



Yukon North Slope
Wildlife Conservation and Management
Plan
2021

Companion Report 11:
Geese

Kanuq/ Nigliq/ Nirglingaq/ Ulugullik



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Companion Report to the Yukon North Slope Wildlife Conservation and Management Plan

Number 11: Geese *Kanuq/ Nigliq/ Nurglingaq/ Ulugullik*

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About the Companion Report

This report is a companion document to the *Yukon North Slope Wildlife Conservation and Management Plan* (WMAC (NS), 2022). The *Yukon North Slope Wildlife Conservation and Management Plan* (the Plan) is grounded in traditional knowledge and Western science. It addresses traditional use and wildlife conservation and management issues affecting the Yukon North Slope. Strategies in the Plan align with actions underway or planned by a range of agencies and organizations with jurisdiction on the Yukon North Slope.

This companion report summarizes the information that was used to support the objectives and strategies in the Plan, and provides references for the studies used in its development. The companion report draws from authoritative works, reports that synthesize knowledge and issues, and presentations of recent research findings. Sources include traditional knowledge and traditional use, scientific reports and journal articles, and management and conservation reports.

Companion Report Table of Contents

Selected Topics

1. Traditional Use
2. Climate Change Effects
3. Contaminants
4. Aullaviat/Aunguniarvik

Featured Species and Species Groups

- | | |
|-----------------|---------------------|
| 5. Caribou | 10. Broad Whitefish |
| 6. Moose | 11. Geese |
| 7. Grizzly Bear | 12. Furbearers |
| 8. Polar Bear | 13. Dall's Sheep |
| 9. Dolly Varden | 14. Muskox |

Each chapter available for download at <https://wmacns.ca/what-we-do/conservation-plan/companion>

There are fourteen companion reports, addressing four selected topics of key interest as well as ten wildlife species featured in the Plan. The featured species were selected by participants at a workshop held in Aklavik. The wildlife species in the companion reports:

- Have high cultural or economic value or are important as food for Inuvialuit;
- Have similar habitat needs to other wildlife species, so that conserving their habitat is key to conserving habitat for other species; and/or
- Are important for healthy ecosystems, including species that are main food items for top predators.

The Plan identifies key conservation requirements on the Yukon North Slope for each featured wildlife species. The Plan's objectives and strategies are designed to meet these conservation requirements. This companion report summarizes the information that guides the objectives, strategies and conservation requirements in the *Yukon North Slope Wildlife Conservation and Management Plan*.

Companion Report: Geese / Kanuq / Nigliq / Nirglingaq / Ulugullik

This companion report provides information on the conservation requirements for geese as identified in the *Yukon North Slope Wildlife Conservation and Management Plan*. It summarizes the information that guides the objectives, strategies and conservation requirements in the Plan. It includes information on traditional use, population status and trends, important habitat types and locations, threats to geese, programs and measures for conservation and management, and selected studies and research relevant to the Yukon North Slope.

Conservation requirements for geese on the Yukon North Slope

1. Conservation of large areas across the Yukon North Slope coast, especially tidal flats and deltas, to allow for variability in habitat use and space for habitat recovery.
2. Management and monitoring of overabundant species to ensure long-term habitat health for geese and other species.
3. Avoidance, mitigation and management of significant impacts to geese from marine industrial development and associated infrastructure, and from increased ship traffic and aerial disturbance.

From the *Yukon North Slope Wildlife Conservation and Management Plan* (WMAAC (NS), 2022)

Geese on the Yukon North Slope

The Mackenzie Delta and the Yukon North Slope are on major flyways for ducks, geese, and swans. Habitat for geese extends along the entire Yukon North Slope coastal area and, for Snow Geese, inland to the foothills. Information on goose species frequenting the Yukon North Slope is in Table 11– 1. Snow Geese and Yellowlegs (Greater White-fronted Geese) are the most abundant goose species.

Table 11– 1. Species and populations of geese on the Yukon North Slope

Common names	Inuvialuit name ¹	Scientific name	Inuvialuit Observations of geese on the Yukon North Slope ²
Snow Goose	Kanuq	<i>Chen caerulescens</i>	By mid-June Snow Geese have moved off the coast to nest further north. They arrive back in August and fatten up on grasses and berries.

Common names	Inuvialuit name ¹	Scientific name	Inuvialuit Observations of geese on the Yukon North Slope ²
Yellowlegs; Greater White-fronted Goose	Nigliq	<i>Anser albifrons</i>	Yellowlegs fly down the West Channel and along the coast to nest in marshy areas all along the coast and at river mouths. They are common in September between the Blow River mouth and the Delta. They like grassy, muddy areas; they pull out the grass and feed on roots and eat berries.
Brant	Nirglingaq	<i>Branta bernicla</i>	Brant migrate from the Alaska coast to the Yukon North Slope in spring. Brant are seen in smaller numbers than Yellowlegs and Snow Geese.
Canada Goose	Ulugullik	<i>Branta canadensis</i>	There are not many Canada Geese along the coast.

¹ WMAC (NS) (2003) except Canada Goose, which is from WMAC (NS) (2012)

² Summarized from *Aklavik Inuvialuit describe the status of certain birds and animals on the Yukon North Slope* (WMAC (NS) & Aklavik HTC, 2003).

Snow Goose | Kanuq

Snow Geese rarely nest in the Yukon. By far the largest nesting colony is on Banks Island, where over 95% of the Western Arctic population of Lesser Snow Geese breed (Hines, Latour, & Machtans, 2010). Other nesting colonies are in the large deltas along the Alaskan coast and on Kendall Island and the Anderson River delta in the NWT (Hawkings, 1987). Molting - the shedding of old feathers and growth of new ones - takes place in the summer near the nesting grounds. Geese are flightless during the molt.



Snow Geese over the Canning River Delta, Alaska North Slope, June 2012; Ian Davies / Macaulay Library at the Cornell Lab of Ornithology (ML31693361)

In the fall, most of the Lesser Snow Goose Western Arctic population is on the Yukon North Slope and adjacent Alaskan coastal areas and, to a lesser extent, the outer Mackenzie Delta. Virtually the entire Yukon coastal plain is used for staging, with some use also into the foothills (Hawkings, 1987; WMAC (NS) & Aklavik HTC, 2018a). The precise areas used vary from year to year. Snow Geese arrive in their fall staging habitat from mid to late August and depart from

mid to late September, depending on weather conditions. During this period, they feed intensively, building up their energy reserves in preparation for migration. In September they head south, first following the Mackenzie River, stopping at additional staging areas in the NWT, Alberta, and Saskatchewan (Pacific Flyway Council, 2013). They winter in southern U.S. and Mexico.

Yellowlegs | Nigliq

Yellowlegs (greater white-fronted goose) nest along the Alaska Coast and in the Mackenzie Delta, but relatively few nest along the Yukon coast (Hawkings, 1987). Unlike Snow Geese, Yellowlegs do not nest in colonies—their nests are spread out along the coast on drier patches in wet tundra. After hatching, Yellowlegs move to deltas and rivers to rear their young and to molt (Sinclair, Nixon, Eckert, & Hughes, 2003). Non-breeding Yellowlegs visit the Yukon North Slope during summer, but not in large numbers (Hawkings, 1987).



Yellowlegs at Qikiqtaruk-Pauline Cove/Simpson Point, June 2011; Cameron Eckert / Macaulay Library at the Cornell Lab of Ornithology (ML63300821)

In late August and the first half September thousands of Yellowlegs migrate eastward along the Yukon coast from nesting and molting areas on the Alaska coast to staging areas in the Mackenzie Delta. They do not linger along the Yukon coast, though they can be present in large numbers in mixed flocks with Snow Geese. They winter in southern U.S. and Mexico, migrating through the prairie provinces. Few Yellowlegs pass through the Yukon North Slope during spring migration (Hawkings, 1987).

Brant | Nirglingaq

Most Pacific Flyway Brant that nest in Canada pass through the Yukon North Slope in spring, heading east to breeding areas (Hawkings, 1987). Nesting is dispersed throughout coastal areas of Yukon, NWT, and Nunavut (Pacific Flyway Council, 2018). Nesting along the Yukon coast is limited to a few locations. Only the Brant that nest in the Yukon are present during molting (Hawkings, 1987). Brant nest in colonies in low-lying areas, including deltas, lagoons, and ponds. After the eggs hatch, Brant move to coastal salt marshes to raise their young (Pacific Flyway Council, 2018).



