhtąįį was founded in 1895. The location was strategically chosen due to the regular crossing of moose, caribou, and other migrating animals.

Recognizing the millennia-old, and deeply-rooted historic and cultural connection of the Neets'ąįį to the Coastal Plain and the greater Yukon Flats region, the BLM must fully analyze the impacts of oil and gas development in the Coastal Plain on all aspects of cultural resources. The EIS must include an inventory of cultural resources that are important to the people and communities of the study area. Potential impacts from the proposed project to these cultural resources must then be identified, recognized, and evaluated in the EIS. Such resources include not only specific land and water areas, sites and structures, but plants and animals, fish and water, and human cultural, spiritual, and other relationships with nature and the environment.

Additionally, the BLM must in good faith engage in the Section 106 process of the National Historic Preservation Act ("NAHP") and its implementing regulations[6] and, in consultation with the Tribes, identify and document historic properties within the area of potential effect, analyze the potential effects to those properties, and develop a plan to avoid, minimize, and mitigate the adverse effects to those properties. In both the NEPA and the NHPA process, the BLM cannot rely solely on archaeological surveys and research to document and identify cultural resources and historic properties.

## IV. Subsistence Impacts

In 1983, Richard A. Caulfield led a research effort on subsistence harvests in the communities of Vashrąįį' K'ǫǫ (Arctic Village), Birch Creek, Chalkyitsik, Fort Yukon, and Vįįhtąįį (Venetie). It is important to note that the data was collected between 1970-1982, which was post-settlement. Figures 9 and 10 (see next page) offer a comparison of annual cycles of resource harvesting activities in the communities of Vashrąįį' K'ǫǫ and Vįįhtąįį. An analysis of the harvest data between the two villages shows a pattern of overlapping dependence on certain animals; however, there were key differences in harvesting by time of year and by primacy as a primary or secondary activity.

The migratory porcupine caribou herd has long been the most important means of subsistence for the Neets'ąįį Gwich'in. Before the advent of rifles, Neets'ąįį families used to camp around a

[6] *See* 36 C.F.R. pt. 800.

caribou fence (also called corrals or pounds). Caribou fences, from a planning perspective, offer some of the oldest physical evidence of the Neets'ąįį land use patterns.

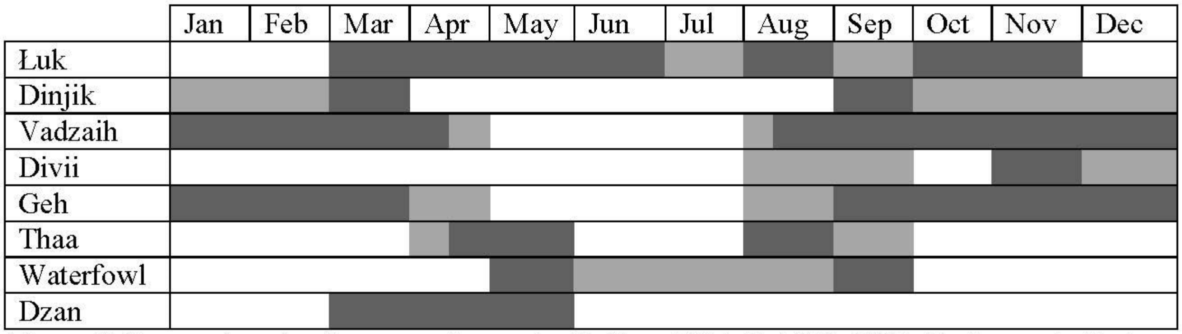



*Figure 9.* Seasonal cycle of resource harvest activities, Vįįhtąįį, 1970–1982. Dark grey indicates primary activity; light grey indicates secondary activity. Adapted from Caulfield (1983) Annual Cycle for Venetie (p. 178).

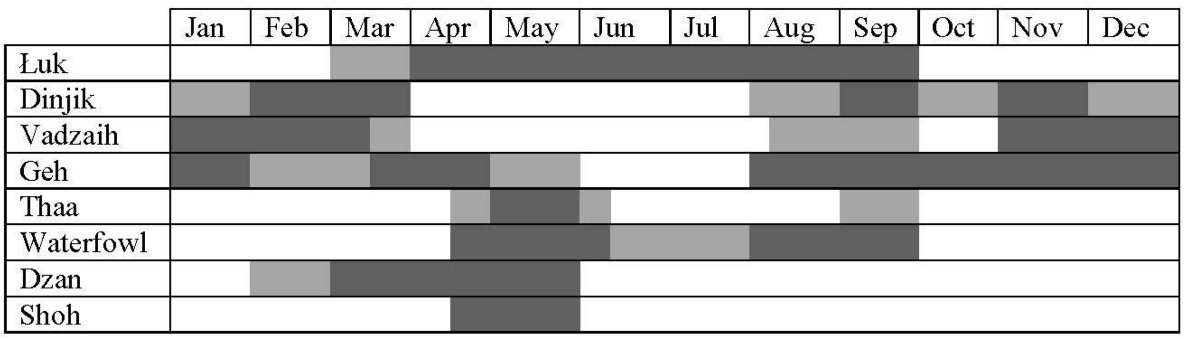



*Figure 10.* Seasonal cycle of resource harvest activities, Vashrąįį' K'ǫǫ, 1970-1982. Dark grey indicates primary activity; light grey indicates secondary activity. Adapted from Caulfield (1983) Annual Cycle for Arctic Village (p. 98).

The Neets'ąįį's reliance on caribou cannot be overstated. Indeed, caribou form the backbone of Gwich'in culture, providing for the health, well-being, economic security, and food security of Tribal members throughout the region. For this reason, that the BLM must thoroughly analyze not only the potential impacts to caribou, but also how those impacts to caribou will impact the subsistence way of life for the Neets'ąįį in Arctic Village and Venetie.

### A. Caribou

Caribou (*Rangifer tarandus*) are the most abundant large terrestrial herbivore in the circumpolar arctic.[7] Known as reindeer in some countries, caribou populations stretch across North America, Europe, and Asia.[8] Although widely distributed, many caribou and wild reindeer populations have faced strong declines, likely due to global changes in climate and anthropogenic landscape change.[9]

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[7] Brathen et al. (2007).
[8] Vors & Boyce (2009).
[9] Vors & Boyce (2009); Russell et al. (2015).

Four caribou herds occupy Alaska's arctic region, having their calves on the coastal plain and foothills of the North Slope. These caribou are renowned for their long-distance migrations, covering thousands of miles each year in some of the longest overland movements in the world.[10] These migrations allow caribou to take advantage of varying resources, moving to areas with greater winter food availability and shelter and then returning to calving grounds with fewer predators.[11]

The Arctic National Wildlife Refuge is used, with varying frequency, by three of the four caribou herds that calve on Alaska's North Slope. The Central Arctic Herd uses the Refuge for summer range, including the coastal plain.[12] The Teshekpuk Caribou Herd occasionally uses parts of the Refuge as winter range.[13] The most consistent use of the Refuge is by the Porcupine Caribou Herd, which inhabits the Refuge throughout the year, including using the coastal plain for calving, insect relief, and other summer habitat.[14] While the Porcupine Caribou Herd's calving grounds have shifted in concentration between the Refuge and Canadian Yukon over time in response to food availability,[15] most of the herd has calved on the Coastal Plain in recent years.[16]

Even in years in which calving was concentrated in Canada, the herd used the Refuge coastal plain for food and insect relief after calving.[17] The Coastal Plain also is critical for caribou post-calving as it provides greater concentrations and prolonged availability of plant nitrogen, a limited resource for caribou that allows them to gain weight during the brief summer months, increasing winter survival and subsequent-year reproduction.[18] Being displaced into the Brooks Range, where plant nitrogen is lower and available for a shorter amount of time, could have negative effects on calving success and population growth. Furthermore, key limiting minerals needed by caribou appear to be more available on the coastal plain than in other seasonally-used areas.[19] As the Alaska Department of Fish and Game has stated about the Porcupine Caribou Herd: "Over time the entire extent of the calving grounds may be important for caribou."[20]

Due to its ecological, cultural, and subsistence importance, conservation of the Porcupine Caribou Herd and its habitat in its natural diversity is a primary purpose of the Refuge.[21] The Alaska National Interest Lands Conservation Act addresses international treaty obligations, including the 1987 Porcupine Caribou Herd Conservation Agreement between the United States and Canada, providing the opportunity for continued subsistence uses of caribou and other Refuge resources purposes of the Refuge.[22]

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[10] Fancy et al. (1989); Bergman et al (2000); Schaefer & Mahoney (2013).
[11] Person et al. (2007); Dau (2011), Joly (2012).
[12] Arthur & Del Vecchio (2009); Lenart (2015).
[13] Person et al. (2007).
[14] Caikoski (2015).
[15] Griffith et al. (2002).
[16] McFarland et al. (2017).
[17] Griffith et al. (2002).
[18] Barboza et al. (2018).
[19] Oster et al. (2018).
[20] Caikoski, at 15-11 (2015).
[21] Pub. L. No. 96-487, Title III, § 303(2)(B)(i), 94 Stat. 2371 (1980) (Title III of ANILCA is not codified).
[22] *Id.* § 303(2)(B)(ii)-(iii).

