APPENDIX 6F

TERRESTRIAL WILDLIFE BASELINE REPORT

Mary River Project
Wildlife Baseline 2006–2011

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EXECUTIVE SUMMARY

North Baffin Island caribou currently occur at low densities and their abundance seems to be cyclical — harvest data and Inuit Qaujimajatuqangit (IQ) suggest a roughly 60- to 70-year cycle of abundance. The cyclical pattern of caribou abundance is similar to patterns described on Greenland and south Baffin Island. The cause of these changes in abundance is currently unknown. The last period of caribou abundance in the regional study area (RSA) was 1980 to 2000. Caribou numbers are expected to gradually increase in the Mary River Region, but might not recover to historical "highs" until the 2050s. There is evidence that caribou occur, and have historically occurred, throughout the entire region and, therefore, use most of the RSA as some form of habitat. The most-used habitat is in the southern and central portion of the RSA, as indicated by caribou sign (bones, antlers, tracks, and trails) and IQ. Trails observed along the proposed railway alignment suggest that some areas are better for movement. Analyses of habitat use show a greater probability of caribou occurrence for some habitats during the calving, growing, and winter seasons, but the probability of occurrence of caribou is relatively equal in many locations throughout the Project area.

Wolves and foxes are the dominant carnivores in the RSA and exist at low densities. Very little information was collected on carnivores because they were so rarely observed. Information in published journal articles was supplemented with anecdotal and IQ information specific to the Project area for this baseline.

This baseline report is the most extensive and thorough summary of north Baffin Island caribou currently in existence. It summarizes and synthesizes the history of government surveys, local harvest, IQ, habitat use, and terrestrial wildlife surveys funded by Baffinland, and is one of the most in-depth analyses of caribou habitat selection completed in Nunavut.

ACKNOWLEDGEMENTS

Vivian Banci, Banci Consulting, started baseline surveys for the Mary River Project in 2006. She prepared two unpublished reports summarizing results of the 2006 and 2007 surveys. Those results were incorporated in this overall baseline summary document. Knight Piésold Ltd. retained the services of EDI Environmental Dynamics Inc. (EDI) in 2007, and Baffinland Iron Mines Corp. retained EDI in 2010 for the terrestrial wildlife baseline and impact assessment.

Traditional knowledge (Inuit Qaujimajatuqangit) and current local knowledge were the primary source of information on caribou in the Project area. Caribou-focused working groups were formed in Pond Inlet, Clyde River, Hall Beach, Igloolik, and Arctic Bay. Working groups were composed of hunters, Elders, youth, and other community members with knowledge of caribou on north Baffin Island. Those workshops were supplemented with public meetings in each of the communities. Knowledge gathered during the workshops was recorded on maps and in discussion transcripts. Details relevant to the Mary River Project and its relationship to caribou on north Baffin Island are used in this report. We appreciate being able to use the information local experts were willing to share.

Carolyn Mallory of the Resource Centre, Government of Nunavut Department of Environment was invaluable in tracking down most of the unpublished reports cited in this document. Maret Tae and Richard Cook (Knight Piésold Ltd.) managed the terrestrial wildlife studies in 2006–2008 and assisted with all components of information gathering. Jason Prno and Shelly Elverum (Knight Piésold) organized and facilitated community workshops and provided transcripts of discussions recorded at those meetings.

Observers during 2006 surveys included Andrew Sangoya of Pond Inlet (primary assistant on terrestrial wildlife studies in 2006 and 2007), Warren Bernhardt, Richard Cook, Joshua Enookolo, Lemech Kadloo, Melissa MacLeod, Maret Tae, David Panipakoocho, Aoorah Samiei, Ryan Veenstra, Ryan Weir, and Troy Yeomans. Vivian Banci, R.P.Bio. was the project terrestrial biologist. Observers during 2007 surveys included Sheatie Tagak and Mollene Anaviapik (Pond Inlet HTO), Maret Tae, Jaypiti Inutiq, Johnny Mangitak, Gerald Koonark, Wayne Renaud, and Natalia Barranova. Vivian Banci, R.P.Bio. was the project terrestrial biologist. Observers during 2008 surveys included Jaypiti Inutiq, Dean Ittuksarjuat, Tyson Quanaq, Alex Amarualuk, James Quaraq, Nicole Basaraba (EDI), Shannon Stotyn (EDI) and Don Albright (EDI). Observers during 2010 surveys included Jake Awa and Benjamin Angnetsiak (Pond Inlet HTO). Michael Setterington, R.P.Bio (EDI) was the terrestrial project biologists.

This report was prepared for Matthew Pickard, Baffinland Iron Mines Corp.

AUTHORSHIP

This report was prepared by EDI Environmental Dynamics Inc. Some of the material was based in part on earlier progress reports from 2006 and 2007 prepared by Vivian Banci.

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1 INTRODUCTION

The Mary River Project (the Project) is a proposed iron ore mine and associated facilities located on north Baffin Island, in the Qikiqtani Region of Nunavut. The Project involves the construction, operation, closure, and reclamation of an 18-million tonne-per-annum (Mt/a) open pit mine that will operate for 21 years. The high-grade iron ore will be extracted from Deposit No. 1 and is suitable for direct shipment after crushing and screening with no secondary processing or concentrating required. The Project will also involve the construction of a railway connecting the mine site to Steensby Inlet, and the development of an all-season deep-water port and ship-loading facility at Steensby Inlet. During the construction period, construction equipment and materials will be received at both Milne Inlet and Steensby Inlet; however, Milne Port will operate only during the open-water season, while Steensby Inlet will be used year-round. Once Steensby Port is operational, Milne Port will only be used occasionally for the delivery of oversized equipment to the Mine Site. The construction of the railway and the Port facilities at Steensby Inlet are expected to take four years. Upon completion, iron ore will be transported via railway from the mine site to Steensby Port, where shipping will occur year-round and will require specialized vessels with ice-breaking capabilities.

This terrestrial wildlife baseline study report was prepared in support of an Environmental Impact Statement (EIS) for the Project, to be submitted by Baffinland to the Nunavut Impact Review Board (NIRB).

EDI Environmental Dynamics Inc. (EDI) was retained by Knight Piésold Ltd. in 2007–2008, and by Baffinland in 2010–2011 to conduct the terrestrial mammal baseline inventories and impact assessment for the Project. Surveys conducted since 2006 include those for caribou, furbearers, small mammals, and habitat surveys. Terrestrial and marine bird surveys, marine mammal surveys, and ecological land classification were separate study components and are described in separate reports. This report summarizes current knowledge and baseline information for terrestrial mammals in the Project area.

1.1 ECOLOGICAL DESCRIPTION

The Project is in the Northern Arctic Ecozone and the Project site is at the boundary of the Melville Peninsula Plateau Ecoregion to the south and the Baffin Island Uplands Ecoregion to the north. The broader Project area also includes the Borden Peninsula Plateau Ecoregion (see Figure 1). The Northern Arctic ecozone is the coldest and driest landscape in Canada. Mean temperatures range from below -30°C in winter and -1.5°C in summer, and mean annual precipitation ranges from 10–20 cm. This precipitation is often in the form of snow that is present as ground cover for 10 months of the year (September to June). The eastern section of the ecozone is composed mainly of Precambrian granitoid bedrock, and tends to consist of plateaus and rocky hills. Permafrost is continuous and can extend to depths of several hundred metres. Cryosolic soils (i.e., those affected by permafrost-related processes) predominate. Ocean conditions vary from south to north. In the

northern half of the ecozone, the waters are ice-fast, even through the summer. In the south, open water is more common in the summer, but pack ice usually persists offshore (Marshall and Schut 1999).

Cold temperatures, short growing season, high winds, shallow soils, and limited precipitation result in sparse and dwarfed vegetation. Vegetative cover consists of grasses, herbs, shrubs, and lichens, but the diversity of vegetation is relatively low. Plant growth and diversity is greater along coastal lowlands, sheltered valleys, and river banks where moisture and nutrients are more abundant. Upland areas tend to have limited vegetation as these areas are exposed to the harsher environmental conditions common in the area during most of the year.

The majority of the Project area falls within the Melville Peninsula Plateau Ecoregion. This ecoregion has a mid-arctic climate and topography characterized by a broad, gently warped, old erosion surface. Like other ecoregions in the Project area, drier sites support sparse covering of purple saxifrage (*Saxifraga oppositifolia*), mountain avens (*Dryas integrifolia*), and willow (*Salix* spp.). Wet sites support continuous cover of grasses, and predominantly include sedges (*Carex* spp.) and cottongrass (*Eriophorum* spp.).

The northern extent of the Project area includes portions of the Borden Peninsula Plateau Ecoregiona and Baffin Island Uplands Ecoregion. These two ecoregions reflect a high inland plateau and a broad, gently warped old erosion surface. Both ecoregions have a high-Arctic climate with sparse vegetation of moss, mixed and low-growing herbs, and shrubs in dry sites. Wet sites in the Baffin Island Uplands, due to greater precipitation, can have up to 60% vegetation cover. Soils range from discontinuous and thin colluvial, morainal, and sandy solids to exposed bedrock. All ecoregions in the Project area have continuous permafrost with differing ice content[1] (Marshall and Schut 1999).

Topography varies considerably across the Project area. The shoreline of Milne Inlet in the northern part of the Project area is situated on a relatively broad, deep and flat sand beach. Milne Inlet itself is enclosed by steep fjord walls measuring from 60–600 m above sea level (asl). Moving inland, the Milne Inlet Tote Road follows the Phillip's Creek valley that starts near sea level at Milne Inlet and rises to 188 m asl at the Mary River site. The Phillip's Creek valley is confined by hills or mountains on both sides. West of the Phillip's Creek valley is mountainous terrain with some occurrence of glaciers.

At Mary River, Deposit No. 1 (Nulujaak) rises quickly to 679 m asl from the fairly flat and sandy outwash plain where the exploration camp is currently located. Nulujaak (Deposit No. 1) is a major landmark for Inuit travelling on the land and is part of a ridge trending approximately north–south. The land west of Deposit No. 1 is equally mountainous with some minor coverage of glaciers. East of Deposit No. 1 the land is somewhat rolling with several elevated plateaus formed by horizontal sedimentary deposits. South of Mary River the undulating outwash plains end near the Ravn River. South of the Ravn River the land is quite flat and poorly drained and begins to drop steeply toward

[1] Ecodistricts, which provide a greater level of detailed description for landscape units, have not been described for Nunavut.

the Cockburn Lake valley, which is bounded by steep cliffs that range from 360–380 m asl. The land south of Cockburn Lake to Steensby Inlet becomes flatter with mainly undulating bedrock and boulder landforms.