Black Brant at Qikiqtaruk-Pauline Cove/Simpson Point, June 2019; Cameron Eckert / Macaulay Library at the Cornell Lab of Ornithology (ML182490461)

The fall migration follows the Beaufort Sea coast, with migrants heading west to Alaska along the Yukon coast from mid-August to the first week of September. Brant stop to rest and feed in tidal marshes, deltas, and lagoons, especially the Blow and Malcolm river deltas and Phillips Bay (Hawkings, 1987). Over the fall migration period many large flocks of Brant will stop at coastal sites with suitable habitat (Alexander, Barry, Dickson, Prus, & Smyth, 1988). Brant winter along the Pacific Coast, from Alaska to Mexico.

Canada Goose | Ulugullik

Canada Geese are uncommon spring and fall migrants and rarely breed on the Yukon North Slope. Small numbers also molt in the area. They made up less than 1% of geese in aerial surveys along coasts of Alaska and Yukon and the Mackenzie Delta in the 1970s. A few hundred are sometimes present on the Babbage River delta (Hawkings, 1987). Canada Geese winter in the US and Mexico and migrate through the prairie provinces.

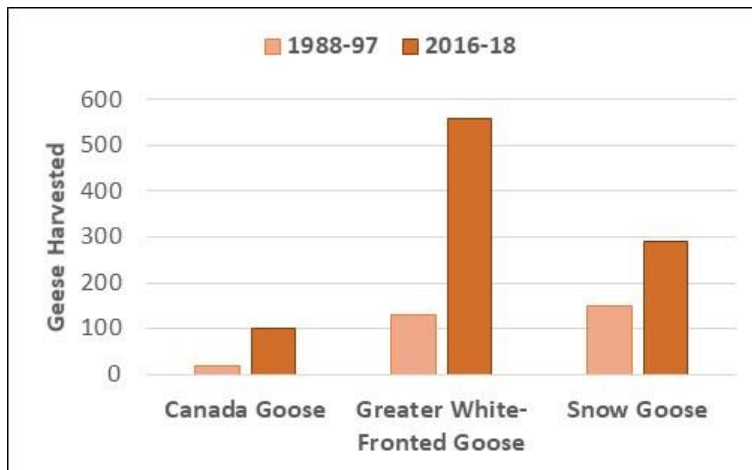


Canada Goose at Qikiqtaruk-Pauline Cove/Simpson Point, June 2016; Cameron Eckert / Macaulay Library at the Cornell Lab of Ornithology (ML46450581)

Traditional Use

Snow Geese, Yellowlegs and, to a much lesser extent, Canada Geese and Brant are harvested by Aklavik Inuvialuit in the Mackenzie Delta and on the Yukon North Slope. Average annual harvests reported through the Inuvialuit Harvest Study have been higher in recent years than during the period from 1988 to 1997 (Figure 11– 1). The goose harvest varies greatly from year to year. Very few Brant are harvested (an average of two per year from 1988 to 1997).

Figure 11– 1. Average annual harvest of geese by Aklavik Inuvialuit during two periods: 1988-1997 and 2016-2018



Data are from the Inuvialuit Harvest Study (Inuvialuit Harvest Study, 2003; IRC, 2019). Greater White-Fronted Goose is also referred to in this chapter by the common local name Yellowlegs.

A 1991 dietary survey documented the importance of geese in the diet of Aklavik Inuvialuit (Wein & Freeman, 1992). Goose meat was in the list of top ten preferred traditional foods. The percentages of the 36 households surveyed that reported eating each type of goose during the previous year were: Snow Goose, eaten by 69% of households; Yellowlegs, eaten by 61% of households; Brant, eaten by 47% of households; and Canada Goose, eaten by 25% of households.

Aklavik Inuvialuit have a long tradition of hunting Yellowlegs in spring and fall and report: they are fatter and tastier than Snow Geese; they are also smarter and more wary; and Brant do not taste as good as Yellowlegs and Snow Geese (WMAC (NS) & Aklavik HTC, 2003).

In interviews and workshops in 2003 (WMAC (NS) & Aklavik HTC, 2003) and 2016 (WMAC (NS) & Aklavik HTC, 2018b), Aklavik Inuvialuit land users pointed out that changes in migration patterns for Yellowlegs and Snow Geese have affected harvesting opportunities. The fall migration route for Yellowlegs changes some years – sometimes they migrate closer to the mountains and away from the Delta. Harvesting Yellowlegs is harder, as they tend to fly higher and away from the coast. Snow Geese are farther away from camps on the coast, making it harder to harvest them. Since the mid-1990s Snow Geese have been flying over higher and feeding inland more. The spring migration over the Delta has shifted to the east, which means that fewer Snow Geese are in the West Channel.

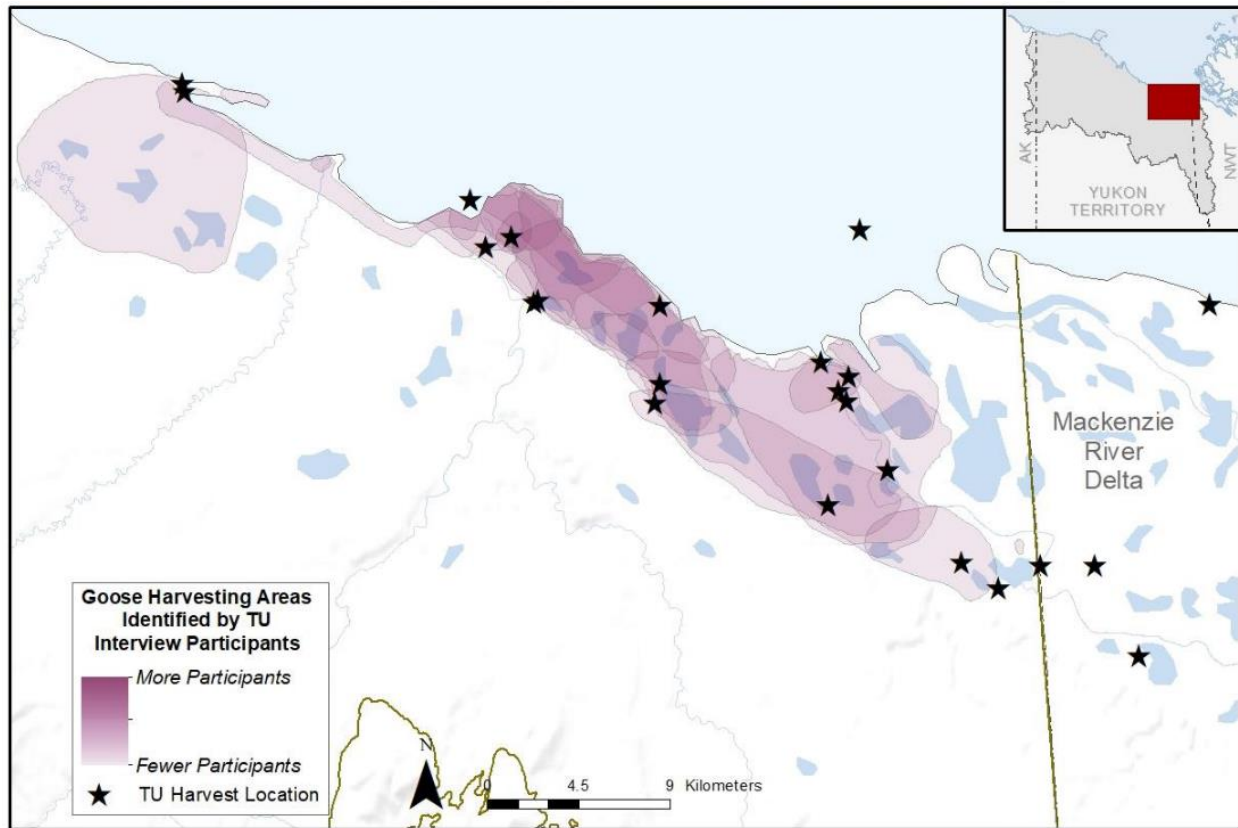
Changing goose migration patterns affect traditional use

Since the early 1990s, Inuvik, Aklavik and Tuktoyaktuk residents have seen the spring goose migration patterns shift eastward, away from their communities and into the eastern Inuvialuit Settlement Region lands. Today, longer travel is required in order to hunt geese, and, overall, these birds are harder to locate. One response has been to organize an Elders goose hunt to ease some of the difficulties that the seniors have in accessing geese.