### 1. Development Impacts on Caribou

Studies of the Central Arctic Herd in relation to the Prudhoe Bay development area and expansion to the west of the Coastal Plain provide a guideline about possible effects of energy development on caribou calving and migration within the Arctic National Wildlife Refuge. The Central Arctic Herd historically used two calving grounds, one in the west between the Colville and Kuparuk rivers and one in the east between the Sagavanirktok and Canning rivers.[23] As development expanded from Prudhoe Bay, caribou using the western calving grounds, where new development occurred, shifted south.[24] Those in the east, outside of main development areas, did not shift.[25] This shift away from new development likely had consequences for caribou. Food availability was lower for development-exposed caribou that shifted calving areas[26] and these caribou showed lower calf body mass[27] and birth rate,[28] though the herd still grew through this period.[29] A review by the United States Geological Survey ("USGS") concluded there was no clear biological explanation for the shift in concentrated calving in the west, implicating petroleum development as its likely cause.[30] The observation that only the development-exposed portion of the herd showed this shift in calving location casts doubt upon alternative explanations, such as the timing of snowmelt.

The sensitivity to development of female caribou about to give birth and those with young calves has been well documented. Studies of the Central Arctic Herd following expansion of the Kuparuk Development Area, west of Prudhoe Bay, found that use of areas by caribou near development declined after infrastructure was established[31] and was lower than expected within four kilometers of roads.[32] While one study reported increasing density of caribou calves within one kilometer of roads in the Kuparuk Development Area,[33] this study was criticized for not taking into account the overall decrease in caribou numbers within the development area when interpreting their findings.[34] This decrease in numbers occurred despite a rapid increase in herd size during this period and has been suggested to reflect a shift of caribou away from the area of concentrated development.[35] Caribou with calves also tend to occur farther from development than those without calves and tend to occur less in areas and at times of higher human activity.[36] Furthermore, females about to give birth or with very young calves tend to avoid, or are less likely to cross, roads and pipelines during the calving season.[37]

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[23] Lenart (2015).
[24] Wolfe (2000); Noel et al. (2004); Cameron et al. (2005); Joly et al. (2006); Lenart (2015).
[25] Wolfe (2000); Russell & McNeil (2005).
[26] Wolfe (2000); Griffith et al. (2002).
[27] Arthur & Del Vecchio (2009).
[28] National Research Council (2003); Cameron et al. (2005).
[29] Lenart (2015).
[30] Griffith et al. (2002).
[31] Cameron et al. (1992); Dau & Cameron (1986).
[32] Cameron et al. (2005).
[33] Noel et al. (2004).
[34] Joly et al. (2006).
[35] *Id.*
[36] Haskell et al. (2006).
[37] Wolfe et al. (2000); Griffith et al. (2002).

Insect activity, primarily that of mosquitoes and oestrid flies, has a strong influence on caribou space use, leading caribou to seek areas of relief from insects, such as the coast, gravel bars and elevated areas.[38] Harassment due to insects can have a negative effect on caribou populations, leading to lower rates of calves being born in years following high insect activity.[39] Caribou may also use areas around infrastructure during periods of moderate to high insect activity.[40] Nevertheless, observations of lower reproduction rates following years of high insect activity for caribou occupying relatively developed areas compared to those occupying less developed areas led the National Research Council to conclude that by altering caribou movements development "probably exacerbates the adverse effects of insect harassment."[41] This is of grave concern as warming conditions in the Arctic are leading to earlier growth and increased survival of mosquitoes.[42]

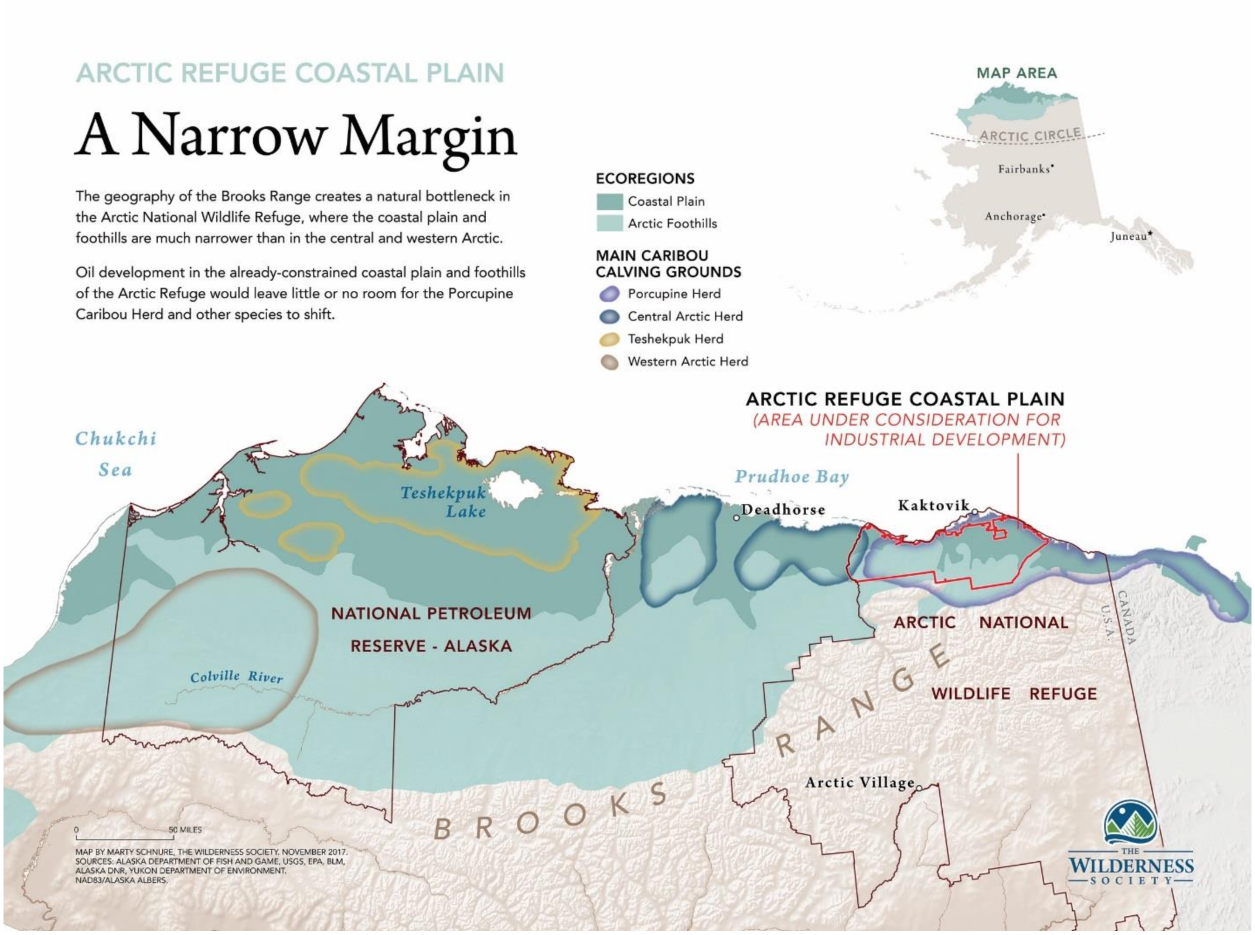
Some have argued that caribou habituate to human activity, learning not to fear it over time.[43] The evidence for this is equivocal at best. A search of the scientific database *Web of Science* for studies of caribou habituation conducted in November 2017 revealed only three peer-reviewed studies of caribou habituation to oil and gas activity. Two of these look at habituation within the Central Arctic Herd.[44] While both claimed to show evidence of habituation, one study suggests this is based largely on use of areas closer to infrastructure during the post-calving period, when insect harassment is a dominant driver of caribou space use.[45] Calving caribou only moved closer to infrastructure during the calving period in one of the three years evaluated.[46] The second study found no evidence of habituation across years.[47] They observed greater percentages of calves and numbers of caribou per kilometer surveyed in years with earlier snowmelt and inferred this as evidence that caribou habituated to infrastructure during each year but point out that "[t]he available data were few, so our results may benefit from further verification or falsification."[48] The third study used 27 years of location data for the Porcupine Caribou Herd to examine winter distribution responses to various human infrastructure and disturbance, including both seismic lines and well sites, as well as non-energy infrastructure.[49] They found a decreasing response of caribou to human infrastructure over time, but concurrent decreases in oil and gas activities made it difficult to determine whether this was due to habituation or to regeneration of natural habitats and processes after the cessation of human activities.[50] Other studies of ungulates have failed to find strong evidence of habituation to industrial development and activity. Boulanger et al. (2012) examined caribou disturbance responses near a diamond mine in Canada and found variation in avoidance responses over time, but no clear evidence of habituation. Similarly, recent research on mule deer (*Odocoileus hemionus*) in the contiguous United States found that the deer did not

[38] Pollard et al. (1996).
[39] National Research Council (2003).
[40] Pollard et al. (1996).
[41] National Research Council, at 115 (2003).
[42] Culler et al. (2015).
[43] *E.g.*, BLM (2018).
[44] Haskell et al. (2006); Haskell & Ballard (2008).
[45] Haskell et al. (2006).
[46] *Id*.
[47] Haskell & Ballard (2008).
[48] *Id.* at 628.
[49] Johnson & Russell (2014).
[50] *Id*.

habituate to energy development, even after a fifteen-year period and intensive mitigation efforts.[51] After discussing habituation, a group of caribou experts concluded that past experiences suggest that the Porcupine Caribou Herd will show "a low degree of habituation, particularly of maternal cows, to the presence of development."[52] This is a topic that requires further scientific investigation to allow adequate determination of the possible effects of oil and gas development. The current scientific literature does not justify an assumption of habituation for caribou.