Figure 1. Ecozones and ecoregions of the proposed Mary River project and surrounding north Baffin Island Region, Nunavut Canada.

2 STATE OF KNOWLEDGE 1900–2005

Documented knowledge of terrestrial wildlife in the north Baffin Island region dates back to as early as the 1920s (Soper 1928). Most of the early information was collected as early naturalist investigations by Environment Canada (Canadian Wildlife Service) and Indian and Northern Affairs Canada (INAC) to determine the wildlife resource availability in the region (Wright 1944; Kelsall 1949; Loughrey 1954; Tener and Solman 1960; Tener 1961; Macpherson 1963, 1964). Local and traditional knowledge of wildlife resources was documented in the 1970s as part of the Inuit Land Use and Occupancy Project (Brody 1976a), and in the 1980s as part of the Northern Land Use and Information Series maps (INAC 1981).

Terrestrial mammals in the region include caribou (*Rangifer tarandus groenlandicus*), wolf (*Canis lupus manningi*), arctic fox (*Vulpes lagopus*), brown lemming (*Lemmus trimucronatus*), Peary Land (northern) collard lemming (*Dicrostonyx groenlandicus*), and Arctic hare (*Lepus arcticus*). Documented occurrences of wolverine (*Gulo gulo*) and red fox (*Vulpes vulpes*) are rare or uncommon. There is little to no scientific survey information available for these species in the Project area or the broader north Baffin region. Compared with the mainland portions of Nunavut, animal diversity and abundance is generally low and possibly cyclic with long periods between years of abundance.

2.1 NORTH BAFFIN ISLAND CARIBOU

Caribou is a keystone species because of its importance as a food source to local people and because it is the largest herbivore and only ungulate on Baffin Island. Local people have relied on caribou for meat and clothing, and they play an important role in Inuit lives and culture. Therefore, caribou have been included in the baseline inventory and impact assessments for all advanced exploration projects and mines that have submitted an application to the NIRB in Nunavut. Caribou is considered a focal species for assessment of the proposed Mary River Project.

A generalized summary of Baffin Island caribou delineated three primary herds on the island, including the north Baffin Island herd (Ferguson 1989). From 1989 through 2005 there were intermittent caribou studies on north Baffin Island (Ferguson 1999a). Two harvest studies included a summary of terrestrial wildlife harvest in the 1980s (Pattimore 1984) and the late 1990s to early 2000s (Priest and Usher 2004). An inventory of north Baffin Island caribou or other terrestrial wildlife has not been completed, though there has been ongoing work on and around Bylot Island 180 km north of the Mary River Project site.

North Baffin Island caribou are one of the least understood of all Arctic barren-ground caribou populations in Nunavut. The Government of Nunavut, Department of Environment (GNDoE) focused previous studies on the southern Baffin Island caribou because they are used by about 70% of Baffin Island's human population. Research recently began on north Baffin Island caribou; partially in response to increasing industrial exploration activities (GNDoE unpublished data).

Caribou populations on Baffin Island are tentatively based on their distinct fall breeding areas but population boundaries are not clearly understood (Ferguson 1989).

Areas of caribou concentration on Baffin Island were mapped by Brody (1976b) based on a series of local knowledge interviews in the Baffin region as part of the Inuit Land Use and Occupancy Project (Freeman 1976). A core area of caribou on northern Baffin Island was identified in the Project area, with various occurrences of seasonal movements along the northern coast of Foxe Basin and north of the Project area to Milne Inlet (Brody 1976b).

By 1989, further understanding of Baffin Island caribou, based mostly on Inuit traditional and local knowledge, identified three primary herds on Baffin Island. Tagging studies from 1974–1982 resulted in identification of a south Baffin Island population (Kraft 1984; Ferguson 1989), and, based mostly on local knowledge, a north Baffin Island population was split at roughly the Barnes Ice Cap in central Baffin Island (Ferguson 1989, Figure 2). Inuit hunters also identify a Northeast Baffin population that occupies the fjords and their headwaters along northeastern Baffin Island (Ferguson 1989; Figure 2). Smaller groups and subpopulations have also been identified within these broad ranges (Ferguson 1989; Piksikik Working Group 2007), and are discussed individually where relevant in this report. The identified range of north Baffin Island caribou is approximately 134,308 km^2.

Residents of Arctic Bay, Igloolik, Hall Beach, Clyde River, and Pond Inlet provided most of the knowledge on the distribution, abundance, and general ecology of north Baffin Island caribou. Earlier documentation of north Baffin Island caribou traditional and local knowledge included the Inuit Land Use and Occupancy Project in the 1970s (Brody 1976a; Freeman 1976) and the Northern Land Use Information Series Maps in the 1980s (INAC 1981). The GNDoE in Pond Inlet regularly consults with Inuit hunters, but a systematic study regarding Inuit Qaujimajatuqangit (IQ) knowledge on north Baffin Island caribou was not documented. As part of the baseline inventory work for this project, workshops and public meetings were organized by Baffinland to collect IQ and current local knowledge on caribou distribution, abundance, and ecology in the Mary River and broader northern Baffin Island region. The IQ and local knowledge was used in association with baseline survey work for the Project.

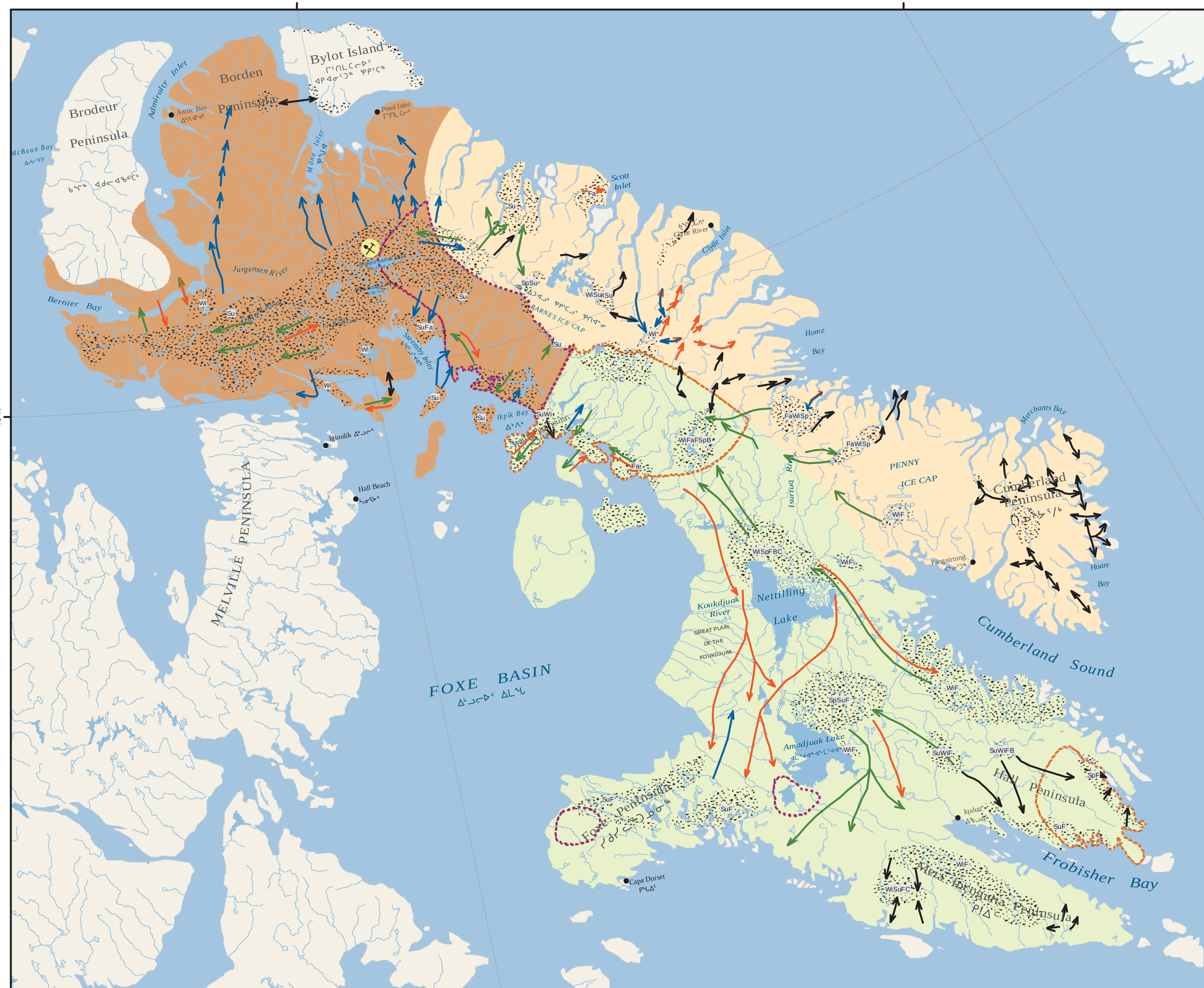
The north Baffin Island caribou population is potentially composed of three types of caribou: migratory (migrating from southern Baffin Island), resident (northern Baffin Island), and mainland (Piksiksik Working Group 2006). Mainland caribou are larger than island (migratory and resident) caribou, and they have eyelashes and darker pelts that tear more easily (Ferguson and Tigullaraq 1996). Island caribou are smaller and do not have eyelashes. The meat of mainland caribou is tastier, probably as a result of a wider variety of vegetation eaten on Melville Peninsula (Igloolik Caribou Focus Group 2008). Igloolik hunters said that island and mainland caribou travel between Baffin Island and Melville Peninsula across Fury and Hecla Strait, but those animals often return in the same season (Igloolik Caribou Focus Group 2008; Koonoo 2006, pers.comm.), and only small numbers are involved in that movement (Clark 1971). The extent and size of these three groups is not known, nor whether it is justified to call each group a separate population.