From Unikaaqatigiit – Putting the Human Face on Climate Change: Perspectives from the Inuvialuit Settlement Region (Communities of Aklavik; Inuvik; Holman Island; Paulatuk and Tuktoyaktuk, Nickels, Buell, Furgal, & Moquin, 2005)

Yukon North Slope harvest sites for waterfowl (including ducks, geese and swans) were identified by Aklavik Inuvialuit through a 2018 traditional use study (WMAC (NS) & Aklavik HTC, 2018b). Harvest sites include the lowlands near Tapqaq (Shingle Point), around Jacobs Lake, at the mouth of John Arey's Creek, the mouth of Blow River, and the shores of channels and islands east of Tapqaq. Goose harvesting locations reported by Aklavik Inuvialuit hunters are shown on Map 11- 1.

Map 11- 1. Goose harvesting locations and hunting areas identified in the Inuvialuit traditional use interviews



The interviewers asked Inuvialuit land users to identify goose harvest areas used within living memory.

Source: Round River Conservation Studies (2018) based on interviews documented in WMAC (NS) (2018b)

Habitat for Geese

Important Bird Areas

Three sections of the coastal plain are designated as Important Bird Areas (IBAs), using international criteria. Many thousands of waterfowl and shorebirds congregate in these coastal areas in the fall, including significant proportions of the global populations of Western Arctic Lesser Snow Geese, Black Brant, and some shorebird species (IBA Canada, n.d.).

Yukon North Slope Important Bird Areas

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IBA YK008: Blow River Delta (Shingle Point to Tent Island)

This IBA includes delta habitat from the mouth of the Blow River east to the edge of the Mackenzie Delta. It extends inland to include channels, ponds, and salt marshes. Storm tides flood much of the grass-sedge flats. This IBA is especially important for Snow Geese and shorebirds in the fall.

IBA YK007: Babbage and Spring River Deltas

This IBA includes coastal land and waters and swings inland at the Babbage River delta. Delta habitats include ponds, channels, grass-sedge wetlands, salt marshes, and tidal mudflats. The IBS is used for staging and molting by many birds, especially waterfowl. Brant concentrate in the delta tidal flats.

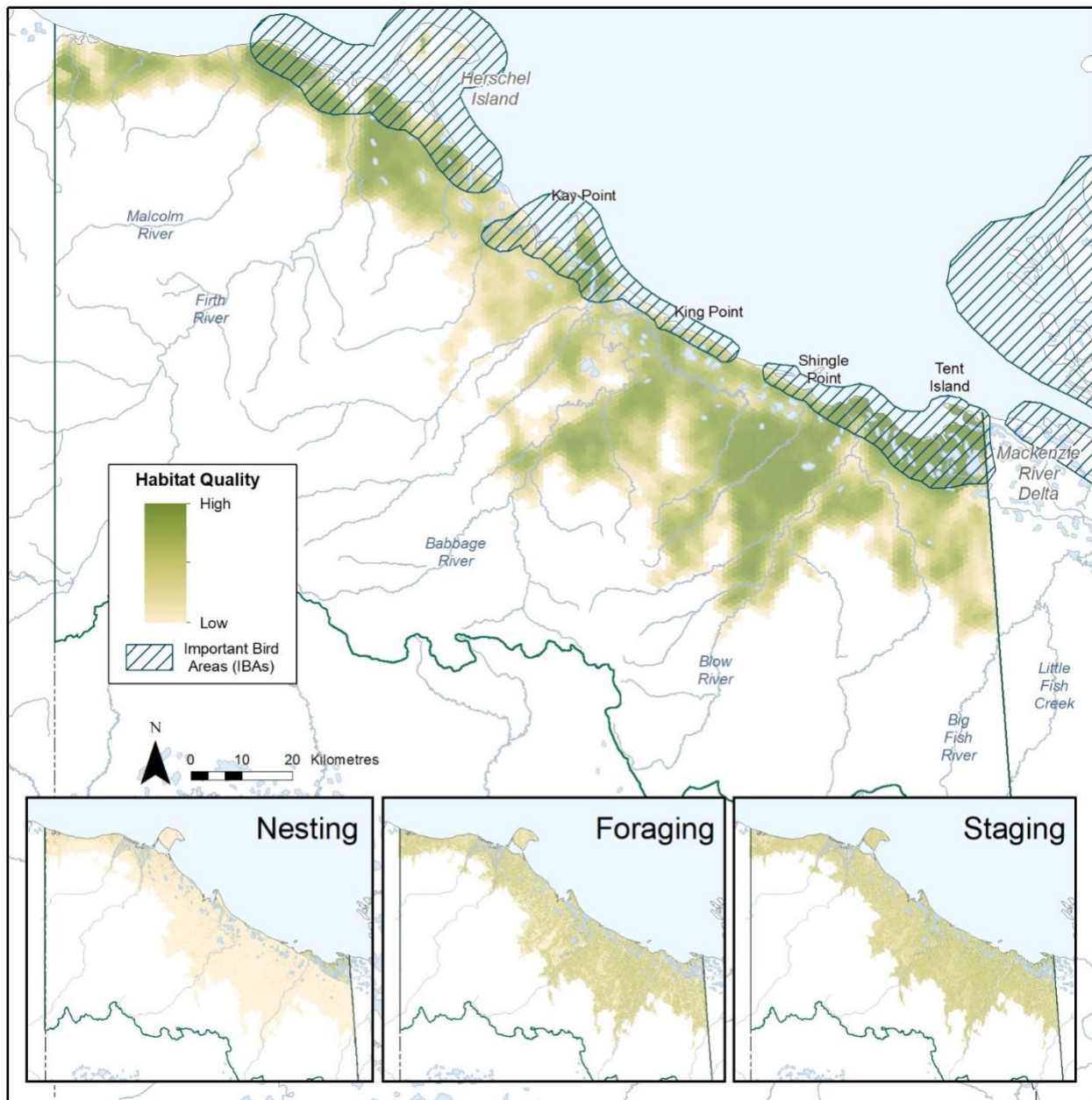
IBA YK005: Nunaluk Spit to Herschel Island

This IBA includes islands and mainland coast with sandy spits and delta wetlands, the open waters of Workboat Passage, and low Arctic tundra with dwarf shrubs, sedges, and herbs along the coastal plain. The IBA is significant for staging and migrating shorebirds, waterfowl, and gulls.

Goose Habitat Suitability Model

Traditional-knowledge-based habitat suitability models were developed as part of the baseline ecological and cultural conservation assessment work undertaken for the Plan (Round River Conservation Studies, 2018). The models provide evidence that goose habitat for nesting, foraging, and staging during migration periods is distributed along the entire Yukon North Slope (Map 11- 2).

Map 11- 2. Habitat suitable for geese nesting, foraging, and staging—mapped from a traditional-knowledge-based habitat model



This map is from the Plan (WMAC (NS), 2022, Appendix 1). The map is created from a habitat model based on Inuvialuit traditional knowledge (IBA Canada, n.d.; data sources: WMAC (NS) & Aklavik HTC, 2018a).

Methods

The goose habitat suitability models are based on traditional knowledge documented by Aklavik Inuvialuit land users and classification and mapping of the Yukon North Slope ecosystems. The report *Yukon North Slope Baseline Ecological and Cultural Conservation Assessment: Traditional Knowledge-based Goose Habitat Model* (Round River Conservation Studies, 2018) should be

consulted for more information on the ecosystem classification system and on how the models were constructed and validated.

The habitat model is based on knowledge about goose habitat documented through interviews conducted in 2016 with 15 Inuvialuit land users (WMAC (NS) & Aklavik HTC, 2018b).

Interviewees described the habitat used for nesting, staging, and foraging by Yellowlegs and Snow Geese, either by pointing out locations on a map or by selecting habitat types from a set of photos of a range of ecosystems on the Yukon North Slope. Because most people interviewed spoke of goose habitat in general, the model does not differentiate between Yellowlegs and Snow Geese. However, as the Snow Goose population that frequents the Yukon North Slope mainly nests on Banks Island, habitat identified for nesting would be mostly for Yellowlegs.

To construct the model, habitat features that study participants described were matched with ecosystem types and landscape features on a map constructed using predictive ecosystem mapping (PEM) techniques (Environment Yukon, 2016). Habitat features were weighted depending on how frequently the feature was identified.

Examples of how traditional knowledge was combined with ecosystem mapping in the model:

- Most participants identified nesting locations or described goose nesting habitat that corresponded to a wet sedge ecosystem type (PEM class hydric sedge). Locations on the map with this PEM class were given a high weight for nesting habitat.
- Participants described geese foraging in good berry habitat. Several PEM classes where berries grow were selected as foraging and weighted by the number of participants identifying berry habitat.