### 2. Application of Current Scientific Understanding to the Porcupine Caribou Herd

It is likely that the responses to development observed in the Central Arctic Herd will similarly apply to the Porcupine Caribou Herd. In fact, the USGS pointed out numerous reasons why responses may be greater in the Porcupine Caribou Herd compared to the Central Arctic Herd.[53] One major factor is that the coastal plain is narrower within the Refuge compared to the main Central Arctic Herd range, leaving less room for shifts in space use.




[51] Sawyer et al. (2017).
[52] Elison et al., at 21 (1986).
[53] Griffith et al. (2002).

Another is that the expansion of development and the shift in Central Arctic Herd calving occurred during a period of relatively favorable environmental conditions. Future environmental changes, due to natural fluctuations or climate change, may reduce the ability of caribou to accommodate range shifts. As the National Research Council pointed out in its 2003 report:

> [A]lthough the accumulated effects of industrial development to date have not resulted in large or long-term declines in the overall size of the Central Arctic Herd, the spread of industrial activity into other areas that caribou use during calving and in summer, especially to the east where the coastal plain is narrower than elsewhere, would likely result in reductions in reproductive success, unless the degree to which it disturbs caribou could be reduced.[54]

Success of mitigation measures to reduce disturbance to movement due to physical barriers has not been adequately determined.[55] However, the shift in Central Arctic Herd calving distribution to the south in the Milne Point and Kuparuk areas was maintained in spite of the use of structures intended to mitigate impacts, like elevated pipelines and reduced road density.[56]

There is still much unknown about caribou and the factors that influence their population dynamics. It is important to note that while caribou populations naturally fluctuate, the USGS points out that "reduced calf survival may slow the rate of increase during positive phases of the growth curve of the herd and increase the rate of decline during the negative phases of the herd's growth curve."[57] Three expert groups evaluated potential consequences of energy development on the Refuge coastal plain for the Porcupine Caribou Herd.[58] Techniques analyzed development scenarios, population simulation models, food availability, predator density, and more. All three indicated likely declines in calf survival, with effects on herd distribution and/or population growth, in response to coastal plain development.[59] These analyses and the concerns raised above urge care and a cautionary approach for sensitive Refuge coastal plain habitat.

The BLM must fully analyze these and other reasonably foreseeable direct, indirect, and cumulative impacts of all phases of oil and gas development on the Porcupine Caribou Herd, utilizing the best available scientific information.

#### 3. Data gaps

Understanding space use by species is fundamental to their management. Information regarding critical habitat and species movement patterns over time enables decision making that balances alternative land use objectives. Protecting fish and wildlife species and their habitats in their natural diversity is among the primary objectives of the Refuge.[60] Previous land management decisions by the BLM in northern Alaska seeking a balance between species conservation and resource development, such as the 2013 National Petroleum Reserve–Alaska ("NPR-A")

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[54] National Research Council, at 6 (2003).
[55] Lenart (2015).
[56] Griffith et al. (2002).
[57] Griffith et al., at 32 (2002).
[58] Elison et al. (1986); Griffith et al. (2002); Russell & McNeil (2005).
[59] Elison et al. (1986); Griffith et al. (2002); Russell & McNeil (2005).
[60] *See* Pub L. No. 96-487, § 303(2)(B)(1).

Integrated Activity Plan ("IAP"), have used information about habitat values for caribou and potential effects of development to inform decisions about where leasing, exploration, and oil and gas development would be allowed.[61] Similar information has not been made available for the Porcupine Caribou Herd in the Refuge and nearby areas. To enable decisions about conservation and development in the NPR-A, scientific studies were conducted and published in peer-reviewed journals. Those studies documented areas of concentrated use by caribou across seasons, based on radio and satellite telemetry data,[62] relative habitat suitability for key caribou periods, such as calving,[63] and a quantitative analysis of reduction in high quality calving habitat under different development alternatives, based on the best available scientific understanding of caribou response to development and of oil and gas availability.[64] This array of information was used to help select the final preferred alternative for the 2013 IAP.[65] The BLM must do the same to inform its leasing EIS for the Coastal Plain.

While some depictions of Porcupine Caribou Herd habitat use exist in terms of general polygons,[66] these mostly only depict habitat use prior to 2005.[67] Such polygon-based depictions of use provide a general depiction of habitat use and important areas, but do not provide the type of resolution or fine-scale information needed to inform specific land use decisions or analyses of development impact similar to that previously used by the BLM.[68] To our knowledge, only one study provides a kernel density-based analysis which can help identify key areas[69] and this only includes caribou location data through 2001. Thus, the BLM should conduct a resource selection function analyses to identify relative habitat value for Porcupine caribou in a spatially continuous manner based on environmental factors.[70] Resulting information should be fed into a simulation analysis similar to that used previously by the BLM to evaluate leasing alternatives for the Refuge coastal plain, including a robust no-action alternative.[71] As the agency has already demonstrated in the NPR-A IAP, this information is essential to the BLM's analysis of alternatives.

### 4. Climate change and caribou

Climate change is disproportionately affecting the Arctic, with warming occurring more strongly than the global average.[72] Caribou population dynamics have been shown to be influenced by broad-scale climate patterns,[73] though in many cases local factors may exert population pressures as strong as, or stronger, than climate.[74]

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[61] BLM (2013).
[62] Person et al. (2007).
[63] Wilson et al. (2012).
[64] Wilson et al. (2013).
[65] BLM (2013).
[66] Hemming (1971); Elison et al. (1986); Griffith et al. (2002); Russell & McNeil (2005); McFarland et al. (2017).
[67] *See* McFarland et al. (2017) (which depicts calving polygons from 2012-2017 and winter polygons from 2008-2017).
[68] Wilson et al. (2013).
[69] Griffith et al. (2002).
[70] *C.f.* Wilson et al. (2012).
[71] Wilson et al. (2013).
[72] IPCC (2013).
[73] Joly et al. (2011); Mallory et al. (2018).
[74] *E.g.,* Mahoney et al. (2016); Uboni et al. (2016).

Climate change has the potential to both negatively and positively influence caribou populations. Warming winter conditions in the Arctic have led to an increase in rain-on-snow events.[75] Such events lead to thick ice cover when temperatures subsequently decrease, blocking access to food for caribou and other species.[76] The potential of such icing events to decrease body condition of overwintering caribou is of great concern, as late winter body mass of female caribou is strongly linked to calf production and survival, influencing population growth rates.[77] These icing events are expected to continue to increase as the Arctic keeps warming and sea ice retreats.[78]

Shifts in climate also are influencing the timing of snowmelt and plant green-up and growing season length across the globe. In northern Alaska, surveys show earlier plant greening and longer growing seasons.[79] While this could increase food availability, warming may also reduce forage quality for caribou, as has been seen in other systems.[80] Thus far, however, forage quality does not seem to have declined during the calving period.[81] Warming conditions also have been associated with expansion of shrubs in the Arctic.[82] Experts suggest that decreased edibility of shrubs for caribou may explain why patterns of Arctic greening are accompanied by population declines in caribou.[83]

Potentially contradictory effects of longer, warmer growing seasons and increased rain on snow events make cumulative effects of climate change on caribou difficult to determine. The variability in potential responses of caribou to changing climate in the arctic calls for increased studies to understand how caribou are likely to respond to warming conditions and for monitoring to determine whether predicted patterns are met. Analyses have been done in Canada to evaluate net effects that consider both positive and negative influences under different climate scenarios.[84] Adapting such studies to the Alaskan Arctic may help provide increased understanding of climate effects and allow cumulative analyses of potential stresses from climate change and resource development.

The BLM must fully analyze existing and reasonably foreseeable impacts of climate change on caribou, including in the environmental baseline and affected environment, and across alternatives.

### B. Fish

Freshwater and near-shore waters of the Coastal Plain of the Arctic Refuge contain numerous Arctic fish species that are sensitive to stressors from oil and gas development. The two most abundant anadromous fish species, Dolly Varden (*Salvelinus malma*) and Arctic Cisco (*Coregonus*

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[75] Hansen et al. (2011); Hansen et al. (2014); Forbes et al. (2016).
[76] Hansen et al. (2011); Hansen et al. (2013).
[77] Hansen et al. (2011); Albon et al. (2017); Veiberg, et al. (2017).
[78] Hansen et al. (2014); Forbes et al. (2016).
[79] Gustine et al. (2017).
[80] Barboza et al. (2018).
[81] Gustine et al. (2017).
[82] Tape et al. (2016); Fauchald et al. (2017).
[83] *See* Fauchald et al. (2017).
[84] *E.g.*, Tews et al. (2007).