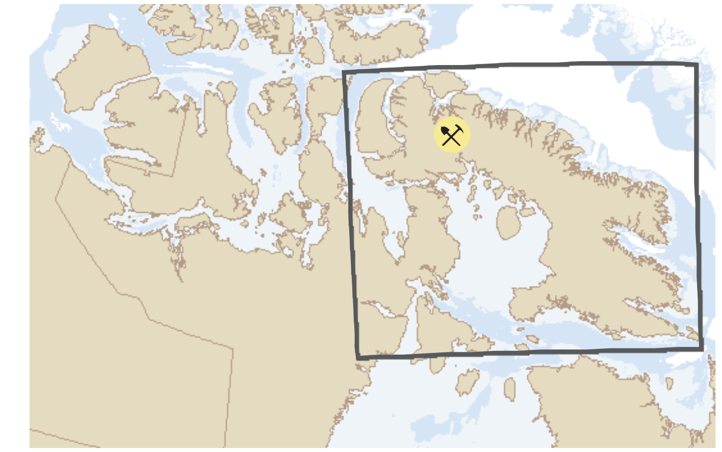
Hunters have stated that the entire northern Baffin region is used or needed by caribou, and that the caribou will use all portions of this range in cycles of abundance (Brody 1976b), with the exception of the northern and interior portion of Brodeur Peninsula that is not considered caribou range (Brody 1976b; Arctic Bay Caribou Focus Working Group 2008, Figure 2). The heartland of the north Baffin Island caribou population was identified as the area north and northeast of Steensby Inlet, described as a large, wet, flat plain animals use to move north and west (Brody 1976b). Based on an aerial survey, hunter interviews, and harvest data, Rippin (1972) proposed that the core of north Baffin Island caribou was the Steensby Inlet–Inuktorfik Lake area. Arctic Bay Inuit identified a separate population of "mountain" caribou on northern Borden Peninsula that persist throughout the year and are separate from the larger migratory north Baffin Island population (Arctic Bay and Pond Inlet Caribou Focus Working Group 2008). The area south of Koluktoo Bay (inclusive of a large portion of the Project area) was indicated as year-round caribou range and important for Inuit hunting (Lancaster Sound Regional Land Use Plan 1989).

Caribou are known to occupy the northeast coast of Bylot Island, sometimes in abundance; for example, 300 animals were shot in 1943 (Miller 1955), possibly extirpating the population at that time (Zoltai et al. 1983). Tracks were seen on Bylot Island occasionally during the 1970s (Ferguson 1989) but caribou did not return to Bylot Island in abundance again until the 1990s, as indicated by harvest records in the late 1990s (Priest and Usher 2004).

Exchange between north and south Baffin Island caribou populations was documented (Ferguson 2005, pers. comm.). The GNDoE collared two caribou in northern Baffin Island in 1988, and three on southern Baffin Island in 1991. Two caribou from southern Baffin Island moved into north Baffin Island and remained there for the life of the collars (three years, Ferguson 2005, pers. comm.; GNDoE unpublished data). North and south Baffin caribou populations might periodically meet up and then separate again (Ferguson 2005, pers. comm.), but the extent of those occurrences and exchange is unknown.

Caribou occurring in the Project area are identified as a component of the north Baffin Island population. Large numbers of caribou are expected to occur cyclically, while small numbers persist through the low in the population cycle (Pond Inlet, Arctic Bay and Igloolik Caribou Focus Working Groups 2008).





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Movement of caribou (Brody 1976b)

- Spring/Summer
- Summer/Fall
- Winter
- Unspecified season
- Concentrations of caribou (Brody 1976b)

Major Herd Distribution (Ferguson 1989)

- Northern Herd
- Southern Herd
- Northeastern Herd
- Calving Area
- Suspected Calving Area

Data Sources:

Major Herd Distribution and Calving Areas:
Ferguson, M. 1989. Baffin caribou. Pp. 142 in Hall, E. (ed). People and caribou in the Northwest Territories. Department of Renewable Resources, Government of the Northwest Territories. Yellowknife, NT. 190 pp.

Caribou Concentration and Movement:
Brody, H. 1976b. Land Occupancy: Inuit Perceptions. Pp. 207, In Freeman, M.M.R. (ed). 1976. Inuit Land Use and Occupancy Project: Volume 1: Land use and occupancy. Prepared for Department of Indian and Northern Affairs Canada. 263 pp.

Scale 0 50 100 200 300 Km

Baffinland Iron Mines Corporation

Estimated Major Caribou Herd Distribution and Movements, Baffin Island

EDI

07 December 2010

FIGURE 2

WHITEHORSE, YT SAVED: J:\Yukon\Projects\2010\10_YC_0025\Mapping\Fig2_Herd_Distribution_07Dec2010.mxd

2.1.1 Historical Caribou Surveys

Early surveying of the north Baffin Island caribou included four aerial surveys between 1949 and 1972 (Hall 1980). However, the results did not produce reliable population estimates or thorough distribution information for a variety of reasons, including poor weather and logistics (Ferguson 1989). A caribou calving reconnaissance survey of northern Baffin Island from May 30 to June 21, 1980 (Allen et al. 1980), with survey flights based out of Igloolik, Arctic Bay, and Pond Inlet, was conducted in response to community comments that caribou range appeared to be expanding in the region and concerns over mineral exploration and disturbance to caribou. The survey included the Mary River area, which had been specifically identified as a "major" calving area by Igloolik, Pond Inlet, and Arctic Bay hunters (Allen et al. 1980; INAC 1981). While the exact areas that the survey covered are now unclear, calving caribou were observed throughout the region and in the Project area. The authors concluded that caribou use of the range was expanding and that caribou numbers might have been increasing as predicted by the communities. In late-July and early August 1982, only one live caribou was seen along the Tugaat River during aerial reconnaissance of an area limited to Bylot Island and adjacent areas on Baffin Island (Zoltai et al. 1983).

Weekly helicopter surveys were conducted in northern Baffin Island during June 1994 and June 1997 (Ferguson 1999a; GNDoE unpublished data). Sex and age classification surveys were augmented with information from three females with satellite telemetry collars. Females appeared to have calved on a rugged ridge of south-facing slopes, and calving continued through the last two weeks of June into early July. Cows were consistently seen along the snowmelt margin. Several caribou were observed in June 1997 at the head of Tugaat Canyon, in the Mary River area, the valley heading southeast from Mary River, the headwaters of Phillips Creek, and the fjords south of Pond Inlet. Calves were observed in all those locations as well, except for the fjords south of Pond Inlet (GNDoE unpublished data).

Overall population estimates for north Baffin Island caribou have ranged from 30,000 in 1985 (Williams and Heard 1986) to 50,000–150,000 in 1991 (Ferguson and Gauthier 1992). Communities have reported a decline in north Baffin Island caribou since the mid-1990s. Harvest data showed an annual decrease in harvest (Priest and Usher 2004; Caribou Focus Working Groups 2008).

2.1.2 Caribou Harvest

Hunters from Arctic Bay/Nanisivik, Pond Inlet, Hall Beach, and Igloolik have traditionally harvested caribou on Baffin Island from the north Baffin Island caribou population (Freeman 1976; Pattimore 1984; Priest and Usher 2004). Harvest data were not consistently collected for northern Baffin Island outside the two harvest studies in the early 1980s (Pattimore 1984) and late-1990s (Priest and Usher 2004). The Royal Canadian Mounted Police (RCMP) maintained harvest records that are documented from the 1930s, 1940s, and late-1950s, but it is difficult now to determine the consistency in reporting of that harvest. The RCMP harvest records were also collected during a

time of changing cultural patterns as Inuit centralized to communities and reporting might have become more consistent through the reporting period.

Regardless, they do provide an indication of the magnitude of caribou harvested and those records are referenced where available. No harvest data were available for the years 1948–1955, 1973–1978, 1979–1980, 1985–1996, and no harvest data have been collected since completion of the Nunavut Wildlife Management Board's Wildlife Harvest Study in 2001 (Priest and Usher 2004).

Harvest data were collected in Pond Inlet since 1932 (with the exception of the years noted above). Harvest reporting appeared to be inconsistent for the other north Baffin Island communities, or because of lack of settlements, the harvest might have been summarized for the entire region under "Pond Inlet." From the 1930s through the early 1950s, caribou harvest from Pond Inlet might account for the numbers harvested in the entire northern Baffin region because it appears that human census data were also collected at that scale (Northern News 1954, Attachment A). Harvest data also included reporting of entire harvests, or were estimated based on a subsample of recorded harvests. Despite these limitations in interpretation of harvest data, the harvest data do provide a general indication of the trends in abundance of caribou in the harvest areas. Though they shouldn't be regarded as absolute values, the data provide an index of harvest through time.

Harvest data from Pond Inlet indicate a general trend of abundant caribou harvest in the mid- to late-1930s, with relatively low harvest levels beginning in the early 1940s. Harvest data from 1932–1939 indicate that 149 to 1499 caribou were harvested per year, with harvest data reported from 1939–1948 declining to either very few reports, to no animals reported as harvested in 1946 (see Table 1). Harvest records from 1955–1963 illustrate a continued harvest in Pond Inlet from 75 to 150 animals. The low harvest continued until the early 1970s, despite the increasing human population (see Table 1 and Figure 3), indicating a probable low abundance of caribou in the region.

Harvest data from the 1960s and 1970s might indicate a gradual expansion of caribou numbers and range use. The 1979 harvest from Pond Inlet (1149, Finley and Miller 1980) was much higher than the harvest reported in any year during the 1960s. Annual caribou harvest in Pond Inlet in the 1960s ranged from 90 to 278 (Bissett 1967), with an upward trend through the 1960s, with a significant increase by the late 1970s and early 1980s. Similar trends were apparent for Arctic Bay/Nanisivik and Igloolik (see Table 1). Annual take of caribou around 1972 was estimated at 50–100 animals in Arctic Bay, and 580 animals harvested on Baffin Island by Igloolik hunters (Rippin 1972).

From 1980 to 1984 the Baffin Regional Inuit Association collected data on the number of caribou harvested in the north Baffin Island region. Estimated harvest from Pond Inlet, Arctic Bay, and Igloolik was roughly 24,000 caribou (see Table 1) during that period (Pattimore 1984). Unfortunately, the location data of the harvested caribou were not available, but based on the communities reporting the harvest, the majority of them were likely from northern Baffin Island. Harvest estimates appear high relative to information provided in the Caribou Focus Working Groups that suggested numbers in northern Baffin Island did not peak until the 1990s (see Table 1 and Figure 4). However, as a general index of abundance, it is clear that caribou were present in large numbers on Baffin Island during the 1980s, and one hunter stated that "caribou were even found on

the ice in Nanisivik in the 1980s" (Hall Beach Caribou Focus Working Group 2008). The most active harvesters on Baffin Island during the 1980s were 30 to 64-year-old men who harvested an average 18 caribou annually per hunter (Donaldson 1988).