Predictive Ecosystem Mapping (PEM) uses knowledge about ecosystem patterns and relationships to predict locations of ecosystems on the landscape (Environment Yukon, 2016). The result is maps showing PEM classes. Each PEM class integrates many features, including vegetation, elevation, water, terrain, soils, and aspect.

Nesting, foraging, and staging habitat were modelled separately, each based on the specific goose habitat types identified by the study participants and on the weights assigned to each habitat type based on the number of participants that identified the feature. A grid system was used for modelling and for showing the results on maps. Each map shows the distribution of suitable goose habitat across this grid, as predicted through the model. Each grid cell has a rank number from 1 to 10, with 1 indicating the lowest quality habitat and 10 the highest.

Results

Table 11– 2. Summary of traditional knowledge about goose habitats and results from habitat suitability modelling

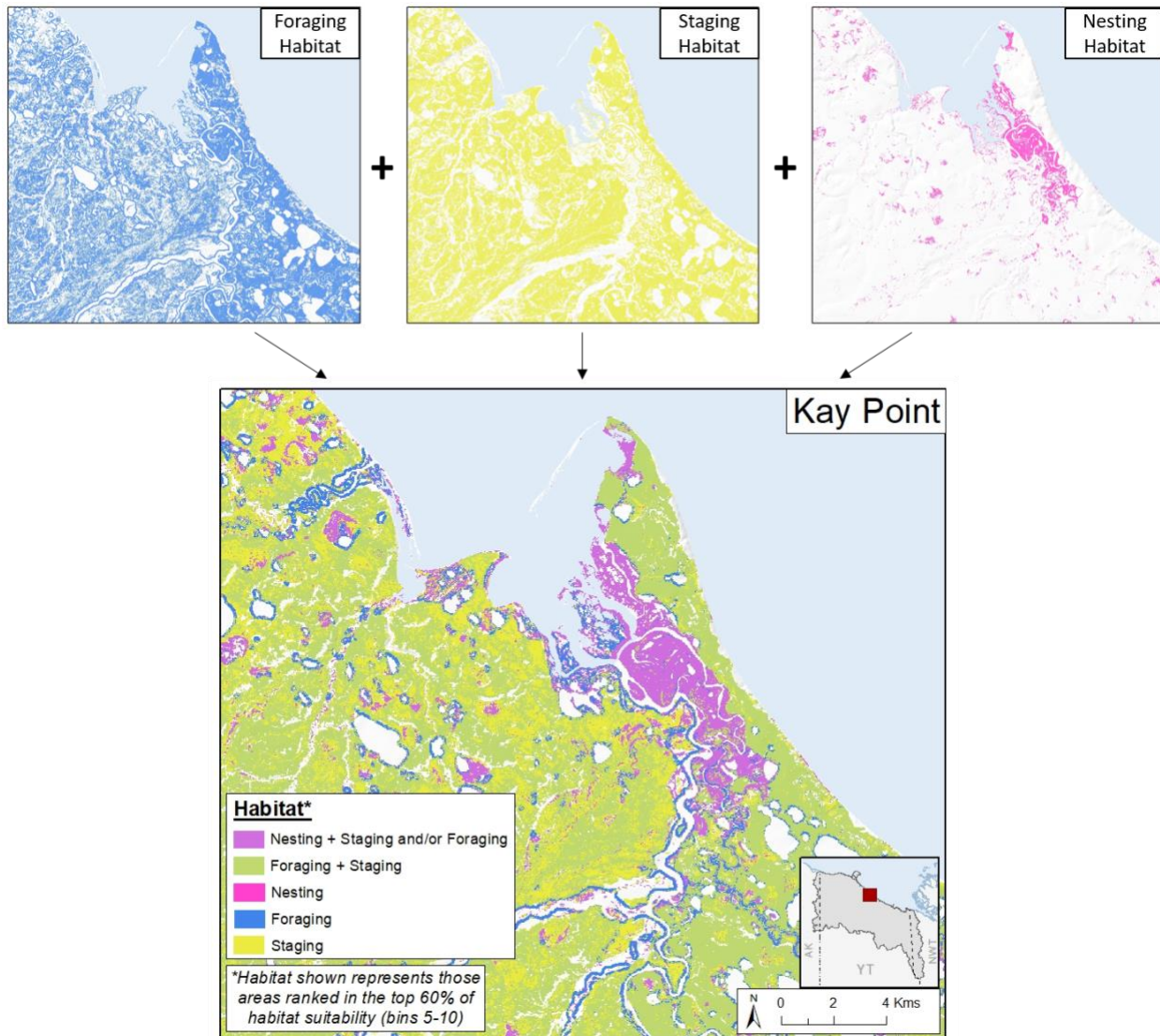
Type of habitat use ¹	Summary of traditional knowledge findings ²	What the habitat suitability models show ¹
Nesting: where nesting geese or newborn goslings are seen.	Goose nests are on flat terrain near water, in lower swamps, upland ponds and swamps, or in low flatlands, often in grassy areas. Geese return to these nesting grounds every year.	High quality nesting habitat is in areas with large amounts of water, including river and lake shorelines and swampy ecosystem types near the coastal plain.
Staging: where geese collect in large numbers as they enter or prepare to leave the Yukon North Slope.	Staging areas are in flatter locations, often containing mud bars, including river and coastal beaches. Geese may use these areas in spring because they thaw first.	Staging habitat is widely distributed along the entire coastal plain, but not at higher elevations and inland.
Foraging: where geese are observed feeding, including while nesting and staging.	Spring foraging areas are low, wet, grassy areas. Yellowlegs remain in these areas in summer, eating grass and roots, and are joined by Snow Geese in late summer. Geese also eat uquk (blueberries), aqpik (cloudberries), and kimmingnaq (cranberries) as they ripen on open, shrubby hillside terrain.	Foraging habitat is distributed along the coastal plain. The model highlights areas further inland where conditions are good for berries to grow.

¹ Summarized from Round River Conservation Studies (2018).

² Based on interviews with 15 Aklavik Inuvialuit land users (WMAC (NS) & Aklavik HTC, 2018a).

The combined habitat map indicates that goose habitat on the coastal plain is widely distributed, with higher quality habitat in the Mackenzie Delta, near Kay Point, on Qikiqtaruk, and at the mouths of the Firth and Malcolm rivers. The Mackenzie Delta and Kay Point were highlighted by the study participants as areas with a high diversity of ecosystems that support geese for nesting, foraging, and staging. Map 11- 3 shows the overlapping habitat types at Kay Point. High quality nesting habitat at Kay Point is concentrated in areas next to water, while high quality foraging and staging habitats are spread out and often overlap.

Map 11- 3. Goose habitat (all uses, separately and combined) around Kay Point



Habitat rated as high quality (rank 5 to 10) is shown in each map.

Round River Conservation Studies (2018), Map 8

Inuvialuit Observations on Goose Habitats

Excerpts from the *Inuvialuit Traditional Knowledge of Wildlife Habitat, Yukon North Slope* report provide more detail on traditional knowledge of goose habitat:

Nesting

[Geese] like an area where they're hard to see, and... they have to live close to the river or the lake where the young ones always...go feeding.

[It's] mostly yellowlegs in this area... you're seeing a lot of snow geese, too... but they're... crossing over to Banks Island... that's where the snow geese nest.

...first week in May, we see a whole bunch [of geese] at Blow River... during the summer they use that [area] for nesting... [It's] yellowlegs, 95%, maybe mixed 5% with snow geese.

The yellowlegs usually nest around Qutaitchuraq [where the river meets the hill]... we don't usually get snow geese until we get... snow on the ground. (WMAC (NS) & Aklavik HTC, 2018a, pp. 44-45)

Staging

...when they're [geese] flying over here [in the fall], they'll... maybe jump a mile or two and then they stop, 'til somebody scares them up. Then they take off, always going south...

... they usually bunch up... thousands and thousands of geese... every spring and fall.

...on this big mud plain... there's always... at least a thousand geese... during the first part of the spring, they come... they stop in there where all the water is... rushing through the Babbage. (WMAC (NS) & Aklavik HTC, 2018a, p. 48)

The Yukon North Slope goose staging areas identified in *Local Ecological Knowledge of Staging Areas for Geese in the Western Canadian Arctic* (Bartzen, 2014) correspond closely with staging areas identified in the traditional knowledge study used for the habitat suitability model (Map 11- 3).

Foraging

...they [geese] pull the roots up from [the marsh] and then they have lunch.

When you watch geese... you observe the area... [the] edge of a lake or swampy area, they're pulling out the grass... they must be eating the roots.