*autumnalis*)[85] are also the most harvested subsistence fish resources.[86] Arctic Cisco have not been documented using freshwater habitat within the Coastal Plain, but extensively use nearshore habitat within the Beaufort Seas as essential foraging habitat between their spawning migration to the Mackenzie River and overwintering location in the Colville River Delta.[87] Dolly Varden have two life forms, and both resident and anadromous forms are present in freshwater and nearshore habitats.[88] Other fishes within the Coastal Plain freshwater habitat include Lake Trout (*Salvelinus namaycush*), Arctic Grayling (*Thymallus arcticus*), Burbot (*Lota lota*), Ninespine Stickleback (*Pungitius pungitus*), and Slimy Sculpin (*Cottus cognatus*).[89] The delta and lower sections of many rivers within the Coastal Plain contain extensive essential fish habitat such as rearing areas for juvenile Dolly Varden[90] as well as distinct overwintering areas located at perennial springs and deep sections of rivers.[91] Another type of essential fish habitat, spawning areas, are located upstream of the Coastal Plain. Many Dolly Varden either migrate downstream after spawning and overwinter at perennial springs within the Coastal Plain or do so in nearby watersheds.[92]

Due to the limited amount of water available in winter, ice roads built using water extracted from rivers will likely have both short and long-term impacts on fish populations. This could include direct loss of overwintering habitat, reduced dissolved oxygen concentrations, and increased stress and mortality of Dolly Varden or other Arctic fish.[93] Seismic exploration has the potential to cause short-term, but severe, impacts to overwintering fish and could include negative behavioral changes (*e.g.*, fleeing, herding), hearing loss, and direct mortality of fish and embryos.[94] Construction of gravel and ice roads, pipelines, and other infrastructure with river crossings would mobilize sediment, with associated impacts to rearing, spawning, and overwinter habitat,[95] as well as the health and behavior of fish.[96] Within floodplain channels in-filling and various types of stream and river crossings have the potential to cause long-term changes to the natural flow regime, and restrict channel movement and fish passage, causing negative impacts to fish populations.[97] Additionally, with the construction and maintenance of a gravel road network, numerous other minor to severe impacts may occur, such as hydrocarbon and sump contamination,[98] introduction of non-native species and increased fishing pressure. All of which would have both short and long-term impacts to fish populations.[99]

The leasing EIS must fully analyze all of the reasonably foreseeable direct, indirect, and cumulative impacts to fish and subsistence biological resources of the Coastal Plain associated with all phases of development. In order to properly under take this analysis, the BLM must:

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[85] Craig (1984).
[86] Bacon et al. (2009).
[87] Reist & Bond (1988); Brown (2008)
[88] Ward and Craig (1974).
[89] U.S. Fish and Wildlife Serv. (2015).
[90] Ward & Craig (1974).
[91] Craig & McCart (1974); Viavant (2005); Brown et al. (2014).
[92] Brown et al. (2014).
[93] *E.g.*, Gaboury & Patalas (1984); Evans (2007); Cott et al. (2008).
[94] McCauley et al. (2003); Popper et al. (2005).
[95] *E.g.*, Robertson et al. (2006).
[96] *E.g.*, Newcombe & Macdonald (1991); Reid et al. (2003); Robertson et al. (2006).
[97] Semple et al. (1995).
[98] Schein et al. (2009); Kanigan and Kokelj (2010).
[99] Schindler (2001).

1. Identify all water withdrawal sites, including lakes and rivers, and fully analyze how winter fish presence will be accurately detected and adverse impacts avoided, minimized, and mitigated;
2. Analyze and articulate how essential fish habitat (spawning, overwintering, and rearing) will be managed or avoided, so that development does not have negative impacts on fish populations;
3. Analyzing and articulate how stream crossing structures within floodplain channels (50 year-200 year) will be managed to minimize impacts to essential fish habitat, the natural flow regime, and aquatic ecological processes;
4. Analyze and identify the physiological and behavioral impacts associated with sediment mobilization and deposition on Arctic fish;
5. Analyze and identify how temporary and permanent fish passage restrictions will be avoided or minimized to allow seasonal movement patterns by fish species such as Dolly Varden and Arctic Grayling; and
6. Articulate how important subsistence fish species will be monitored to detect short and long-term negative impacts to subsistence fisheries.

## V. Human Health Impacts

The NEPA requires federal agencies to take a hard look not only at the potential impacts to the natural environment, but to the human environment as well. As such, it is incumbent on the agency to thoroughly analyze in the leasing EIS how all phases of a proposed oil and gas leasing program will impact the health of the region's residents, including those residents of Arctic Village and Venetie, the Yukon Flats, and other United States and Canadian communities that are connected to the Coastal Plain through ecological and social systems, like the Porcupine Caribou Herd. All of these communities should be formally identified within the EIS as potentially affected communities ("PAC").

To adequately analyze such human health impacts, the BLM must complete a thorough Health Impact Assessment ("HIA").[100] This type of assessment has an established framework and methodology that will allow the agency to take a hard look at the health impacts of various leasing alternatives and compare them to the "no action" alternative.[101] This analysis needs to focus on how oil leasing, exploration, construction, operation, and the cumulative effects of development will expose residents to health risks, as well as how direct and indirect determinants that positively contribute to health may be compromised by development-related activities.

The HIA will require the BLM to compile comprehensive baseline data to complete a thorough assessment. When analyzing human health, the BLM must comprehensively examine how oil and

[100] *See* Karen Lock, *Health Impact Assessment*, 320 BRITISH MEDICAL J., 1395 (2000).
[101] *See* Alaska Health Impact Assessment Program, *Technical Guidance for Health Impact Assessment in Alaska* (2015), *available at* http://dhss.alaska.gov/dph/Epi/hia/Documents/AlaskaHIAToolkit.pdf.

gas development will impact the numerous health benefits that subsistence resources and practices provide to regional residents. These benefits include: food security and nutrition, social networks, and mental health. While ecosystems are a foundational determinant of the public's health and wellness everywhere, in Alaska's subsistence-based Tribal communities this connection is particularly important.[102]

The HIA must also consider how a Coastal Plain leasing program will impact the region's food security.[103] All three pillars of food security should be examined: food availability, food access, and food use.[104] Within each of these pillars, attention should be given to the importance of nutrition and traditional foods, as well as subsistence. The HIA must examine how oil and gas activities will impact the harvest, preparation, sharing, and consumption of wild resources and subsistence through the lens of dietary, identity, and cultural changes. This should also include an analysis of how changes to the harvesting, preparing, sharing, and consumption of wild resources will impact social networks and community structure within PACs.[105] Social networks contribute significantly to human health outcomes.[106] How these networks may change and how these alterations will impact residents' health must be considered and described.

Examination of how development will impact relationships, including sociocultural and socioeconomic systems relationships to mental health is also necessary. The act of procuring and providing traditional subsistence resources has positive psychological health benefits at the individual and community level. How an oil development program may disrupt traditional practices, cultural identity, and mental health should be analyzed.[107] Moreover, the anxiety and stress of development should also be considered.

Of particular importance to the Tribes is the inclusion in the HIA a risk assessment for subsistence practices impacted by development. The disturbances of oil development are forcing our tribal hunters to travel further from their community to access caribou and other subsistence resources.[108] This increased travel increases the risk of harm and injury because hunters must travel longer distances and have an increased exposure to harsh and often dangerous conditions.

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[102] *See* Philip A. Loring & S.C. Gerlach, *Food, Culture, and Human Health in Alaska: An Integrative Health Approach to Food Security*, 12 ENVIRONMENTAL SCIENCE & POLICY 466 (2009).

[103] *See* Janell Smith et al., *Measurable Benefits of Traditional Food Customs in the Lives of Rural and Urban Alaska Inupiaq Elders* (2009), *available at* http://www.alaskaanthropology.org/wp-content/uploads/2017/08/akanth-articles_275_v7_n1_Smith-Saylor-Easton-Wiedmen-Elders.pdf.

[104] *See* World Health Org., *Trade, Foreign Policy, Diplomacy, and Health: Food Security* (2014), *available at* http://www.who.int/trade/glossary/story028/en/.

[105] *See* Gary Kofinas et al., *Subsistence Sharing Networks and Cooperation: Kaktovik, Wainwright, and Venetie, Alaska. BOEM Report 2015-023DOI; AFES Report MP 2015-02* (2016).

[106] *See* Kristin P. Smith & Nicholas A. Christakis, *Social Networks and Health*, 34 THE ANNUAL REV. SOCIOLOGY 405 (2003).

[107] *See*: N.K. McGrath-Hanna et al., *Diet and Mental Health in the Arctic: Is Diet an Important Risk Factor for Mental Health in Circumpolar Peoples? – Review*, 63:3 INTERNATIONAL J. CIRCUMPOLAR HEALTH 228 (2003).

[108] *See* Final Supplemental Environmental Impact Statement for the Greater Mooses Tooth One Development Project, (2014).

Finally, the BLM must fully consider and integrate the impacts of climate change on human health into the HIA. Specifically, the agency must consider how climate change affects the social and environmental determinants of health within the region for PACs.[109] This analysis should include, but not be limited to: mental health, air quality, impacts to subsistence resources and practices, and food security. Ongoing and reasonably foreseeable climate change impacts and stressors must be integrated into the BLM's baseline and across all alternatives.

## VI. Air and Water Quality

### A. Air Quality

The leasing EIS must rigorously assess the significant air quality impacts associated with all phases of an oil and gas development program for the Coastal Plain. Adequate NEPA analysis and compliance with the Clean Air Act will require the BLM to model the air pollution impacts associated with each alternative, ensure prevention of significant deterioration of air quality, fully analyze a suite of enforceable mitigation measures, and address greenhouse gas emissions and climate change impacts associated with all phases of oil and gas development.