Caribou harvest from 1996–2001 was recorded by the Nunavut Wildlife Management Board's Nunavut Wildlife Harvest Study (Priest and Usher 2004). Harvest location data were available for that study, and Pond Inlet Inuit harvested caribou relatively close to the community, along coastal areas west of Pond Inlet and along the south coast of Bylot Island (see Figure 4). Harvest by Arctic Bay Inuit extended inland into central Borden Peninsula and the entire east coast of Admiralty Inlet. Igloolik and Hall Beach Inuit hunted the mainland coast directly across Fury and and Hecla Strait as well as the coast of Steensby Inlet (see Figure 4). Harvest from 1996 through 2001 on Baffin Island reported from Pond Inlet, Arctic Bay, and Igloolik amounted to roughly 9600 caribou. Most of that harvest originated from Pond Inlet. Caribou availability has declined significantly since completion of the harvest study, and few caribou are now found on northern Baffin Island (Caribou Focus Working Group 2008).

Table 1. Reported or estimated caribou harvested by hunters from Arctic Bay/Nanisivik, Pond Inlet, Hall Beach, and Igloolik, 1932–2001.

Years	Reported/Estimated Caribou Harvest				Source
	Arctic Bay and Nanisivik	Pond Inlet	Hall Beach	Igloolik	
32–33		663			Kelsall 1949 (cited in Hall 1980)
33–34		1,214			
34–35		149			
35–36		458			
36–37		1,499			
37–38		832			
38–39		1,156			
39–40		756			
40–41		66			
41–42		982			
42–43		315			
43–44	77	58			
44–45	20	5			
45–46	83	0			
46–47	88	22			
47–48	25	34		77	
48–55	No data				
55–56	104	104		222	Macpherson 1964 (RCMP records)

Years	Reported/Estimated Caribou Harvest				Source
	Arctic Bay and Nanisivik	Pond Inlet	Hall Beach	Igloolik	
56–57	54	125		200	Bissett 1967 (RCMP records)
57–58	25	75		227	
58–59	50	124		338	
59–60	12	138		350	
60–61		90			Macpherson 1964 (RCMP records)
61–62		100			
62–63		150			
63–64		154			Rippin 1972 (Hunter interviews)
64–65		194			
65–66		137			
66–67		102			
67–68		158			
68–69		208			
69–70		278		580	
70–71		274			
71–72		345			
72–73		600			Treude (1977, cited in Zoltai et al. 1983)
73–78		No data			
78–79		1,149			Finley and Miller 1980 (estimates)
79–80		No data			
80–81	1,652	1,765	1,391	2,936	Pattimore 1984
81–82	1,353	572	1,299	1,718	
82–83	1,145	2,315	1,209	1,900	
83–84	1,018	2,529	1,113	1,940	
84–85	418	2,062	1,676	912	
85–96		No data			
96–97	94	2,169	61	121	Priest and Usher 2004
97–98	78	2,534	88	118	
98–99	67	1,847	79	128	
99–00	63	1,466	78	122	
00–01	58	1,123	81	122	

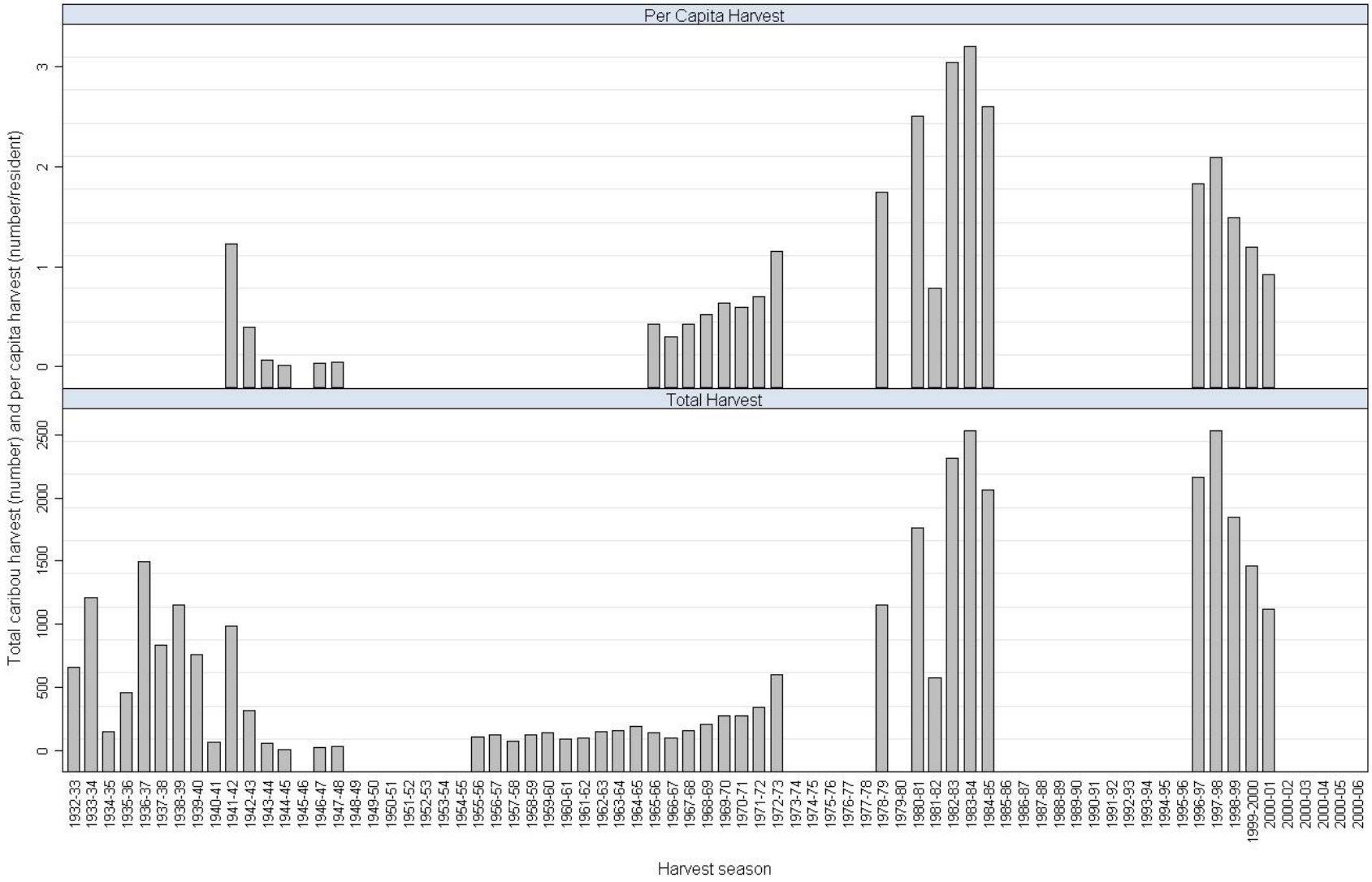
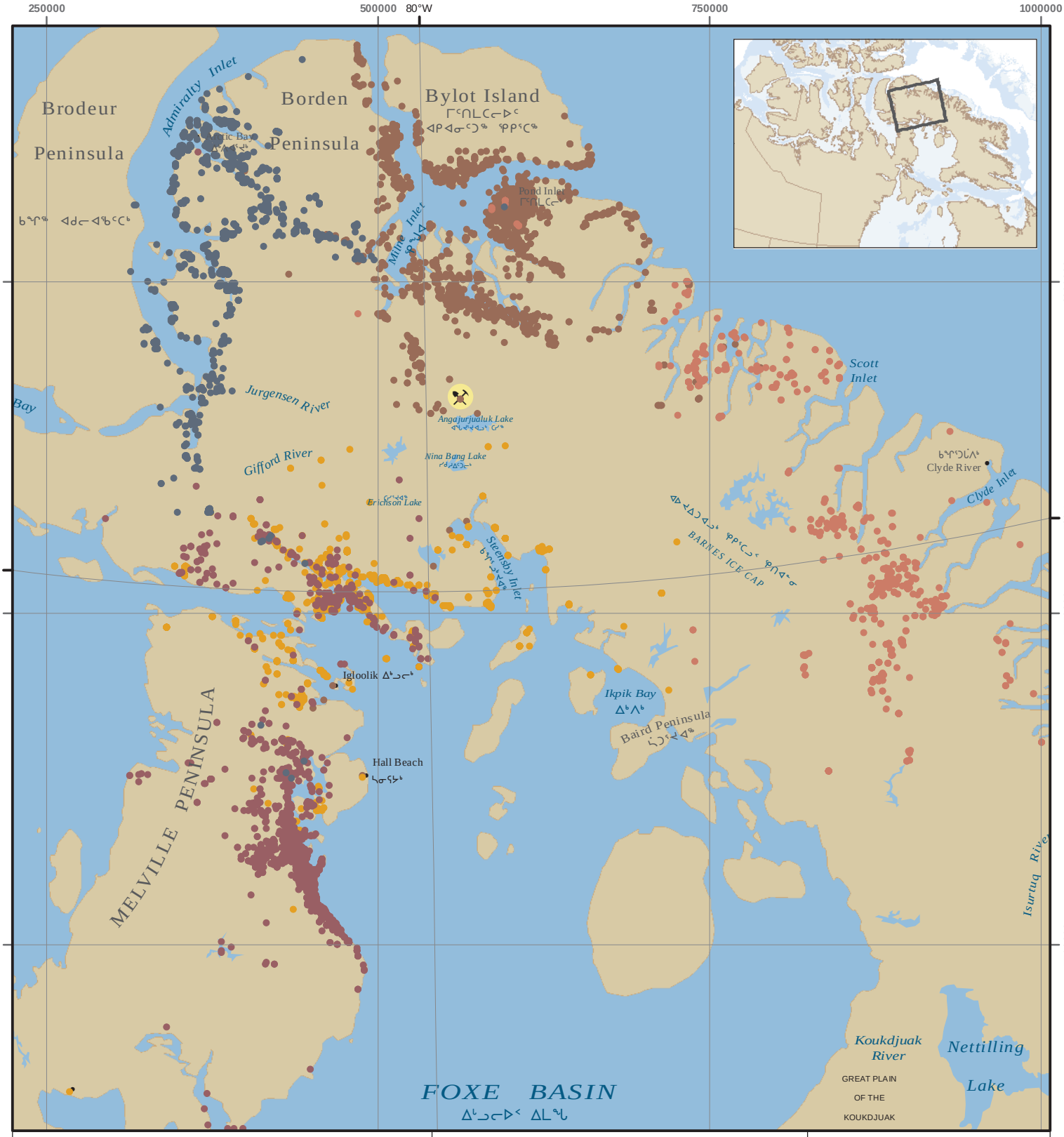


Figure 3. Summary of reported or estimated caribou harvest for Pond Inlet, Nunavut, 1932–2006.