...when we stay at Shingle Point, we see them [geese] come from the ocean, then they're flying up to the high hills, up to the tundra... and eating a lot of aqpiq [yellow berries]."

We know they're eating berries in late fall... They always come from the ocean and they're always heading to the foothills.

...soon as you see cloudberry...whoosh...that's where they [geese] go.

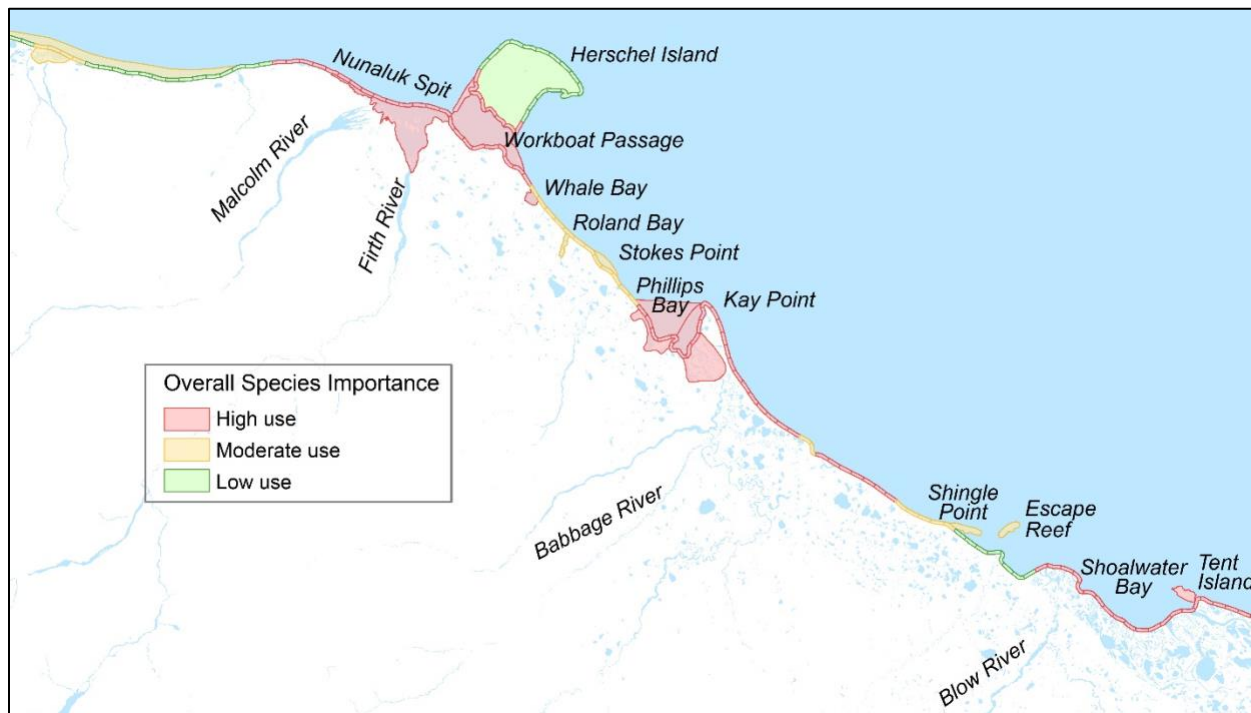
I don't know [everything] they [geese] eat, but ... when you look in their guts, you can find blueberries. (WMAC (NS) & Aklavik HTC, 2018a, pp. 46-47)

Mapping of Key Areas for Birds Along the Yukon Coast

Map 11- 4 shows key areas for waterbirds during the fall staging period. The red high use areas correspond generally with high value goose staging habitat areas identified in the traditional

knowledge study used for the habitat suitability model. The high use value assigned to Workboat Passage in Map 11- 3 may reflect its importance for diving ducks and phalaropes (Alexander et al., 1988).

Map 11- 4. Key areas for birds during mid-August to late September on the Yukon Coast, based on aerial surveys



Map provided by Canadian Wildlife Service. Produced January 2013.

Goose Populations

Species Conservation Status

The goose species that frequent the Yukon North Slope are not considered at risk in Canada (Canada, n.d.). None of the species have been assessed by the Committee on the Status of Endangered Wildlife in Canada and none are currently candidates for assessment (COSEWIC, 2020). Snow Goose and Brant are on the Yukon Conservation Data Centre's animal track list (animals considered of conservation concern in the Yukon) (Yukon CDC, 2019). They are included on the list because both species have limited breeding in the Yukon and, in the case of Brant, because of vulnerability during staging.

Population Status and Trends

Snow Goose, Yellowlegs, and Canada Goose populations that frequent the Yukon North Slope have increased since the 1970s (CWS Waterfowl Committee, 2017). The mid-continent

population of White-fronted Geese (Yellowlegs) is estimated to have increased approximately five-fold from 1975 to 2016, with an average population of 2.3 million adults between 2012 and 2016. Lesser Snow Goose population estimates are based on harvest estimates and band returns on their wintering grounds, where the Western Arctic population, which frequents the Yukon North Slope, mixes with the Wrangell Island population. Estimates indicate that these two Snow Goose populations combined increased from about 300,000 in the 1970s to about 1.2 million adults between 2012 and 2016. Increases in the Snow Goose and Yellowlegs populations are attributed to conditions on their winter ranges, such as changes in land use and agricultural practices (CWS Waterfowl Committee, 2017).

Surveys on their wintering range indicate that the Black Brant population has changed little since the 1960s (CWS Waterfowl Committee, 2017). However, recent estimates based on recovery of bands from Black Brant indicate a decline in the population since the 1990s (Sedinger, Riecke, Leach, & Ward, 2019).

A majority of the participants in the study on Inuvialuit traditional knowledge of wildlife habitat on the Yukon North Slope noted increases in goose populations, especially Yellowlegs. Below are some comments from participants (WMAC (NS) & Aklavik HTC, 2018a, p. 48):

...there's a lot of geese now... I see there's more than there used to be.

... over the past ten years... it's a good, healthy [population]... both snow geese and yellowlegs.

One thing about yellowlegs, they're really multiplying, which is really good.... Twenty years ago, you could see very few... [but, now] around this area, I could easily say there were at least... four thousand geese...

Harvest

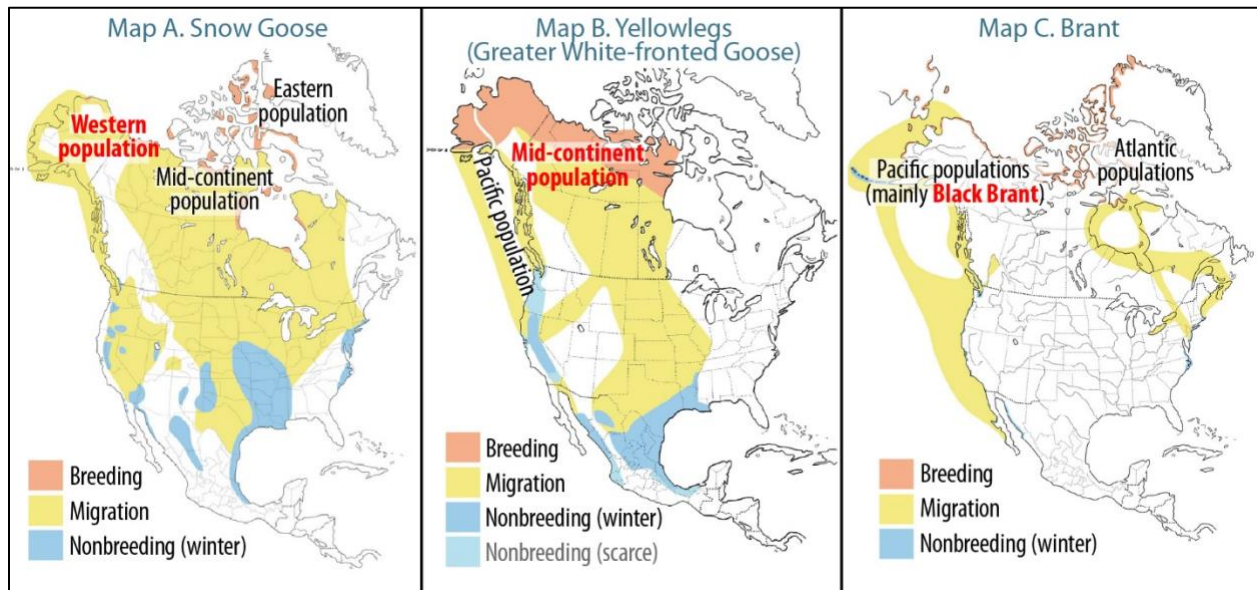
The Inuvialuit Final Agreement (1984) guarantees Inuvialuit the exclusive right to harvest geese in Ivvavik and Herschel Island–Qikiqtaruk parks, and the preferential right to harvest geese on the remainder of the Yukon North Slope. There are no restrictions (such as seasonal closures or harvest limits) on Inuvialuit goose harvest. Non-Inuvialuit hunters are subject to the Migratory Birds Regulations, which set out open and closed seasons and other restrictions. The Regulations allow for a spring hunt of Snow Geese in the Yukon and NWT (CWS Waterfowl Committee, 2018).