### B. Water Resources

The Coastal Plain contains a variety of permafrost dominated lentic and lotic ecosystems including large rivers, small beaded streams and both shallow and deep thermokarst lakes that are sensitive to oil and gas development. Compared to the rest of the North Slope Coastal Plain, the area within the Refuge lacks widespread deep lakes to provide water sources for ice roads.[110] Areas that do contain deep lakes will need to be carefully managed for impacts to surface water connectivity, seasonal flow regime patterns, and processes within aquatic ecosystems. Impacts from improper water withdrawals could include loss of overwintering habitat, degraded water quality, loss of littoral habitat and freezing of fish eggs or benthos.[111]

While historically considered as a potential water source for ice roads, lotic environments should be avoided due to the high potential for detrimental aquatic impacts.[112] Due to the lack of available water during the winter months for ice roads, development will likely require construction, maintenance, and use of numerous permanent gravel roads, which in turn have a number of significant impacts.[113] Both short and long-term impacts from roads, stream crossings and development within the riverine floodplain may occur and could include increased sediment transport and deposition, increased frequency of mass wasting and slump events, and degraded water quality and habitat.[114] Associated negative impacts to Arctic fish populations from degraded

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[109] *See* Alaska Epidemiology, *Assessment of the Potential Health Impacts of Climate Change in Alaska* (Jan. 8, 2016), *available at* http://www.epi.alaska.gov/bulletins/docs/rr2018_01.pdf.
[110] Trawicki et al. (1991); Lyons and Trawicki (1994).
[111] Gaboury & Patalas (1984); Turner et al. (2005); Cott et al. (2008).
[112] Bendock (1976).
[113] *E.g.*, DFO (2000).
[114] *E.g.*, Newcombe & Macdonald (1991); Robertson et al. (2006)

water quality and habitats are likely to include minor to severe impacts to critical habitat (i.e., spawning, rearing, and overwintering) quality and quantity and to Arctic fish fitness.[115]

In the leasing EIS, the BLM must fully analyze all of the reasonably foreseeable direct, indirect, and cumulative impacts to water resources and hydrology of the Coastal Plain associated with all phases of development. As such, the agency must:

1. Identify water withdrawal amounts under each alternative and fully analyze associated impacts to Arctic fishes;

2. Identify and analyze a full suite of protective measures to avoid, minimize, and mitigate adverse impacts to fish and hydrology associated with water withdrawals;

3. Ensure adequate information on the spatial and temporal variability of water and dissolved oxygen concentrations in lakes within the study area;

4. Identify and analyze a full suite of protective measures for designation, construction, and maintenance of stream crossings to minimize impacts to water quality, natural flow regimes and ecological processes;

5. Ensure that river and stream setbacks minimize impacts to riparian and floodplain processes; and

6. Fully analyze physiological and behavioral impacts on Arctic fish from impacts to water resources associated with all phases of oil and gas development.

## VII. Cumulative Impacts

The leasing EIS must fully consider and analyze all reasonably foreseeable direct, indirect, and cumulative impacts associated with all phase of an oil and gas development program for the Coastal Plain.

### A. Leasing Impacts

As part of analyzing the likely impacts of leasing on the Coastal Plain, the BLM must consider the impacts to management for other resources, including: wildlife habitat, subsistence, recreation, and tourism. Issuing an oil and gas lease is an irretrievable commitment of resources. Oil and gas leases confer "the right to use so much of the leased lands as is necessary to explore for, drill for, mine, extract, remove and dispose of all the leased resource in a leasehold."[116] Therefore, issuing a lease constitutes an "irreversible and irretrievable commitment of resources."[117] Once leased, regardless of development potential or actual ongoing development, federal agencies take the

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[115] *E.g.*, Goldes et al. (1988); Berg and Northcote (1985); Reynolds et al. (1989).
[116] *See*, e.g., *New Mexico ex rel. Richardson v. Bureau of Land Management*, 565 F.3d 683, 718 (10th Cir. 2009); *Pennaco Energy, Inc. v. U.S. Dep't of Interior*, 377 F.3d 1147, 1160 (10th Cir. 2004).
[117] *New Mexico*, 565 F.3d at 718.

position that leased land cannot be proactively managed for wildlife, recreation, or land conservation. Once the BLM leases land to the fossil fuel industry, management for conservation, even on sensitive lands with important wildlife habitat, wilderness values, or cultural resources, is essentially abandoned.

### B. Seismic Exploration Impacts

The impacts of seismic surveys conducted during the winter must be analyzed as part of considering the impacts of an oil and gas development program for the Coastal Plain. Seismic surveys taking place during the winter will industrialize the Coastal Plain. Source and receiver lines typically would be placed just a few hundred feet apart. Some of the significant adverse impacts from seismic activities include: noise and other impacts on wildlife, including denning polar bears, damage to the tundra by moving heavy equipment, operating a mobile camp with hundreds of people, use of large amounts of water in a water-limited region, discharge of wastewater to the environment, and effects to wildlife energetics and activities by performing seismic work beyond the short winter season.

### C. Infrastructure Impacts

The BLM must thoroughly analyze impacts associated with infrastructure under all development scenarios being considered, including providing estimates of surface acreage disturbance. Oil and gas exploratory drilling and production would have a variety of significant impacts associated with infrastructure. These include impacts associated with the physical footprint of the infrastructure, acquisition of materials such as gravel to build the infrastructure, and infrastructure operations. Under full development scenarios, exploratory and production-related drilling infrastructure could potentially sprawl over vast stretches of the Coastal Plain, greatly exceeding the development area provided for in the 2017 Tax Cuts and Jobs Act.[118]

Finally, the BLM must fully analyze the impacts of the development of road infrastructure and well pad construction. The construction and maintenance of permanent, ice, and snow roads has significant and adverse impacts on wildlife, habitat, water resources, and subsistence that must be fully analyzed. Permanent road construction and maintenance requires gravel transport and mining, with associated impacts on wildlife habitat. Stream crossings for roads require bridges or adequately sized and maintained culverts to ensure water flow and adequate fish passage and to prevent creation of flooded wetlands. Temporary ice roads require significant water and ice withdrawals which can adversely impact over-wintering fish in lakes. Temporary, compacted snow roads can harm tundra growth, as the snow overlying those areas likely will require more time to melt during the very short growing season, and snow compaction can affect surface flows. Roads fragment habitat, with associated avoidance behavior by caribou and other wildlife. Raised permanent roads built to protect permafrost make subsistence travel more difficult. Similarly, gravel well pad construction and operation will adversely affect wildlife habitat. Wildlife generally

[118] Pub. L. No. 115-97, 131 Sta. 2054 (Dec. 22, 2017).

avoid pads because they are noisy areas with humans around. Pads also require significant quantities of mined gravel.

### D. Spill Impacts

The BLM must analyze all reasonably foreseeable impacts associated with potential blowouts and spills. Oil exploration and production will inevitably result in a blowout, upturn, or spill. Operators cannot prevent all exploratory and production-related blowouts because companies may encounter unexpected or changing subsurface conditions that have not been adequately addressed during drilling. Similarly, major and minor spills can occur from corrosion, human errors, inadequate maintenance, earthquakes, infrastructure failures, and freezing. Inadequate leak detection and valve placement for gathering and transmission pipelines can also lead to larger spills. And management and disposal of drilling muds and cuttings, produced water and other forms of wastewater including oil-contaminated storm-water, and hydraulic fracturing related chemicals and wastes can have significant impacts as well. The agency must also fully analyze and consider how it will ensure operators will comply with all relevant lease and state and federal regulatory requirements, particularly given the remoteness of the region and associated challenges with and costs of performing regulatory inspections.

### E. Other Impacts

The BLM must fully analyze all other impacts associated with oil development in the Coastal Plain, including, but not limited to: air and noise pollution, waste generation, surface water use, and restrictions on access for subsistence.

Furthermore, the BLM cannot rely on directional drilling to claim that numerous significant impacts associated with development will be eliminated or mitigated. Directional or extended reach drilling for oil has the same impacts as vertical well drilling. The limited range of directional drilling makes in ineffective in avoiding, minimizing, and mitigating the impacts of vertical well drilling.

## VIII. International Obligations

While the Refuge and the Coastal Plain lie wholly within the United States, they are part of a larger human and natural environmental that spans international borders. Any NEPA analysis of the Coastal Plain must consider these many complex transboundary issues. Some such issues arise from international agreements and treaties the United States is subject to, such as the Porcupine Caribou Herd Conservation Agreement ("the Agreement") between the United States and Canada, while other issues stem from NEPA obligations to consider transboundary environmental and associated socio-economic effects. It is critically important for the BLM to cooperate and coordinate closely on these transboundary issues with relevant Canadian government officials, agencies, Canadian First Nations—specifically the Gwich'in communities of Old Crow, Fort McPherson, Tsiigehtchic, Aklavik, and Inuvik—as well as with the U.S. Fish and Wildlife Service, the United States Department of State, other federal and state agencies, and the federally recognized Tribes in the region.