Note: Data are summarized as per capita caribou harvest (top) and total caribou harvested (bottom) by year.



LEGEND

Mary River Project

.....Mary River Project

Caribou Harvest (by community)

- .....Pond Inlet
- .....Igloolik
- .....Hall Beach
- .....Clyde River
- .....Arctic Bay

NOTES:

Caribou Harvest Data: NWMB Harvest Study (1996 to 2001).

Projection: North American Datum 1983 UTM Zone 17N

Scale 0 25 50 100 150 200 Km

Baffinland Iron Mines Corporation

EDI

Caribou Harvest

07 December 2010

FIGURE 4

WHITEHORSE, YT SAVED: J:\Yukon\Projects\2010\10_YC_0025\Mapping\Fig4_Caribou_Harvest_07Dec2010

2.1.3 Cyclical Abundance

Caribou on Baffin Island have exhibited large fluctuations in abundance (Clark 1971). Syntheses of harvest data, observations, and Inuit knowledge that cover more than one century suggest that the north Baffin Island caribou exhibit population cycles. The current cycle suggests a period of 60-70 years and is consistent with Inuit knowledge (Pond Inlet Caribou Focus Working Group 2008). The regularity of this cycle is unclear. Similar frequency cycles of caribou abundance have also been described in southern Baffin Island (Ferguson et al. 1998) and for several herds in Greenland (Post and Forchhammer 2004).

Evidence and local knowledge used to document abundance of caribou dates back to 1879 (Clark 1971). It is difficult to determine exact dates and estimates of abundance because they are dependent on locations of observations and interpretation of local records. However, it appears that north Baffin Island caribou were in a period of high abundance from the late 1920s to the early 1940s, were relatively uncommon through the 1940s to the 1970s, experienced a gradual recovery of the population from the late 1960s/early 1970s, and were abundant again beginning in the late 1970s through the 1990s. These estimates are similar, at a ten year time lag, to estimates of caribou abundance in south Baffin Island (Ferguson et al. 1998). The caribou on northern Baffin Island are currently at the low in the cycle.

1900–1940

The period between 1900 and 1940 was a time of large change in caribou abundance on north Baffin Island. Caribou were abundant between the 1920s and 1930s on north Baffin Island. After reviewing reports written between 1879 through 1962, Macpherson (1963, cited in Clark 1971) reasoned that the caribou population increased during the 1920s and 1930s from a low in the 19th century and the population peaked sometime during the late-1930s. According to north Baffin Island Inuit, the range occupied by caribou on northern Baffin was large in the 1920s and small in the 1940s (Brody 1976a; Allen et al. 1980; Pond Inlet, Arctic Bay, Igloolik Caribou Focus Working Groups 2008). Caribou were noted to have been "numerous" on the Baffin Island side of Fury and Hecla Strait during winter 1939–1940 (Manning 1943). Reported caribou harvest was relatively high in northern Baffin Island during the 1930s, with the total reported harvest and the per capita harvest dropping sharply in the early 1940s (see Figure 3). After the population peak, caribou range began to shrink on both Baffin Island and Melville Peninsula (Brody 1976a), and by the late 1930s and 1940s the only accessible caribou on Baffin Island were inland from Baird Peninsula on the east coast of northern Foxe Basin (Brody 1976a).

1940–1980

Caribou were uncommon starting in the 1940s. There seems to be general acceptance that there was a severe decline in caribou abundance in the 1940s after a period of caribou abundance in the preceding decade (Kelsall 1949; Macpherson 1964, cited in Hall 1980; Pond Inlet Caribou Focus Working Group 2008). No caribou were seen in 1949 on an aerial survey from Igloolik-Pond

Inlet-Arctic Bay-Igloolik (Kelsall 1949, cited in Hall 1980). The population started to rebound in the 1950s and numbers increased, but caribou remained at relatively low densities until the 1970s. Increased observations of caribou were noted in the early to mid-1970s (Brody 1976a, 1976b). Caribou numbers were recognized as "high" south of Mary River beginning in the mid-1970s (see Figure 6). In 1974, the first new caribou tracks were observed on Bylot Island—the last tracks having been observed in 1959 (Brody 1976a). Reported and per capita harvest were relatively low during the late-1950s through the late-1960s, with a noted increase in harvest in the early 1970s (see Figure 4).

Caribou range use seemed to expand in the 1970s–1980s (Allen et al. 1980; Pond Inlet Caribou Focus Working Group 2008). In the mid-1970s, Pond Inlet hunters were predicting that caribou would "very soon" be abundant, even on Bylot Island (Brody 1976b).

1980–Present

In the early 1980s on Bylot Island and adjacent Baffin Island, numbers of caribou were considered "not significant" and there were "comparatively few present" (Zoltai et al. 1983). Numbers in the Project area might have started to recover beginning in the 1960s, but it was not until 1991 that caribou were considered to have returned to the Pond Inlet area. Caribou were most abundant in the Project area from 1994–1996 (Mittimatalik Hunters and Trappers Organization pers. comm. 2006). From the 1960s to the 1990s there was a gradual expansion of caribou north to the southern portions of the Borden Peninsula (Ferguson 1989). Arctic Bay Inuit said that caribou that had left that area many years ago returned in the late-1990s in response to recovered lichen growth, a key food item for caribou (Arctic Bay Caribou Focus Working Group 2008).

Harvest data from the 1980s (see Figure 4) show abundance of harvested caribou greater than that reported as harvested in the 1990s (Pattimore 1984; Priest and Usher 2004). However, judging by an approximation of the spatial distribution of the abundance of caribou during the last "high" in the abundance cycle (see Figure 6; Pond Inlet Caribou Focus Working Group 2008), Pond Inlet hunters might have been travelling farther to harvest caribou in the 1980s than they were in the late 1990s (see Figure 5).

By the late-1990s people were finding dead caribou across the land, and from 1998–1999 numbers appeared to decrease (Pisiksik Working Group 2006). Since late-1999 there have been no caribou in Pond Inlet and very few have been found in northern Baffin Island (MHTO 2006). Harvest information (Priest and Usher 2004) provides further evidence that caribou numbers have been depressed in northern Baffin Island since about 1998. Existing trails and IQ suggest a much greater distribution and abundance of caribou than has recently been observed in the Project area.

The cause of the cycle in caribou abundance is undetermined. It is not understood if the population fluctuates (e.g., increases and then dies off), or if the larger component of the herd has moved and dispersed to locations where people do not currently hunt, or into mountainous terrain where it is difficult to see large numbers at a single time. Opinions on the cyclic nature of caribou abundance in

the past have included caribou moving as a result of disturbance in other parts of their range and decreased food availability (Brody 1976b). Harvest has the potential to cause changes to caribou abundance and population recovery rates (COSEWIC 2004), but the significance of harvest on the north Baffin Island caribou population is unknown. The strongest opinion presented was that the caribou responded in numbers to the renewal of food (lichens), and that larger numbers of caribou will return when the currently exposed and worn caribou trails begin to grow over with vegetation, an estimated 40–50 years from present (Igloolik Caribou Focus Working Group 2008). Based on trail orientation and observations from the Caribou Focus Working Groups, the potential cyclic nature of south Baffin Island caribou (Ferguson et al. 1998), and large numbers of north Baffin Island caribou could be the result of movement from south Baffin Island into the north in response to availability of forage (food).

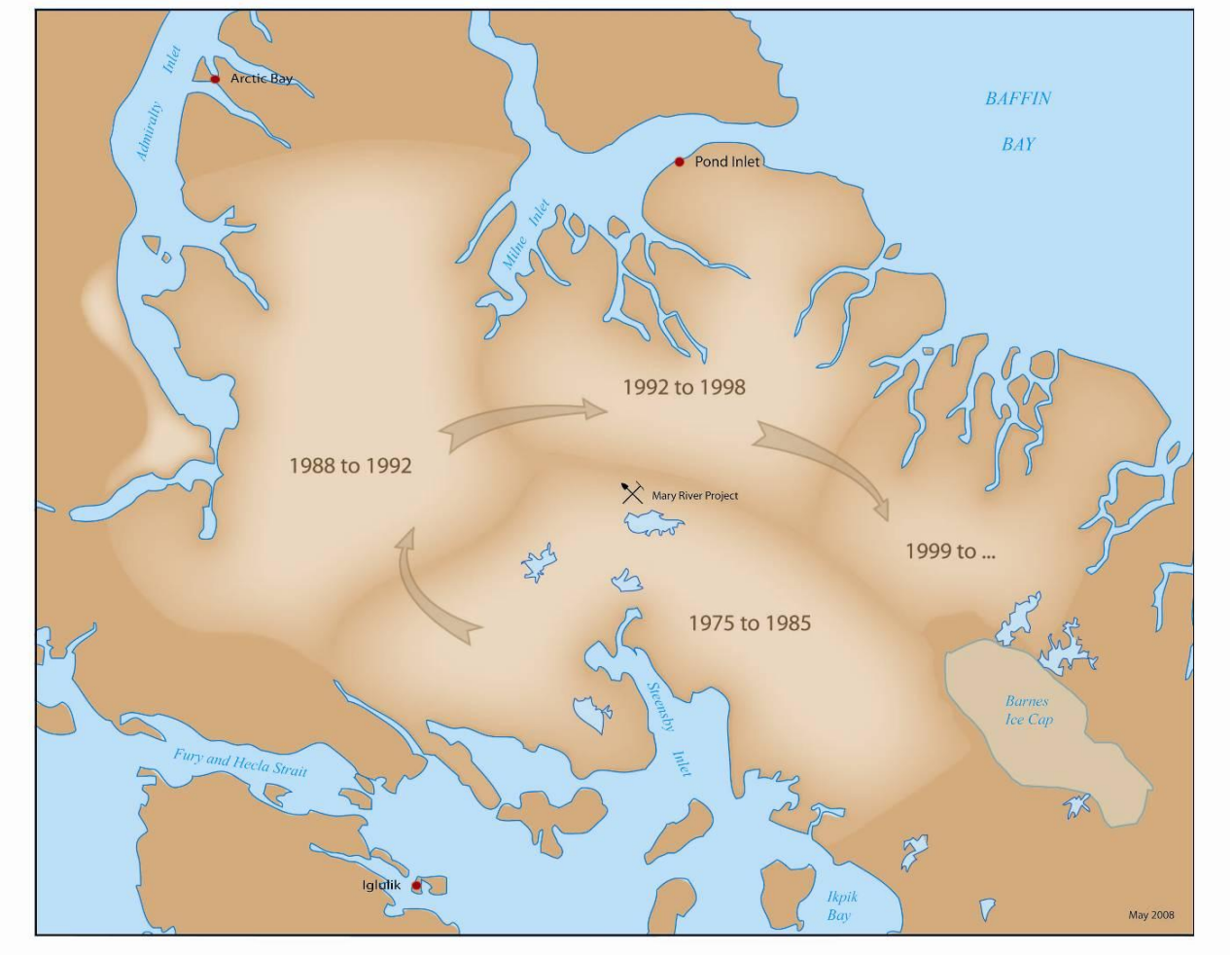


Figure 5. Estimated distribution of caribou during the last high in the population cycle on north Baffin Island, Nunavut.