In 2014 the Western Arctic population of Lesser Snow Geese was designated as “overabundant” through Canada’s Migratory Birds Regulations (CWS Waterfowl Committee, 2014). This designation is applied when the numbers of geese are such that they may damage habitat or lead to other negative effects. The overabundant designation provides for tools to reduce the population size, including allowing a spring harvest all along the geese’s migration route through southern Canada.

Transboundary Considerations

All geese present on the Yukon North Slope have continental ranges. They migrate each spring to the Arctic to nest and return to wintering grounds each fall. Snow Geese, Yellowlegs, and Canada Geese winter in the US and Mexico. Black Brant spend the winter along the Pacific Coast from Alaska to Baja California in Mexico. **Error! Reference source not found.** shows the continental year-round ranges of the main goose species, including the populations that frequent the Yukon North Slope. Conservation and management require coordinated efforts across breeding, migration, and non-breeding (winter) rang

Map 11- 5. North American seasonal ranges of Snow Geese, Yellowlegs, and Brant



The populations labelled in red are those frequenting the Yukon North Slope. Adapted from species range maps in *Birds of North America* (Cornell Lab of Ornithology, n.d.)

Goose staging areas include several jurisdictions, as they are dispersed across the Alaskan and Yukon North Slopes and extend to the Mackenzie Delta in the NWT. During the fall staging period, geese move among staging areas, likely primarily depending on snow conditions. The Yukon and Alaska Beaufort coast and Mackenzie Delta staging areas combined are used each fall by as many as 600,000 Snow Geese (Pacific Flyway Council, 2013, based on an estimate from 1986).

Observations, Concerns, and Threats

Conservation issues identified for the three designated Important Bird Areas along the Yukon coast are:

- Potential damage from oil and gas development and associated infrastructure;

- Rapid shoreline erosion leading to loss of habitat through a decrease in area of spits and low-lying coastal lands (IBA Canada, n.d.).

A concern expressed by Inuvialuit land users is that, although Yellowlegs and Snow Geese numbers have increased in recent years, migration routes have changed, making geese less available to harvesters. The conservation requirements for geese set out in the Wildlife Conservation and Management Plan aim to address these concerns in a broad way, through space and protection from impacts of development.

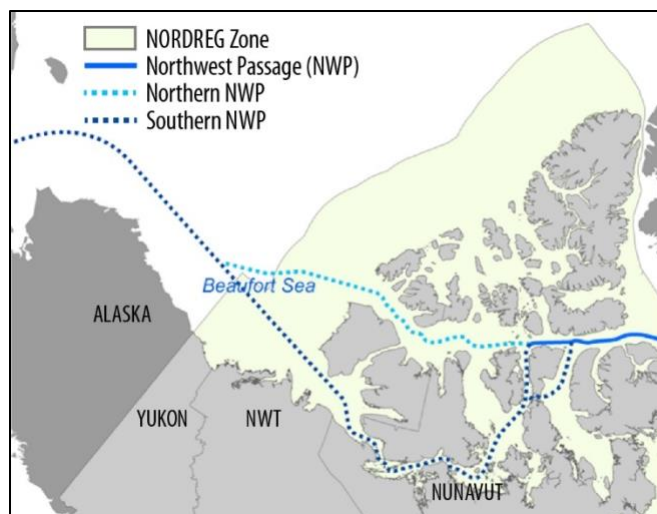
Development Activity

Impacts from development activities include disturbance of geese and other waterbirds from aircraft overflights, and risk of damage to habitat and to the birds from oil spills or other accidents, such as well blow-outs. An important source of potential impacts, in addition to oil and gas exploration and development, is ship traffic. Growing marine traffic is associated with increased risk of impacts from spills of oil or other toxic substances, as well as potential for increased disturbance to geese if nearshore boat and cruise ship activity increases.

Ship traffic is increasing in the Canadian Arctic, with additional growth expected as the seas become more navigable due to climate change impacts on sea ice. The greatest change observed in the past 15 years along the Yukon coast is an increase in traffic from pleasure craft (Dawson et al., 2020). This category of shipping includes all small craft not used for commercial purposes.

Northwest Passage shipping routes are becoming increasingly feasible for commercial shipping. Both the northern and the southern shipping routes pass through the marine waters of the Yukon North Slope, but at different distances offshore from the Yukon coast.

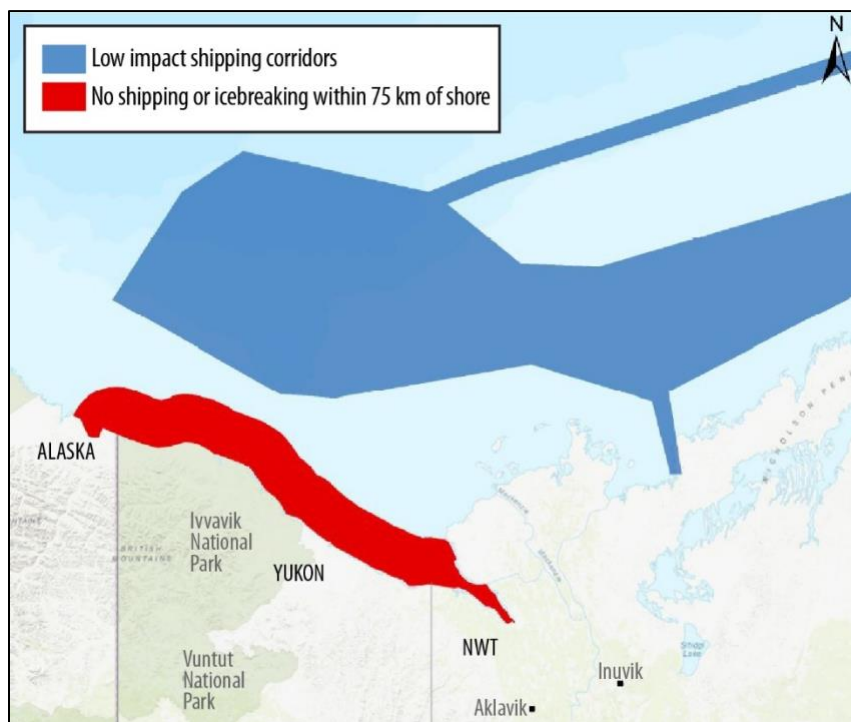
Map 11- 6. Northwest Passage shipping routes west of Hudson Bay



NORDREG = Northern Canada Vessel Traffic Services.
Adapted from Dawson et al. (2018), Figure 1.

Recommendations for low-impact shipping and no-shipping corridors, based on a Government of Canada initiative (Arctic Corridors Research, 2020) with input from the Aklavik Inuvialuit community, are shown on Map 11- 6. The recommended corridors and zone include results of consultation with Inuvialuit community members.

Map 11- 7. Recommendations for low impact shipping corridors and no shipping or icebreaking zone, Yukon North Slope and adjacent waters



From the Aklavik community report of the *Arctic Corridors and Northern Voices* initiative, Carter et al. (2018), adapted from Map 21. The no-shipping zone extends into Alaska and the NWT, reflecting Aklavik Inuvialuit traditional knowledge and use areas.

Risks of impacts from development activities on geese and other waterbirds have been studied since the 1970s in relation to proposals for oil and gas development and exploration activities. Studies are at various scales, including the Alaska and Yukon North Slopes (e.g., Davis & Wiseley, 1973, effects of aircraft flights on staging Snow Geese); the Canadian Beaufort Sea region (e.g., Dome Petroleum Ltd., Esso Resources Canada Ltd., & Gulf Canada Resources Inc., 1982, on impacts of oil spills); and studies specific to the Yukon North Slope (e.g., Gollop, Black, Felske, & Davis, 1974, on effects of disturbance on Brant; Vermeer & Anweiler, 1975, on vulnerability of birds to oil spills).