### A. Porcupine Caribou Herd Conservation Agreement

One of Congress's express purposes for the Refuge is "to fulfill the international treaty obligations of the United States with respect to fish and wildlife and their habitats."[119] The Agreement was signed on July 17, 1987, by United States Secretary of the Interior Don Hodel and his Canadian counterpart Thomas McMillan. The Agreement recognizes that the Porcupine Caribou Herd:

> [R]egularly migrates across the international boundary between Canada and the United States of America and that caribou in their large free-roaming herds comprise a unique and irreplaceable natural resource of great value which each generation should maintain and make use of so as to conserve them for future generations.[120]

The Agreement further recognizes "the importance of conserving the habitat of the Porcupine Caribou Herd, including such areas as calving, post-calving, migration, wintering and insect relief habitat."[121] The Agreement specifically defines the herd's habitat as "the whole or any part of the ecosystem, including summer, winter and migration range, used by the Porcupine Caribou Herd during the course of its long-term movement patterns."[122]

The Agreement's first objective is "[t]o conserve the Porcupine Caribou Herd and its habitat through international cooperation and coordination so that the risk of irreversible damage or long-term adverse effects as a result of use of caribou or their habitat is minimized."[123]

The agreed-upon "conservation" obligations of the two countries are clarified in seven clauses of Article 3 of the Agreement:

1. The Parties will take appropriate action to conserve the Porcupine Caribou Herd and its habitat.

2. The Parties will ensure that the Porcupine Caribou Herd, its habitat and the interests of users of Porcupine Caribou are given effective consideration in evaluating proposed activities within the range of the Herd.

3. Activities requiring a Party's approval having a potential impact on the conservation of the Porcupine Caribou Herd or its habitat will be subject to impact assessment and review consistent with domestic laws, regulations and processes.

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[119] Pub L. No. 96-487, § 303(2)(B)(ii).
[120] Agreement between the Government of Canada and the Government of the United States of American on the Conservation of the Porcupine Caribou Herd (July 17, 1987), *attainable at* www.treaty-accord.gc.ca/text-texte.aspx?id=100687.
[121] *Id.*
[122] *Id.*
[123] *Id.*

4. Where an activity in one country is determined to be likely to cause significant long-term adverse impact on the Porcupine Caribou Herd or its habitat, the other Party will be notified and given an opportunity to consult prior to final decision.

5. Activities requiring a Party's approval having a potential significant impact on the conservation or use of the Porcupine Caribou Herd or its habitat may require mitigation.

6. The Parties should avoid or minimize activities that would significantly disrupt migration or other important behavior patterns of the Porcupine Caribou Herd or that would otherwise lessen the ability of users of Porcupine Caribou to use the Herd.

7. When evaluating the environmental consequences of a proposed activity, the Parties will consider and analyze potential impacts, including cumulative impacts, to the Porcupine Caribou Herd, its habitat and affected users of Porcupine Caribou.

The BLM must address each of the Agreement's seven conservation obligations in the development of its leasing EIS for the Coastal Plain. Oil and gas leasing, together with subsequent related activities will have significant long-term impacts on the Porcupine Caribou Herd and its habitat. As such, the agency must, pursuant to the Agreement, notify and consult with Canada while developing its draft leasing EIS. This effort needs to be done well in advance of BLM's publication of the draft leasing EIS, in order to integrate information and data obtained during the consultation process into the draft.

### B. International Porcupine Caribou Board

The Agreement also establishes a bilateral advisory board—the International Porcupine Caribou Board ("the Board")—consisting of four representatives from each country. The Agreement states that the Board "will make recommendations and provide advice on those aspects of the conservation of the Herd and its habitat that require international coordination," including, for example, "the identification of sensitive habitat deserving special consideration."[124] Under the Agreement, the two countries will "promptly notify the Board of proposed activities that could significantly affect the conservation of the Porcupine Caribou Herd or its habitat and provide an opportunity to the Board to make recommendations."[125] The two countries are not required to abide by any Board recommendations, but they are expected to "consider and respond" to any such recommendations.[126]

The Agreement specifies several topics for the Board to address in its recommendations and advice. These topics raise relevant issues that should be considered in the EIS:

1. The sharing of information and consideration of actions to further the objectives of this Agreement at the international level;

[124] *Id.*
[125] *Id.*
[126] *Id.*

2. The actions that are necessary or advisable to conserve the Porcupine Caribou Herd and its habitat;

3. Cooperative conservation planning for the Porcupine Caribou Herd throughout its range;

4. When advisable to conserve the Porcupine Caribou Herd, recommendations on overall harvest and appropriate harvest limits for each of Canada and the United States of America taking into account the Board's review of available data, patterns of customary and traditional uses and other factors the Board deems appropriate; and

5. The identification of sensitive habitat deserving special consideration.

It remains unclear to the Tribes what process the BLM will undertake to engage with the Board in the development of the EIS. The answer is of critical importance to the Tribes, as one of the seats on the Board is reserved for a Gwich'in representative. Presently, the Tribes have nominated, with the support of the other Tribal councils in the region, Dr. Charlene Stern to serve as the Gwich'in representative. In moving forward with this EIS process, the BLM must comply with the Agreement and utilize the Board to obtain its recommendations and advice regarding the proposed oil and gas leasing program in the Coastal Plain. In doing so, it is critically important that the Board have adequate opportunity to collect, share, and discuss all the relevant and most up-to-date information pertaining to the effects of oil and gas development on the Herd and to make its recommendations before the BLM completes and releases the Draft EIS for public comment. Otherwise, the Agency's proposed action and alternatives will not reflect the input and recommendations of the Board and, likewise, the public will not be able to comment on the alternatives and the analysis of environmental effects in the Draft EIS in light of the Board's input and recommendations. If the Draft EIS precedes the Board's recommendations and advice, then it will be very likely that the BLM will have to produce a Supplemental Draft EIS and circulate it for public comment.

### C. Other Treaties

#### 1. Polar Bear

The 1976 Agreement on the Conservation of Polar Bears between the United States and the governments of Canada, Denmark, Norway, and Russia recognizes the responsibilities of circumpolar countries for coordinating actions to protect polar bears. Specifically, this multilateral agreement commits each associated country to sound conservation practices by protecting the ecosystem of polar bears, with special attention to denning areas, feeding sites, and migration corridors based on best available science through coordinated research.

The BLM must consider the United States' obligations under this treaty and ensure that any action it takes in the leasing and potential development of the Coastal Plain complies with the treaty. The Tribes note that the Coastal Plain of the Arctic Refuge provides very important habitat for polar bears. The Coastal Plain has the highest density of on-shore polar bear dens found anywhere in America's Arctic, and more and more bears are using on-shore habitat as sea ice diminishes due to climate change. In developing the proposed oil and gas leasing program and alternatives the BLM must consider how such actions will affect polar bear denning areas, feeding sites, and migration corridors, including corridors between Alaska and Canada.

### 2. Migratory Birds

All bird species that utilize the Arctic Refuge, with the exception of grouse and ptarmigan, are covered by the Migratory Bird Treaty Act of 1918 and its amendments.[127] Multiple species of migratory waterfowl from six continents rely upon the Coastal Plain lagoon and wetlands for nesting and breeding grounds, including threatened vulnerable species of Steller's Eiders. The migratory waterfowl flying north to the Coastal Plain represent one of the most important historic and contemporary subsistence species to the Neets'ąįį Gwich'in. Historically, the spring waterfowl harvest presented the first opportunity of the year to take fresh game after a long winter, ensuring that tribal members avoided hunger during spring break-up. The return of waterfowl in the spring continues to be celebrated in Venetie and Arctic Village, with traditional lotteries and games associated with the first harvests of the year.

Because of the critical importance of migratory birds to the Neets'ąįį Gwich'in, the BLM must conduct a comprehensive analysis in the EIS to ensure impacts from leasing and transportation corridors to all species are fully understood and mitigated, and to ensure compliance with the Migratory Bird Treaty Act of 1918.

## IX. Conclusion

As discussed above, the Tribes fully expect the BLM to comprehensively address and analyze the numerous impacts posed to the natural and human environment by the proposed oil and gas leasing program on the Arctic Refuge's Coastal Plain. In doing so, the Tribes also expect the BLM to adhere to the established laws and policies of the United States recognizing and affirming the sovereignty of the Tribes and the rights of their tribal citizens. The Tribes look forward to further developing the BLM's analysis of these and all other issues as cooperating agencies throughout the NEPA process.

[127] 16 U.S.C. §§ 703-712.

## References


Albon, S.D., Irvine, R.J., Halvorsen, O., Langvatn, R., Loe, L.E., Ropstad, E., Veiberg, V., Van der Wal, R., Bjørkvoll, E.M., Duff, E.I., Hansen, B.B., Lee, A.M., Tveraa, T., Stein, A. 2017. Contrasting effects of summer and winter warming on body mass explain population dynamics in a food-limited Arctic herbivore. Global Change Biology 23, 1374-1389.

Arthur, S.M., Del Vecchio, P.A. 2009. Effects of oil field development on calf production and survival in the Central Arctic herd. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Final Research Technical Report. Grants W-27-5 and W-33-1 through W-33-4. Project 3.46. Juneau, AK, USA.

Bacon, J.J., Hepa, T.R., Brower, Jr. H.K., et al. 2009. Estimates of subsistence harvest for villages on the North Slope of Alaska, 1994-2003. North Slope Borough Department of Wildlife Management Technical Report 127p.