(Adapted from map drawn by Malachi Arreak and discussion at Pond Inlet caribou focus working group meeting, February 13, 2008.)

2.1.4 Seasonal Habitats

Caribou are found year-round in most areas of northern Baffin Island. There are no large-scale, seasonal migratory movements as are seen in many mainland herds; seasonal movements are small scale and elevation movements limited to calving and winter habitats. Baffin Island caribou movement is not restricted by difficult topography and caribou are often observed in areas lacking vegetation, including glaciers (Pond Inlet, Clyde River, and Arctic Bay Caribou Focus Working Group 2008; M. Ferguson 2005, pers. comm.). Angalurjuak Lake, approximately 16 km south of Deposit No. 1, is "famous" for the male caribou found on its shores and said to be too large and too lazy to be moving all the time (Brody 1976b, p. 208). This observation was similar to that documented from the Caribou Focus Working Group Meetings for the current project.

Migration and Movement

Local knowledge about caribou focuses on herd movement because it is the ability to predict caribou movements that makes a good hunter (Brody 1976b). Inuit from north Baffin Island communities have contributed to the understanding of caribou movements since the earliest documented research on northern Baffin Island. The first attempt at mapping caribou range and migration "corridors" was documented in the Inuit Land Use and Occupancy Project (Brody 1976b), and on Northern Land Use and Information Series maps (INAC 1981). These documents suggest that during May, females and young males migrate from Tay Sound, Paquet Bay, and Milne Inlet southward through Mary River valley to reach calving areas. The bulls remain behind in summer and do not migrate inland (Ferguson 1989).

To update knowledge on caribou movement and migration, Inuit in northern Baffin communities were asked to identify known migration routes during Caribou Focus Working Group meetings at Arctic Bay, Pond Inlet, Clyde River, Hall Beach, and Igloolik in 2008. Inuit participating in the workshops identified movement associated with the "large" herds when caribou are abundant, and suggested some seasonal movement in the smaller, more distributed herds. Working group members generally found this a challenging exercise because it was difficult to map exactly where caribou move, and suggested that when they are abundant, they can be found in many places moving in many directions. There was reference to well-worn trails on the landscape formed when large numbers of caribou follow each other during seasonal movement, and some of the more well-known areas with these trails were identified (see Figure 6). A significant spring migration route was identified that originates in central Baffin Island, runs along the northern shore of Foxe Peninsula corridor, north along Steensby Inlet, dispersing into the Project area (see Figure 6). That route is used when caribou are abundant, as can be seen by the many worn trails from the last period of abundance in the 1980s and 1990s (Pond Inlet Caribou Focus Working Group 2008). Several other smaller seasonal movement routes were identified that indicated general areas where caribou move into higher or lower elevations depending on the season (see Figure 6).

IQ interviewees noted that caribou in north Baffin Island are always moving to find food. Interviewees also expected that when caribou return to north Baffin Island in the large number that

they previously experienced, the caribou will migrate from southern Baffin Island when the habitat recovers from the last abundance of caribou. This statement suggests that local people believe the local caribou population is capable of overgrazing north Baffin Island, causing the population cycles (see Section 2.1.3).

Calving Areas

Calving occurs in late-spring, usually June. Baffin Island caribou do not necessarily migrate to areas to congregate in distinct calving grounds, and many likely calve on or near their wintering areas in a dispersed fashion (Ferguson 1989; Pond Inlet, Arctic Bay, Igloolik Caribou Focus Working Groups 2008). Based on local knowledge at the time, calving areas in the Project area (see Figure 7) were identified on Northern Land Use Information Series maps (INAC 1981). A large area extending from the Tugaat River southwest to the Ravn River, encompassing Nuluujaak Mountain (Deposit No. 1) and the eastern edge of Angajurjualuk Lake was identified as an area where calving had been known to occur in discrete portions of the area. Caribou have been observed calving at the snowmelt margin (Ferguson 1999). The distribution of the snowmelt margin, timing of snowmelt, and proximity to post-calving areas could be primary factors influencing calving locations (Ferguson 1999). Caribou follow the spring phenology of plants, feeding on purple saxifrage in upland areas where the snow melts first.

Broadly defined calving areas of the north Baffin Island caribou were identified by Ferguson (1989) who, using Inuit local knowledge, identified the most common calving area for north Baffin Island caribou to be north of Steensby Inlet, east to south of the Barnes Ice Cap (see Figure 2). Many caribou apparently calved in rough terrain east of Angajurjualuk Lake. Calves were usually seen on hillsides and in small valleys, and historically the Project area had high numbers of calving caribou (Ferguson 2005, pers. comm.).

Weekly helicopter surveys were conducted on northern Baffin Island during June in 1994 and 1997 (Ferguson 1999; GNDoE unpublished data). It was noted that females migrated to give birth on a rugged ridge of south facing slopes, and calving continued through the last two weeks of June into early July. Cows were consistently seen along the snowmelt margin. In June of 1997, cows with calves were observed at the head of Tugaat canyon, near Deposit No. 1, the valley heading southeast from Mary River, and the headwaters of Phillips Creek (GNDoE unpublished data).

Caribou Focus Working Groups described calving habitat as higher elevation habitat away from predators. The caribou's choice of rugged mountainous terrain for calving is a strategy to avoid predation from wolves (Pisiksik Working Group 2006; Pond Inlet, Arctic Bay, and Igloolik Caribou Focus Working Groups 2008). Specific calving grounds were described with less certainty—some people mentioned that calving caribou were dispersed, while others mentioned calving groups. The groups identified the Mary River region as a calving area (see Figure 7). Many areas were consistent with previously documented information (e.g., INAC 1981), but all participants noted that while large areas may be encompassed within a calving "area," that caribou do not necessarily calve there every year, and usually only in portions of the identified areas. Some areas were known to

participants through traditional knowledge and were unsure if the areas are currently used for calving. Generally, when caribou are abundant they calve in many locations (see Figure 7), most of which were identified on the maps at the working group meetings (Arctic Bay, Pond Inlet, Clyde River, and Hall Beach Caribou Focus Working Groups 2008).

Summer

Caribou can be found anywhere in the summer, depending on food availability (Ferguson 1989; Caribou Focus Working Groups 2008). In June and July they are found upland in well-drained areas. In late summer they are located on coastal plains, including the vicinity of Steensby and Milne Inlets, or near inland lakes. Bulls, and eventually cows and calves, will move close to larger waterbodies so they can swim to avoid wolf predation (Pond Inlet Caribou Focus Working Group 2008). Summer distribution has been noted scattered south of Oliver Sound and around the coastal plains of Steensby Inlet (Ferguson 1989).

Avoidance of insect harassment has been documented as a reason for changes in caribou foraging and movement behaviour (Morschel and Klein 1997; Hagemoen and Reimers 2002). IQ interviewees confirmed that caribou movement and habitat selection on north Baffin Island can be significantly driven by insect harassment. In midsummer, caribou are sometimes found walking on glaciers to avoid insect harassment (Brody 1976b; Clyde River Caribou Focus Working Group 2008). Since caribou can be found where there is suitable forage or in areas suitable for insect avoidance, summer range was generally not explicitly identified on maps during the Caribou Focus Working Group meetings.

Fall/Breeding

Fall aggregations start to occur in September (Caribou Focus Working Groups 2008). Areas known to have caribou during the fall breeding season were included on the Community Caribou Focus Working Group maps and were generally at low elevation along shoreline margins.

> *"Caribou only rut in the flat lands, not in the mountains" (Ammaq 2008).*
>
> *"I have seen them moving towards the coast and starting to mate in September. East of "Big A" [Angalurjuak Lake] lake is a mating area" (unknown Pond Inlet interviewee 2008).*
>
> *General consensus, however, was that caribou do not select particular areas for the fall breeding period (Pond Inlet and Arctic Bay Caribou Focus Working Groups 2008).*
>
> *"Then the caribou start to slow down for mating, when October comes they will start mating then they become calmer and they can start walking around again, that's how they are when it is getting cold" (Akumalik 2008).*
>
> *"Caribou tend to not be frighten[ed] during breeding" (Oyukuluk 2008).*

Winter and Spring

In winter (December through February), caribou move little (Ferguson 2005, pers. comm.).

> *Yes…, the ones that are idle, not walking [winter on top of mountains]" (Uttak 2008).*
>
> *"Caribou will winter on mountain tops because it is warmer there" (unknown Pond Inlet interviewee 2008).*

Winter distribution is not consistent and probably in response to forage abundance (Ferguson 2005, pers. comm.; Pisiksik Working Group 2006, pers. comm.; Pond Inlet, Arctic Bay Caribou Focus Working Group 2008).

> *"Ah, the caribou goes on top of the peaks in the winters, I won't point out a peak because they're all over the place in the general area". "Peak, peak, if you look at this land if there's a peak, then the valley has lots of snow and the peak hardly has any snow, so they go where there's less snow where they can smell, where they can find food and where they are on top in the winter {yes} here (pointing on the map), here when it's mid-winter they are right on top of the peaks, these, these high places are where they are because it has less snow where they can find their food here (pointing on the map), in the summer they're in lower flat lands when the food is plenty on the lowlands" (Ikummaq 2008).*
>
> *"There are no distinct wintering areas for caribou—they migrate and move around the island" (unknown Pond Inlet interviewee 2008).*

Ferguson (1989) suggested that in winter caribou concentrate in the valley bottoms south of Tay Sound, Paquet Bay, and Milne Inlet. In winter, caribou feed on vegetation exposed by wind, or crater through the snow to feed (Ferguson 1999b). Interactions among snow, terrain, and wind determine accessibility of forage on winter range (Ferguson 1999b). Caribou that winter on tundra often consume little lichen in comparison to those wintering in forests (Ferguson 1999b).