Oil Spills

Oil spills pose a greater threat to Yukon North Slope birds such as seabirds and shorebirds that feed and rest in marine habitat, than to geese, which frequently feed and rest on land (Vermeer & Anweiler, 1975). The exception is Brant geese, as they are mainly in marine and estuarine ecosystems throughout the year. Brant are particularly vulnerable to oil spills because they often nest right at the water's edge and forage in the intertidal zone. Other geese nesting on the Yukon coast (mainly Yellowlegs) would also be vulnerable to spills when they are molting, and oil could contaminate their nesting areas (Dome Petroleum Ltd. et al., 1982).

The Beaufort Regional Environmental Assessment developed oil spill vulnerability profiles for key species considered vulnerable to spills, including Snow Geese, Brant, and two species of sea ducks (BREA, 2016). The information includes areas and times of year when the key species are particularly vulnerable, and exposure and thresholds for damage from oil spills. The analysis concluded that molting and staging waterfowl would be at risk from oil slicks in near-shore bays, lagoons, and estuaries, especially in areas where they congregate (BREA, 2015). The Beaufort Regional Coastal Sensitivity Atlas (Government of Canada, 2015) provides a synthesis of environmental information relevant to oil-spill preparation and response measures, including maps showing seasonal distribution of waterfowl, shorebirds, and seabirds.

Disturbance from Aircraft

The *Inuvialuit Settlement Region Traditional Knowledge Report* (ICC, TCC, & ACC, 2006) study participants noted that aircraft activity disturbs geese and interferes with the goose harvest.

"Geese they fly when they hear helicopters ... it's hard to hunt when they keep flying away" (ICC et al., 2006, p. 4-1)

An Alaskan study found that Brant were much more vulnerable to disturbance from aircraft than were Canada Geese, with 75% of Brant flocks taking flight in response to overflights, and only 9% of Canada Geese taking flight (Ward, Stehn, Erickson, & Derksen, 1999). Helicopter flights were more disruptive than fixed-wing overflights. A study of the behaviour of Snow Geese staging on the Yukon and Alaska North Slopes and their reaction to aircraft disturbance found that aircraft overflights reduced the time geese spent feeding during staging (Davis & Wiseley, 1973). A Quebec study concluded that human-caused disturbance can have a significant impact on geese's energy reserves (Belanger & Bedard, 1990).

While avoiding overflights is a best-practice for limiting wildlife disturbance, with overabundant geese populations on the Yukon North Slope, it is unlikely that aircraft disturbance is causing population level impacts.

Impacts from Climate Change

Interviews with Aklavik Inuvialuit land users demonstrate the range of potential effects of climate change on geese (WMAC (NS) & Aklavik HTC, 2018a, p. 48):

Seven individuals suggested that climate change may also be altering goose habitat, although responses varied regarding specific impacts. Two interviewees noticed geese arriving at the study area earlier, and one interviewee stated concern that increasingly erratic weather may result in geese arriving to the region too soon, exposing themselves to late spring cold spells. Other concerns included drying out of nesting habitat or flooding and salt kill from coastal storms. One interviewee suggested that warmer weather might benefit geese, especially during the nesting period.

Effects on Goose Habitats

Snow Geese, Yellowlegs, and Canada Geese forage in a range of ecosystem types distributed across the coastal plain and inland. Vegetation communities on the Yukon North Slope are being affected now by climate change and are likely to change more in the future (Myers-Smith et al., 2019). These changes, including increased spread of shrubs and taller plant growth, are likely to alter the distribution and suitability of goose habitats, but the overall effect of these changes on the geese is difficult to predict.

Brant have more specific habitat needs than the other Yukon North Slope goose species, as they nest, feed, and raise their young in coastal and estuarine salt marshes (Cornell Lab of Ornithology, n.d.). Changing air and water temperatures, water flows and levels, erosion, sedimentation, and wave action are some factors that affect the extent and quality of salt marshes available to Brant. Coastal salt marshes have expanded on the Alaskan Beaufort coastal plain, due to permafrost thaw, subsidence of ice-rich tundra, and increased erosion, leading to increased sedimentation (Tape, Flint, Meixell, & Gaglioti, 2013). The increase in coastal salt marshes has been linked to a shift in distribution of Brant since the 1970s (Tape et al., 2013).

Warmer Temperatures and Earlier Springs

A study on the Alaskan North Slope looked at trends in first arrival dates of 16 migratory bird species over a period of 50 years (Ward et al., 2016). The trend was to earlier arrival—on average by 6 days over the 50-year period. This corresponds to about 1 day earlier for every 1-degree annual change in temperature. Yellowlegs and Snow Geese had the greatest rates of change in arrival date of all migratory birds: their dates of arrival advanced at a rate of almost 2 days per decade (arriving, on average, nearly 10 days earlier by 2013 than in the mid 1960s). These geese appear to be able to adjust their migration patterns to take advantage of earlier spring plant growth.

Because Brant lay their eggs soon after they arrive in the Arctic, they depend on the food in their wintering areas in Pacific coastal ecosystems for nutrition for egg development (Hupp, Ward, Soto, & Hobson, 2018). Their wintering areas are likely to become poorer for goose foraging due to effects of a warming climate on important Brant foods, especially eelgrass (*Zostera marina*) (Hupp et al., 2018; Ward et al., 2005). A study of Black Brant showed that the number of nests at a major Alaskan nesting area have been declining since the mid-1990s and that the first-year and adult survival rates for the population as a whole have also declined (Leach et al.,

2017). The study authors consider that these changes may be due to poorer foraging conditions on wintering and migration habitats along the Pacific coast.

Earlier springs are likely to improve spring foraging conditions in the Arctic, which may improve reproductive success for Western Arctic Lesser Snow Geese and Yellowlegs. These geese populations spend time foraging in the Arctic before they nest—therefore they acquire most of the nutrients for egg development after they have arrived in the Arctic (Hupp et al., 2018). However, although early springs tend to favour the production and laying of eggs, the growth and survival of the goslings may be negatively affected. This can happen if the peak of spring plant growth has passed when the goslings are in most need of an abundant supply of food (Nolet, Schreven, Boom, & Lameris, 2019).

Goose Overabundance

The Western Arctic population of Lesser Snow Geese is estimated to be 1.3 million, a significant increase from the estimated 300,000 birds in the 1970s (CWS, 2020). Since Snow Geese forage by pulling out the roots of grasses and sedges, they can damage or destroy habitat for other species. This happens especially in high-use or high-density areas such as those near breeding colonies. Because of its increasing population, the Western Arctic population of Lesser Snow Geese was designated as overabundant in 2014, due to the potential for severe damage to arctic and subarctic vegetation and the other species that depend on the same habitat (CWS, 2020).

An overabundance of Snow Geese in other Arctic areas has led to overgrazing of areas where the geese nest (CWS Waterfowl Committee, 2014; Lefebvre et al., 2017). Intensive feeding by geese removes vegetation and can change soil conditions and moisture level, leading to permanent changes in ecosystems (CWS Waterfowl Committee, 2014). Overgrazing by Snow Geese has had impacts on vegetation on the main nesting grounds of the Western Arctic Snow Goose population on Banks Island, though a 2010 study concluded that these impacts were not as severe as in the Eastern Arctic (Hines et al., 2010). Snow Goose overgrazing may be contributing to a reduction in the amount of surface water on western Banks Island by altering permafrost and vegetation cover around ponds (Campbell, Lantz, & Fraser, 2018).

As many thousands of Snow Geese forage intensively on the Yukon North Slope during fall staging, overabundance could lead to impacts, especially on coastal lowland ecosystems where Snow Geese feed on the underground parts of tall cotton-grass. A research project on effects of Snow Goose foraging on the Alaskan North Slope indicated that the amount of cotton-grass, both above and below ground, was reduced by goose grazing for 2 to 4 years after feeding (Hupp, Robertson, & Schmutz, 2000). The study concluded that there were likely no long-term effects on vegetation communities because the geese move among foraging areas from year to year, allowing the cotton-grass to recover. This need to rotate areas contributes to the large spatial requirement of Snow Geese during fall staging (Hupp et al., 2000).

Aklavik Inuvialuit traditional knowledge holders, while reporting that goose numbers have increased, have not reported observations of goose overgrazing (WMAC (NS) & Aklavik HTC,

2003, 2018a). In the fall, geese spread out and forage inland on berries. Several people commented that coastal lowland goose habitat is not affected by the increase in geese; they noted that geese shift around as the rivers and ocean current change, and the swamp grass (cotton-grass) that the geese eat on mud flats grows back (WMAC (NS) & Aklavik HTC, 2003).