Barboza, P.S., Van Someren, L.L., Gustine, D.D., Bret-Harte, M.S. 2018. The nitrogen window for arctic herbivores: plant phenology and protein gain of migratory caribou (*Rangifer tarandus*). Ecosphere 9, e02073.

Bendock, T.N. 1976. De-watering effects of industrial development on Arctic fish stocks. Unpublished report for the Alaska Board of Fisheries. Alaska Department of Fish and Game, Division of Sport fish, Fairbanks, 13pp.

Berg, L., Northcote, T.G. 1985. Changes in territorial, gill-flaring, and feeding behavior in juvenile coho salmon (*Oncorhynchus kisutch*) following short-term pulses of suspended sediment. Can. J. Fish. Aquat. Sci. 42: 1410-1417.

Bergman, C.M., Schaefer, J.A., Luttich, S.N. 2000. Caribou movement as a correlated random walk. Oecologia 123, 364-374.

BLM [Bureau of Land Management]. 2013. National Petroleum Reserve – Alaska Integrated Activity Plan Record of Decision. U.S. Department of the Interior, Bureau of Land Management, Anchorage, AK, USA.

BLM [Bureau of Land Management]. 2018. Alpine Satellite Development Plan for the Proposed Greater Mooses Tooth 2 Development Project: Draft Supplemental Environmental Impact Statement. U.S. Department of the Interior, Bureau of Land Management, Anchorage, AK, USA.

Boulanger, J., Poole, K.G., Gunn, A., Wierzchowski, J. 2012. Estimating the zone of influence of industrial developments on wildlife: a migratory caribou *Rangifer tarandus groenlandicus* and diamond mine case study. Wildlife Biology 18, 164-179.

Bråthen, K.A., Ims, R.A., Yoccoz, N.G., Fauchald, P., Tveraa, T., Hausner, V.H. 2007. Induced shift in ecosystem productivity? Extensive scale effects of abundant large herbivores. Ecosystems 10, 773-789.

Brown, R.W., Loewen, M.B., and Tanner, T.L. 2014. Overwintering Locations, Migrations, and Fidelity of Radio-Tagged Dolly Varden in the Hulahula River, Arctic National Wildlife Refuge, 2007-09. Arctic 67, 149-158.

Brown, R.J. 2008. Life history and demographic characteristics of Arctic cisco, Dolly Varden, and other fish species in the Barter Island region of northern Alaska, U.S. Fish and Wildlife Service, Alaska Fisheries Technical Report No. 101, Fairbanks, Alaska.

Caikoski, J.R. 2015. Units 25A, 25B, 25D, and 26C caribou. Chapter 15, pages 15-1 through 15-24 [*In*] P. Harper and L. A. McCarthy, editors. Caribou management report of survey and inventory activities 1 July 2012–30 June 2014. Alaska Department of Fish and Game, Species Management Report ADF&G/DWC/SMR-2015-4, Juneau.

Cameron, R.D., Reed, D.J., Dau, J.R., Smith, W.T. 1992. Redistribution of calving caribou in response to oil field development on the arctic slope of Alaska. Arctic 45, 338-342.

Cameron, R.D., Smith, W.T., White, R.G., Griffith, B. 2005. Central Arctic caribou and petroleum development: distributional, nutritional, and reproductive implications. Arctic 58, 1-9.

Cott, P.A., Sibley, P.K., Somers, M.W. et al. 2008. A review of water level fluctuations on aquatic biota with an emphasis on fishes in ice-covered lakes. J. Amer. Water Res. Ass. 44: 343-358.

Craig, P. 1984. Fish Use of coastal waters of the Alaskan Beaufort Sea: a review. Transactions of the Amer. Fish. Soc. 113: 265-282.

Craig, P.C. and McCart, P.J. 1974. Classification of stream types in Beaufort Sea drainages between Prudhoe Bay, Alaska and the Mackenzie Delta. Arctic Gas, Biological Report Series no. 17(Chapter I): 47 p.

Culler, L.E., Ayres, M.P., Virginia, R.A. 2015. In a warmer Arctic, mosquitoes avoid increased mortality from predators by growing faster. Proceedings of the Royal Society B, 282, 20151549.

Dau J. Units 21D, 22A, 22B, 22C, 22D, 22E, 23, 24, and 26A caribou management report. In: Harper P, editor. Caribou management report of survey and inventory activities 1 July 2008–30 June 2010. Juneau: Alaska Department of Fish and Game; 2011. p. 187–250.

Dau, J.R., Cameron, R.D. 1986. Effects of a road system on caribou distribution during calving. Rangifer 1, 95-101.

DFO. 2000. Effects of sediment on fish and their habitat. DFO Pacific Region Habitat Status Report 2000/01. Department of Fisheries and Oceans, Ottawa, ON.

Elison, G.W., Rappoport, A.G., Reid, G.M. 1986. Report of the Caribou Impact Analysis Workshop, Arctic National Wildlife Refuge, November 19-20, 1985. U.S. Department of the Interior, U.S. Fish and Wildlife Service, Arctic National Wildlife Refuge, Fairbanks, AK, USA.

Evans, D.O. 2007. Effects of hypoxia on scope-for-activity and power capacity of lake trout (*Salvelinus namaycush*) Can. J. Fish. Aquat. Sci. 64: 345-36.

Fauchald, P., Park, T., Tømmervik, H., Myneni, R., Hausner, V.H. 2017. Arctic greening from warming promotes declines in caribou populations. Science Advances 3, e1601365.

Forbes, B.C., Kumpuka, T., Meschtyb, N., Laptander, R., Macias-Fauria, M., Zetterberg, P., Verdonen, M., Skarin, A., Kim, K-Y., Boisvert, L.N., Stroeve, J.C., Bartsch, A. 2016. Sea ice, rain-on-snow and tundra reindeer nomadism in Arctic Russia. Biology Letters 12, 20160466.

Gaboury, M.N., Patalas, J.W. 1984. Influence of water level drawdown on the fish populations of Cross Lake, Manitoba. Can. J. Fish. Aquat. Sci. 41: 118-125.

Goldes, S.A., Ferguson, H.W., Moccia, R.D. et al. 1988. Histological effects of the inert suspended clay kaolin on the gills of juvenile rainbow trout, *Salmo gairdneri* Richardson. J. Fish Dis. 11: 23-33.

Griffith, B., Douglas, D.C., Walsh, N.E., Young, D.D., McCabe, T.R., Russell, D.E., White, R.G., Cameron, R.D., Whitten, K.R. 2002. The Porcupine caribou herd. Pages 8-37 [*In*] Douglas, D.C., Reynolds, P.E., Rhode, E.B., editors. Arctic Refuge coastal plain terrestrial wildlife research summaries. U.S. Geological Survey, Biological Resources Division, Biological Science Report USGS/BRD/BSR-2002-0001.

Gustine, D., Barboza, P., Adams, L., Griffith, B., Cameron, R., Whitten, K. 2017. Advancing the match-mismatch framework for large herbivores in the Arctic: evaluating the evidence for a trophic mismatch in caribou. PLoS ONE 12, e0171807.

Hansen, B.B., Aanes, R., Herfindal, I., Kohler, J., Sæther, B-E. 2011. Climate, icing, and wild arctic reindeer: past relationships and future prospects. Ecology 92, 1917-1923.

Hansen, B.B., Grøtan, V., Aanes, R., Sæther, B-E., Stien, A., Fuglei, E., Ims, R.A., Yoccoz, N.G., Pedersen, Å.Ø. 2013. Climate events synchronize the dynamics of a resident vertebrate community in the High Arctic. Science 339, 313-315.

Hansen, B.B., Isaksen, K., Benestad, R.E., Kohler, J., Pedersen, Å.Ø., Loe, L.E., Coulson, S.J., Larsen, J.O., Varpe, Ø. 2014. Warmer and wetter winters: characteristics and implications of an extreme weather event in the High Arctic. Environmental Research Letters 9, 114021.

Haskell, S.P., Ballard, W.B. 2008. Annual re-habituation of calving caribou to oilfields in northern Alaska: implications for expanding development. Canadian Journal of Zoology 86, 627-637.

Haskell, S.P., Nielson, R.M., Ballard, W.B., Cronin, M.A., McDonald, T.L. 2006. Dynamic responses of calving caribou to oilfields in northern Alaska. Arctic 59, 179-190.

Hemming, J.E. 1971. The distribution and movement patterns of caribou in Alaska. Game Technical Bulletin No. 1. Alaska Department of Fish and Game. pp.67.

IPCC [Intergovernmental Panel on Climate Change]. 2013. Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Eds. Stocker, T.F., Qin, D., Plattner, D-G., Tignor, M., Allen, S.K., Boschung, J., Nauels, A., Xia, Y., Bex, V., Midgley, P.M.. Cambridge University Press, Cambridge, UK and New York, NY, USA.

Johnson, C.J., Russell, D.E. 2014. Long-term distribution responses of a migratory caribou herd to human disturbance. Biological Conservation 177, 52-63.

Joly, K. 2012. Sea ice crossing by migrating caribou, *Rangifer tarandus*, in northwestern Alaska. Canadian Field-Naturalist 126, 217–20.