Of lichen that is consumed, *Cladina* spp. and *Cladonia* spp. are most selected by southern Baffin caribou (Ferguson 1999b). There is no published information on winter forage selection for northern Baffin caribou.

> *"They eat nirnak [white lichen], nirnak, nirnak, those small, they always eat nirnak and is their main food, they also eat the yellow lichen, some roots, also some lichen stuck on rocks is what they eat" (Uttak, 2008).*

Current knowledge suggests that from late-winter until fall, bulls and non-pregnant females are found near southern Admiralty Inlet and on southern Borden Peninsula. Caribou from southern Admiralty Inlet, Bell Bay and Jungersen River migrate east to the calving areas north of Steensby Inlet. Igloolik Inuit reported caribou found north of Agu Bay east and south to Baird Peninsula for much of the year. In the spring, the caribou migrate from the Gifford River to calving areas north and east of Steensby Inlet. Some calve along the coast of Ikpik Bay and on Baird Peninsula. The migration route identified the south coast (east and north of Steensby Inlet) as being used when

caribou are abundant, and it is the movement of the "large" herd rather than the few that persist during the population low of the cycle (Igloolik Caribou Focus Working Group 2008).

400000 500000 80°W 600000 700000 800000

8100000 8000000 7900000 7800000 70°N 7700000

Peninsula

Pond Inlet

Milne Inlet

Jurgensen River

Gifford River

Angajurjualuk Lake

Nina Bang Lake

Erichson Lake

Steensby Inlet

BARNES ICE CAP

Igloolik

Ikpik Bay

Baird Peninsula

VSULA

LEGEND

.....Mary River Project

Caribou Migration (Traditional Knowledge Workshop 2007)

.....Non-specified Migratory Route

.....Fall Migratory Route

.....Spring Migratory Route

.....Caribou Migration (NLUIS 1980)

Caribou Migration (Traditional Knowledge Interviews)

.....Migration Route

.....Movement Over Time

NOTES:

This is a DRAFT of the results of Inuit Qaujimajatuqangit (~Traditional Knowledge) of caribou seasonal/historical distribution, abundance, and migration/movement routes in the Mary River area of north Baffin Island, Nunavut. The information was collected as part of the environmental baseline studies for Baffinland Iron Ore Corporation's proposed Mary River Project.

Data sources:

Caribou Polygons and Lines — Inuit Qaujimajatuqangit (~Traditional Knowledge) of caribou seasonal/historical distribution, abundance, and migration/movement routes are derived from a series of public and invited meetings in Pond Inlet, Clyde River, Hall Beach, Iglulik, and Arctic Bay during February and March, 2008. Invited members include select elders, hunters and other invited key knowledge holders. Public meetings included a variety of community members with local and traditional knowledge of caribou distribution, movement, and abundance. Information collection was focused on the Mary River area (approximate centre of the map) so the information does not necessarily reflect complete Inuit Qaujimajatuqangit outside of that region.

Information from the Traditional Knowledge Interviews (Inuit Qaujimajatuqanjit) was provided by Knight Piesold Consulting.

NLUIS Data: Adapted from NLUIS mapping conducted in summer 1980. Mapping produced 1981. Her majesty the Queen in Right of Canada. Department of Energy, Mines and Resources.

Projection: North American Datum 1983 UTM Zone 17N

Scale 0 25 50 75 100 Km

Baffinland Iron Mines Corporation

Caribou Migration

07 December 2010

EDI Environmental Dynamics Inc.

FIGURE 6

WHITEHORSE, YT SAVED: J:\Yukon\Projects\2010\10_YC_0025\Mapping\Fig6_Caribou_Migration_07Dec2010

400000 500000 600000 700000 800000

8100000 8000000 7900000 7800000 7700000

Peninsula

Pond Inlet

Milne Inlet

Jurgensen River

Angajurjualuk Lakes

Nina Bang Lake

Gifford River

Erichsen Lake

Steensby Inlet

BARNES ICE CAP

Igloolik

Ikpik Bay

Baird Peninsula

LEGEND

.....Mary River Project

Caribou Calving (Traditional Knowledge)

- Current Calving Grounds
- Past Calving Grounds
- Post Calving Grounds
- Post Calving Grounds (20 - 100 Caribou)
- Post Calving Grounds (100+ Caribou)

Season/Activity

- Calving (IQ Workshop)
- Calving Area (NLUIS Data)

NOTES:

This is a DRAFT of the results of Inuit Qaujimajatuqangit (~Traditional Knowledge) of caribou seasonal/historical distribution, abundance, and migration/movement routes in the Mary River area of north Baffin Island, Nunavut. The information was collected as part of the environmental baseline studies for Baffinland Iron Ore Corporation's proposed Mary River Project.

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NLUIS Data: Adapted from NLUIS mapping conducted in summer 1980. Mapping produced 1981. Her majesty the Queen in Right of Canada. Department of Energy, Mines and Resources.

Projection: North American Datum 1983 UTM Zone 17N

Scale 0 30 60 90 120 Km

Baffinland Iron Mines Corporation

Caribou Calving Areas

EDI Environmental Dynamics Inc.

07 December 2010

FIGURE 7

WHITEHORSE, YT SAVED: J:\Yukon\Projects\2010\10_YC_0025\Mapping\Fig7_Caribou_Calving_Areas_07Dec2010

2.2 BAFFIN ISLAND WOLF

Distribution

The Baffin Island Wolf (*Canis lupus manningi*) is the smallest of the Arctic wolves and is found in all parts of Baffin Island from Hudson Strait to Pond Inlet and Bylot Island (Anderson 1943). The Baffin Island Arctic wolf is considered a subspecies synonymous with the plains wolf (*Canis lupus nubilus* Say, 1823) historically distributed from contiguous United States to Baffin Island excluding southeastern, northern, and central Quebec (Nowak 2003). Genetic exchange may be maintained with mainland populations as wolves follow infrequent caribou migrations across Fury and Hecla Strait and the mainland.

Interviewees generally agreed that wolves occur around the Mary River mine site (Community Caribou Focus Working Groups 2008). Wolves have not been seen on Bylot Island since the extirpation of caribou from the island in the late 1940s (Miller 1955). Wolf abundance and density is dependent on caribou abundance and density (Caribou Focus Working Groups 2008).

> *"There aren't that many wolves now since there aren't any caribou" (Kyak 2008).*

> *"The wolves hunt caribou for food, they walk to where there are more caribou, that's when there are more wolves" (Akoomalik 2008).*

Within the Project area, Inuit hunt wolves in an area with many lakes north of Steensby Inlet, as they are easier to catch there because of the absence of high mountains (Pisiksik Working Group pers. comm. 2006). Wolves also occur in the Tuunik area but they are difficult to hunt there because of the rough terrain. In the past, a pack of ~20 wolves was seen near Steensby Inlet and south Baird Peninsula. Brody (1976a) also reported that wolves were particularly abundant in areas on the east side of Steensby Inlet, and Grant-Suttie and Ikpik Bays.

Population Status

The current population status of wolves in Nunavut is classified as Secure by the Canadian Endangered Species Conservation Council (CESCC 2011). Information from Inuit hunters suggests that wolves are rare in northern Baffin Island (Pisiksik Working Group pers. comm. 2006).

> *"No I haven't really noticed [many wolves], this area traditionally has never had a lot of wolves, the Pond Inlet area it is only recently that they have started coming around, it was only when I became an adult did I start hearing of wolves being spotted" (Kilukishak 2008).*

Studies in southern and central-west Baffin Island found that wolf densities ranged from 1 wolf/311 km^2 (1966–1969; Clark 1971) to 1 wolf/260 km^2 (1938–1940; Manning 1943). These estimates are lower than densities reported elsewhere in North America (Clark 1971). Wolf numbers appear to be regulated primarily by high pup mortality, availability of suitable den sites, limitations of alternative prey, and long-term fluctuations in caribou numbers (Clark 1971).

Long-term hunter harvest surveys can be used to track population trends in hunted populations in the absence of population survey data. Reported harvests from Pond Inlet between 1961 and 1981 range from 1 to 27 wolves with eight of those years reporting zero harvests (Zoltai et al. 1983).

Annual harvest estimates from 1996–2001 from Pond Inlet averaged 13 wolves per year with most harvesting occurring from February to May (Priest and Usher 2004). Annual wolf harvest estimates from 1966–2001 in the vicinity of Igloolik averaged 14 wolves per year (Priest and Usher 2004), many of which were harvested on the mainland. Brody (1976) found no evidence that wolf hunting is less significant than early in the 20th century, although with improved guns and motorized vehicles wolf hunting has probably increased.

> *"[Hunting season is] when there are tracks to follow and the environment is ideal to hunt in. The hunting season is in March and April and only if there are some. People hunt wolves in the spring in April." (Aksarjuk 2008).*

Ecology

Besides humans, wolves are considered the most important predator of caribou, and their distributions and movements most likely correspond to migrating caribou. However, wolves are likely opportunistic foragers and prey on whatever animal provides the greatest source of energy; therefore, larger animals like caribou and marine mammals that wash up on shores are probably the most important food sources. Other prey animals (lemmings, Arctic hares and shorebirds) likely supplement wolves' diets when their primary food is less abundant. An example of the importance of smaller prey items for wolves living in the Arctic is that the size and number of offspring in a wolf pack on Ellesmere Island was correlated with hare abundance, but not muskox abundance (Mech 2007), even though muskox was likely their primary food source. Furthermore, a study of Arctic wolf diets on eastern Greenland showed that ungulates were the main source of nutrition, but 20–35% of the diets were composed of secondary food sources: lemmings, Arctic hares, Arctic foxes, geese, and other birds (Marquard-Petersen 1998).

> *"Wolves eat rabbits"* (Mucpa 2008; Kyak 2008).

> *"…The ones in packs, they just want to eat anything with blood even their own when they are hungry"* (Akoomalik, 2008).

Wolf dens in central Baffin Island are located in suitable soils (glacio-fluvial materials) that are snow-free, well-drained, have a nearby water source, and are within convenient reach of spring migration routes of caribou (Clark 1971).

> *"…sandy area has wolf dens"* (Kilukishak 2008).