Links to Plans and Programs

This section lists plans and programs that link to the objectives and strategies of the *Yukon North Slope Wildlife Conservation and Management Plan*. These plans and programs informed the development of the Yukon North Slope Plan and are an integral part of its implementation.

Habitat Conservation

- *Aklavik Inuvialuit Community Conservation Plan* (Aklavik HTC, Aklavik Community Corporation, WMAC (NWT), FJMC, & Joint Secretariat, 2016)
The Eastern Yukon North Slope (East of the Babbage River) is identified as critical waterfowl habitat, with geese using the area for fall staging and swans using the area for summer molting and nesting.
- *Important Bird and Biodiversity Areas (IBAs)* (IBA Canada, n.d.)
Canada's Important Bird and Biodiversity Areas Program aims to identify, conserve, and monitor sites that provide essential habitat for bird populations. IBAs are sites that support threatened birds, large groups of birds, and/or birds with restricted by ranges or habitat. IBAs are identified using international criteria. This designation is useful in promoting transboundary collaboration to conserve habitats and in setting conservation priorities. Three IBAs are within the Yukon North Slope (shown on Map 11- 2).
- *Park plans* (Herschel Island-Qikiqtaruk Management Plan Review Committee, 2018; Parks Canada, 2018)
Conservation of goose habitat is encompassed by the goals and actions to maintain ecological integrity (Goal 1) and to maintain traditional use and cultural connection (Goal #4) in the Herschel Island-Qikiqtaruk Plan and the strategy to understand and conserve natural resources of Ivvavik National Park (Strategy #1).

Population Management

Legislation that provides tools for population management consists of the Migratory Birds Convention Act and regulations (Canada, 2017; CWS Waterfowl Committee, 2018) and the Inuvialuit Final Agreement (Canada, 1984).

At the population level, plans and initiatives for migratory waterfowl monitoring and management are coordinated by teams with representatives from jurisdictions over the

continental range of each population. Management plans are in place for three of the goose populations that frequent the Yukon North Slope. Each plan includes an assessment of the population status and trends, and conservation strategies. There is no management plan for Canada Geese in this region.

- *Pacific Flyway Management Plan for the Western Arctic Population of Lesser Snow Geese* (Pacific Flyway Council, 2013)

Management strategies relevant to the Yukon North Slope:

- Habitat 1.b. Assess habitat conditions at important staging areas.
- Harvest 6. Monitor subsistence harvest in Canada involving the subsistence users as data gatherers.

- *Management Plan for Midcontinent Greater White-Fronted Geese* (Flyway Councils, 2015)

The plan has no strategies specific to the Yukon North Slope.

- *Management Plan for Pacific Population of Brant* (Pacific Flyway Council, 2018)

Philips Bay is identified as a nesting/molting area for Brant.

Management strategy relevant to the Yukon North Slope:

- Harvest Assessment 3. Determine magnitude and distribution of subsistence Brant harvest in Canada.

Research and Monitoring Programs

- *Arctic Goose Joint Venture* (Arctic Goose Joint Venture, 2019)

The Arctic Goose Joint Venture sets priorities and facilitates research and monitoring for goose populations that breed in the Arctic and migrate to wintering areas in southern Canada, the United States, and Mexico. The Canadian Wildlife Service and Ducks Unlimited Canada are partners in this initiative.

- *Harvest monitoring: Inuvialuit Harvest Study* (IRC, 2017, 2018, 2019)

Annual harvest monitoring in the ISR from 2016-2019 was led by the Inuvialuit Game Council and the Inuvialuit Regional Corporation. This program included goose harvest monitoring. Aklavik Inuvialuit Community Resource Technicians (CRTs) collected harvest information, including harvest locations, through monthly interviews with active harvesters. Results were summarized for each community in annual newsletters. This program built on previous harvest monitoring methods and data (Inuvialuit Harvest Study, 2003).

Selected Studies and Research Relevant to the Yukon North Slope

Knowledge about locations and ecosystems that are important, such as seasonal habitat for geese on the Yukon North Slope, is based on Inuvialuit traditional knowledge and periodic aerial surveys, particularly surveys from the 1970s and 1980s. Goose habitat models for the YNS have been developed based on traditional knowledge of important habitat characteristics for nesting, foraging and staging. Population information is based on results of banding studies, surveys, and harvest statistics, generally assessed at the continental or national scale. Traditional knowledge provides information on local population trends.

This section is an annotated listing of selected reports, scientific papers, and other resources that provide support to the *Yukon North Slope Wildlife Conservation and Management Plan* and highlight issues and research directions that will be important to consider during its implementation.

Traditional Knowledge Studies

- *Aklavik Inuvialuit Describe the Status of Certain Birds and Animals on the Yukon North Slope* (WMAC (NS) & Aklavik HTC, 2003).

This study is based on 10 interviews and a workshop conducted in 2003. Results are presented for 21 species, including Yellowlegs, Snow Goose, and Brant. Four additional waterbirds are featured: Common Eider, Long-tailed Duck, Red-necked Phalarope, and Scoters (White-winged and Surf). Information is included on wildlife numbers, ranges, habitat, and condition.

- *Local Ecological Knowledge of Staging Areas for Geese in the Western Canadian Arctic* (Bartzen, 2014)

This project's objectives were to identify staging areas and document observations of changes in goose migration patterns and numbers. Participants marked areas where they had observed 1,000 or more geese. The information they provided was compiled onto maps. Results for the Yukon North Slope are summarized in the Habitat for Geese section.

- *Yukon North Slope Inuvialuit Traditional Use Study* (WMAC (NS) & Aklavik HTC, 2018b) and *Inuvialuit Traditional Knowledge of Wildlife Habitat, Yukon North Slope* (WMAC (NS) & Aklavik HTC, 2018a)

These two studies were undertaken by the WMAC (NS) and the Aklavik HTC to document traditional use patterns and knowledge about wildlife habitat on the Yukon North Slope. Both studies were based on interviews with Aklavik Inuvialuit land users. The results were used in developing the Plan and are described and referenced throughout this chapter.

Assessments and Syntheses of Surveys

- *Population Status of Migratory Waterbirds on the Yukon Coastal Plain and Adjacent Mackenzie Delta* (Hawkings, 1987)
This Canadian Wildlife Service report summarizes survey-based information on geese and other waterbirds for the Yukon coastal area up to the mid-1980s. The author concludes that the most significant components of waterbird ecology along the Yukon coast, from a national perspective, are the fall concentrations of Lesser Snow Geese throughout the coastal plain and the midsummer concentration of molting seaducks at Herschel Island. The report includes a data appendix with results of all waterbird studies along the Yukon coast conducted from 1971 to 1985.
- *Key Areas for Birds in Coastal Regions of the Canadian Beaufort Sea* (Alexander et al., 1988)
In this Canadian Wildlife Service report, survey data up to the mid-1980s are compiled onto maps that outline areas of high, medium, and low use for a range of waterbirds in Canadian coastal regions of the Beaufort Sea. The maps are accompanied by descriptions of key seasonal waterbird habitats. Maps are presented for the Yukon coast for spring, summer, and fall.
- *Beaufort Regional Environmental Assessment* (BREA, 2016)
BREA was a four-year research program (2012-2015) focused on research to inform decision-makers on offshore oil and gas development in the Beaufort Sea. Research areas included:
 - Coastal and marine birds
 - Information for key species of birds, fish, and marine mammals (Valued Ecosystem Components, or VECs)—This project included assembling existing data and filling information gaps with traditional knowledge. Lesser Snow Goose and Black Brant are included in the list of priority species to protect from oil spills. Vulnerability profiles were developed for these two goose species.
- *Population Status of Migratory Game Birds in Canada* (CWS Waterfowl Committee, 2017)
This report presents continental population status and trends for goose populations that frequent the Yukon North Slope.
- *Beaufort Regional Strategic Environmental Assessment* (BRSEA, 2018; KAVIK-Stantec Inc., 2020)
This assessment, launched in 2016 and completed in 2020, provides analysis of environmental considerations, strategic direction, and recommendations on future offshore oil and gas activity in the ISR.

Research

Research that is of interest for goose conservation on the Yukon North Slope includes studies from other areas on impacts of climate change on Arctic-breeding geese, impacts on

ecosystems from goose overabundance, and research on the effects of oil spills and disturbance on geese. Research projects related to their wintering ranges and population dynamics are also relevant. For example, an ongoing study on the populations of Lesser Snow Geese and Greater White-fronted Geese that frequent the Yukon North Slope includes research on the goose populations' wintering grounds in California, and tracking of individual geese to learn more about migration timing and routes (USGS, n.d.).

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