Joly, K., Nellemann, C., Vistnes, I. 2006. A Reevaluation of caribou distribution near an oilfield road on Alaska’s North Slope. Wildlife Society Bulletin 34, 866-869.

Joly, K., Klein, D.R., Verbyla, D.L., Rupp, T.S., Chapin III, F.S. 2011. Linkages between large-scale climate patterns and the dynamics of Arctic caribou populations. Ecography 34, 345-352.

Kanigan, J.C.N., and Kokelj, S.V. 2010. Review of current research on drilling-mud sumps in permafrost terrain, Mackenzie Delta region, NWT, Canada. In Geo2010, Proceedings of the 63rd Canadian Geotechnical Conference & 6th Canadian Permafrost Conference, 12–16 September 2010, Calgary, AB. pp. 1473–1479.

Lenart, E.A. 2015. Units 26B and 26C caribou. Chapter 18, pages 18–1 through 18–38 [*In*] P. Harper and L. A. McCarthy, editors. Caribou management report of survey and inventory activities 1 July 2012–30 June 2014. Alaska Department of Fish and Game, Species Management Report ADF&G/DWC/SMR-2015-4, Juneau.

Lyons, S., and Trawicki, J. 1994. Water resource inventory and assessment, coastal plain Arctic National Wildlife Refuge, 1987-1992. Final report, WRB 94-3. U.S. Fish and Wildlife Service, Anchorage, Alaska.

Mahoney, S.P., Lewis, K.P., Weir, J.N., Morrison, S.F., Luther, J.G., Schaefer, J.A., Pouliot, D., Latifovic, R. 2016. Woodland caribou calf mortality in Newfoundland: insights into the role of climate, predation and population density over three decades of study. Population Ecology 58, 91-103.

Mallory, C.D., Campbell, M.W., Boyce, M.S. 2018. Climate influences body condition and synchrony of barren-ground caribou abundance in northern Canada. Polar Biology 41, 855-864.

McCauley, R.D., Fewtrell, J., Popper, A.N. 2003. High intensity anthropogenic sound damages fish ears. J. Acoust. Soc. Am. 113: 638-642.

McFarland, H.R., Caikoski, J., Lenart, E., and Taras, M., 2017, Porcupine caribou news [Newsletter]. Alaska Department of Fish and Game, Division of Wildlife Conservation, Fairbanks, Alaska. Available at: http://www.adfg.alaska.gov/static/home/library/pdfs/wildlife/porcupine_caribou_news/porcupine_caribou_news_summer_2017.pdf

National Research Council. 2003. Cumulative environmental effects of oil and gas activities on Alaska's North Slope. National Academies Press, Washington D.C., USA.

Newcombe, C.P., Macdonald, D.D. 1991. Effects of suspended sediments on aquatic ecosystems. N. Am. J. Fish. Manage. 11: 72-82.

Noel, L.E., Parker, K.R., Cronin, M.A. 2004. Caribou distribution near an oilfield road on Alaska's North Slope, 1978-2001. Wildlife Society Bulletin 32, 757-771.

Person, B.T., Prichard, A.K., Carroll, G.M., Yokel, D.A., Suydam, R.S., George, J.C. 2007. Distribution and movements of the Teshekpuk Caribou Herd 1990-2005: Prior to oil and gas development. Arctic 60, 238-250.

Pollard, R.H., Ballard, W.B., Noel, L.E., Cronin, M.A. 1996. Summer distribution of caribou, Rangifer tarandus granti, in the area of the Prudhoe Bay Oil Field, Alaska, 1990-1994. The Canadian Field-Naturalist 110, 659-674.

Popper, A.N., Smith, M.E., Cott, P.A., et al. 2005. Effects of exposure to seismic airgun use on hearing of three fish species. J. Acoust. Soc. Am. 117: 3958-397.

Reid, S.K., Glenn, I., Metikosh, S. et al. 2003. Physiological response of rainbow trout to sediment release during open-cut pipeline water course construction. Water Qual. Res. J. Can. 38: 473-481.

Reist, J.D., and Bond, W.A. 1988. Life history characteristics of migratory coregonids of the lower Mackenzie River, Northwest Territories, Canada. Finnish Fisheries Research 9: 133-144.

Reynolds, J.B., Simmons, R.C., Burkholder, A.R. 1989. Effects of placer mining discharge on health and food of Arctic grayling. J. Am. Water Resour. Assoc. 25: 625-635.

Robertson, M.J., Scruton, D.A., Gregory, R.S. et al. 2006. Effect of suspended sediment on freshwater fish and fish habitat. Can. Tech. Rep. Fish. Aquat. Sci. 2644. 37 p.

Russell, D.E., McNeil, P. 2005. Summer ecology of the Porcupine Caribou Herd. Report published by the Porcupine Caribou Management Board. pp.16.

Russell, D.E., Gunn, A., White, R.G. 2015. CircumArctic collaboration to monitor caribou and wild reindeer. Arctic 61, 6-10.

Sawyer, H., Korfanta, N.M., Nielson, R.M., Monteith, K.L., Strickland, D. 2017. Mule deer and energy development – Long-term trends of habituation and abundance. Global Change Biology 23, 4521-4529.

Schaefer, J.A., Mahoney, S.P. 2013. Spatial dynamics of the rise and fall of caribou (*Rangifer tarandus*) in Newfoundland. Canadian Journal of Zoology 91, 767-774.

Schein, A., Scott, J.A., Mos, L., et al. 2009. Oil dispersion increases the apparent bioavailability and toxicity of diesel to rainbow trout (*Oncorhynchus mykiss*) Environ. Toxicol. Chem. 28: 595-602.

Schindler, D.W. 2001. The cumulative effects of climate warming and other human stresses on Canadian freshwaters in the new millennium. Can. J. Fish. Aquat. Sci. 58: 18-29.

Semple, J.R., Zamora, P.J., Rutherford, R.J. 1995. Effects of dredging on egg to fry emergence survival, timing and juvenile Atlantic salmon abundance, Debert River, Nova Scotia. Can. Tech. Rep. Fish. Aquat. Sci. 2023. 34 p.

Tape, K.D., Gustine, D.D., Ruess, R.W., Adams, L.G., Clark, J.A. 2016. Range expansion of moose in arctic Alaska linked to warming and increased shrub habitat. PLoS ONE 11, e0152636.

Tews, J., Ferguson, M.A.D., Fahrig, L. 2007. Potential net effects of climate change on High Arctic Peary caribou: lessons from a spatially explicit simulation model. Ecological Modelling 207, 85-98.

Trawicki, J.M., Lyons, S.M., and Elliot, G.V. 1991. Distribution and quantification of water within the lakes of the 1002 area, Arctic National Wildlife Refuge, Alaska. Alaska Fisheries Technical Report Number 10, U.S. Fish and Wildlife Services, Anchorage, Alaska.

Turner, M.A., Huebert, D.B., Findlay, D.L., et al. 2005. Divergent impacts of experimental lake-level drawdown on planktonic and benthic plant communities in a boreal forest lake. Can. J. Fish. Aquat. Sci. 62: 991-1003.

Uboni, A., Horstkotte, T., Kaariejärvi, E., Sévêque, A., Stammler, F., Olofsson, J., Forbes, B.C., Moen, J. 2016. Long-term trends and role of climate in the population dynamics of Eurasian reindeer. PLoS ONE 11, e0158359.

U.S. Fish and Wildlife Service. 2015. Arctic National Wildlife Refuge revised comprehensive conservation plan-chapter 4, Affected Environment: U.S. Fish and Wildlife Service, Final environmental impact statement, v. 1 256p accessed June 04, 2018.

Veiberg, V., Loe, L.E., Albon, S.D., Irvine, R.J., Tveraa, T., Ropstad, E., Stien, A. 2017. Maternal winter body mass and not spring phenology determine annual calf production in an Arctic herbivore. Oikos 126, 980-987.

Viavant, T. 2005. Eastern North Slope Dolly Varden Stock assessment. Alaska Department of Fish and Game. Fishery Data Series Number 05-07.

Vors, L.S., Boyce, M.S. 2009. Global declines of caribou and reindeer. Global Change Biology 15, 2626-2633.

Ward, D., and Craig, P. 1974. Catalogue of streams, lakes and coastal areas in Alaska along routes of the proposed gas pipeline from Prudhoe Bay to the Alaska/Canadian border. Canadian Arctic Gas Study Ltd./Alaskan Arctic Gas Study Co. Bio. Rep. Ser. 19, Calgary, Alberta.

Wilson, R.R., Prichard, A.K., Parrett, L.S., Person, B.T., Carroll, G.M., Smith, M.A., Rea, C.L., Yokel, D.A. 2012. Summer Resource Selection and Identification of Important Habitat

Prior to Industrial Development for the Teshekpuk Caribou Herd in Northern Alaska. PLOS One 7, e48697.
Wilson, R.R., Liebezeit, J.R., Loya, W.M. 2013. Accounting for uncertainty in oil and gas development impacts to wildlife in Alaska. Conservation Letters 6, 350-358.
Wolfe, S.A. 2000. Habitat selection by calving caribou of the Central Arctic Herd, 1980-95. MS Thesis, University of Alaska Fairbanks, Fairbanks, Alaska, USA.
Wolfe, S.A., Griffith, B., Wolfe, C.A.G. 2000. Response of reindeer and caribou to human activities. Polar Research 19, 63-73.