2.3 MID-SIZED CARNIVORES

2.3.1 Wolverine

Distribution

Wolverines are solitary carnivores that range over large areas in most of northern and western Canada, including parts of Baffin Island. Historically, wolverine were absent from Baffin Island (Manning 1943). In the early 1900s wolverine may have crossed onto Baffin Island via Fury and Hecla Strait and bred in large numbers extending their range to the northern tip of Baffin Island by the 1920s (Manning 1943).

During IQ interviews all people noted that they had heard of wolverines occurring in the Project area, but no persons recalled ever directly seeing one. When interviewees were asked if wolverines were present in the Project area, comments included:

> *"A long time ago I saw wolverine tracks between Mary River and Milne Inlet"* (I. Katsak 2008).
>
> *"When I was a child there used to be wolverines here"* (Kyak 2008).
>
> *"Yes, here in Pond Inlet, also in Mount Herodier there were some paw prints. There used to be a lot of wolverines around, but now there aren't as many as before. Wolverines were hunting for foxes, but now there aren't any more wolverines"* (Kyak 2008).

Population Status

Wolverines are listed as a species of Special Concern by the Committee on the Status of Endangered Species in Canada (COSEWIC 2003) but in Nunavut specifically are listed as Secure by CESCC (2011). Reports dating from the mid-1920s–1930s state that tracks were fairly common around Pond Inlet (Manning 1943). Three pelts were traded in Pond Inlet in 1927–1928. Elders indicate that wolverine tracks were found on Bylot Island "a long time ago" and in 1990 one wolverine was sighted. Wolverine tracks were seen at Mary River and Elders believe that wolverine occurred between Clyde River and Pond Inlet. Inuit hunters took one wolverine near Igloolik and none around Pond Inlet during the NWMB Harvest Study (1996–2001; Priest and Usher 2004). Currently, wolverines are suspected to be rare in the Project area (Pisiksik Working Group 2006, pers. comm.).

Ecology

Wolverines are scavengers, but are also opportunistic predators. They likely rely on a diversity of foods to offset the uncertainty of availability in the harsh northern environment. The presence of large prey, such as ungulates, at least at some time during the year, appears to be important for the persistence of wolverine populations (Banci 1994). Thus, the distribution and abundance of wolverine are related to the presence of caribou. Wolverines may rely on alternate food sources such as seal pups and scavenging on dead marine mammals.

2.3.2 Foxes

Foxes are one of the top predators and have historically been trapped by local peoples, though recently few people continue to trap foxes.

> *"I have never really seen people trapping [foxes] anymore."* (I. Katsak 2008).

> *"Since becoming wage earners, some of the employed have so much to do that they don't bother hunting for foxes"* (Kilukishak 2008).

> *"We used to go set up the fox traps when the Hudson Bay Company [purchased the fox pelt]; when the fox fur was a high price"* (Kyak 2008).

Distribution

Arctic and red foxes are distributed across Baffin Island. Red fox colonized southern Baffin Island in 1918 and reached the northern tip of the island 30 years later (Anand-Wheeler 2002).

> *"We have a species that is always around, the white one is called tigiganiaq, the little black ones are kiangaktut. The newer species are the brown ones kayuit and kiaqsait. They have not been around that long"* (Katsak 2008).

Arctic fox are commonly found in lowland and coastal areas (Miller 1955). Most foxes were frequently trapped where valleys opened into waterbodies (Zoltai et al. 1983). They can also range far out onto pack ice in winter, along floe edges, and winter sealing areas in search of prey and carrion (NatureServe Explorer 2006).

Population Status

Both Arctic and red fox populations are listed as Secure in Nunavut by CESCC (2011). Zoltai et al. (1983) considered Arctic fox as the only abundant terrestrial mammal in northern Baffin Island, but population numbers can fluctuate widely following changes in lemming populations (Macpherson 1969; Garrott and Eberhardt 1987). Reproductive output of foxes is primarily driven by lemming numbers (Bêty et al. 2002) with a lag time of approximately one year (Macpherson 1969). However, the use of additional food sources such as birds and their eggs during the summer contribute to the breeding success of foxes and may be important for the maintenance of Arctic fox populations in the low phase of the lemming cycle (Bêty et al. 2002; Macpherson 1969). Inuit hunters from Pond Inlet took an average of 38 Arctic fox/year and 17 coloured fox/year from 1996–2001 (Priest and Usher 2004). Large numbers of Arctic fox (average: 196 fox/year) were taken in the Igloolik region during the same period (Priest and Usher 2004).

> *"Most Foxes I ever saw was in 1945...During that time there was lots of lemmings at the same time"* (Mucpa 2008).

Ecology

Researchers with the Bylot Island Environmental Monitoring Project propose designating the Arctic fox as a potential indicator species of climate change due to its use of multiple ecosystems (Giroux et al. 2005). They defined foxes as using three main ecosystems: marine (scavenging on seal carcasses), terrestrial (hunting lemmings) and temperate (raiding eggs from migrating geese) (Giroux et al. 2005).

> *"They eat anything they come across, but their main diet is lemmings and when they can catch a rabbit they eat those too"* (Kilukishak 2008).

> *"The fox is one and I have seen one that gathered the lemmings it caught and it would disappear for a while and reappear again to hunt and cache its prey. I think he brought the lemmings to its den as well. They are very craft[y], the fox* (Katsak 2008).

The red fox is an opportunistic omnivore. It eats a wide variety of food from small mammals, carrion, birds, insects, fruit, and human garbage (NatureServe Explorer 2006). Hares and small mammals are also common prey. The Arctic fox is a common predator of colonially nesting birds (e.g., brant and snow geese).

Arctic foxes that have been introduced or colonized islands often have a devastating effect on seabird communities (Lensink 1984; Bailey 1993; Birkhead and Nettleship 1995).

> *"They go everywhere there is food for them. Dead seal is called Kimik, for caribou it is Tuqugaruviniq, there go everywhere that is why I can't point that out on the map"* (Katsak 2008).

> *"Anything that they could eat, dead caribou, animals from the sea. Mouse and birds too. Babies from birds."* (Mucpa 2008).

> *"I think they follow the weather, I notice after there is lot of Lemmings there would be foxes afterwards. They just follow the food source"* (Mucpa 2008).

> *"The foxes usually walk along the beaches looking for food, just before the sea ice forms. In the spring time, they go to the sea ice looking for baby seals for food"* (Akoomalik 2008).

> *"The different kinds of foxes walk around just about anywhere, they probably live in the same areas, maybe just not encountering each other. Where there is food"* (Akoomalik 2008).

> *"When we were not living here and the men use to trap fox the catches were never the same. There would be years of plenty and other times there was none. It was different from year to year"* (Qamaniq 2008).

Foxes require suitable substrate to establish their dens. In the Arctic, fox dens are commonly found on eskers and other accumulations of suitable glacial materials (Macpherson 1969; Banci pers. obs.). Arctic foxes select den sites on ridges or slopes with early snowmelt and close to a food source, so

tend to avoid north-facing slopes (Szor et al. 2004). The availability of dens may be a limiting factor if suitable habitat is scarce.

> *"They try to stay in higher areas of the land, like places that protrude on the ground. They also make their dens in higher level sandy places. The dens are then surrounded by grass"* (Katsak 2008).

> *"The foxes have dens around a sandy area, where it is less rocky and also the mice have dens where there are less rocky areas"* (Akoomalik 2008).

> *"For example, foxes and wolves that have dens. From what I have seen, there will occasionally be a den in the sandy areas of the arctic"* (Aksarjuk 2008).

Competition for habitat may occur between Arctic and red foxes. Red foxes, which are larger, have been known to displace Arctic foxes by taking over den sites and other limited habitat resources and food supplies (Rudzinski et al. 1982; Bailey 1992). Red and Arctic foxes are direct competitors and likely cannot co-exist in the same areas

> *"I have seen a brown [red] fox eating a white [arctic] fox, so they do not live together"* (Katsak 2008).

Conservation Concerns

Arctic and red foxes are behaviourally adaptable and tolerate high levels of human disturbance. However, Arctic foxes are a primary vector of rabies, and can pose a potential health risk to humans. Rabies outbreaks in fox populations occur during population highs roughly every three years.

2.3.3 Ermine

Distribution and Population Status

The ermine is a top level predator, primarily consuming small mammals. Its continued occurrence is an indication of the size of prey populations, and ultimately an indication of the state of the Arctic ecosystem. Little is known about ermine populations in the Arctic. Zoltai et al. (1983) describe the ermine as a common lowland species in northern Baffin Island, usually denning in rocky areas or scree slopes, but also seen in other habitats.

Given that a number of ermine populations occurring on islands (Prince of Wales, Queen Charlotte Islands, Kodiak Island, and Suemez Island) have been designated as sub-species it is possible that the Baffin Island ermine is also distinct. This hypothesis has not been investigated further.

2.4 SMALL PREY MAMMALS

2.4.1 Lemmings

Distribution

Lemmings are short, stocky rodents with a thick pelage that varies seasonally. Two species, the brown lemming and the Peary Land collared lemming are the only rodents known to occur in northern Baffin Island and the high Arctic, including Bylot Island (Anand-Wheeler 2002).

Population Status

Lemmings are a key prey species in Arctic ecosystems. Their abundance affects the behaviour, habitat use, and population dynamics of carnivores such as Arctic fox, red fox, wolf, Snowy Owls, and falcons. Lemming populations are considered Secure in Nunavut (CESCC 2011). Populations typically undergo large regular fluctuations in population size (every three to four years). Population peaks can be 200 times greater than the lows depending on the species (Nowak 1999). However, recent studies on Bylot Island suggest that collared lemming may not undergo cyclic fluctuations, unlike the brown lemming (Laval University 2006, Predavec et al. 2001). Bylot Island researchers suggest that climate may not cause the cyclic nature of lemming populations, but weather conditions could accentuate or alter the amplitude of these cycles (Gruyer et al. 2005). For example, the lemming cycles have dampened in recent years and abundance during peak years is lower, most likely a consequence of climate warming. Information on lemming abundance on Bylot Island has been collected using snap-trap surveys since 1993 and live trapping since 2004 (Laval University 2006). Peaks in lemming numbers were observed in 2000 and 2001 on Bylot Island (Laval University 2006), but that population may not be synchronous with lemmings from the Project area. Inuit do not actively hunt lemmings, although in the past they ate them when they had no other food (Pisiksik Working Group pers. comm. 2006).

> *"All animals have that cycle, the indicators to Inuit were lemmings, when there were more lemmings than usual, even down at the sea ice, they would get excited because they know that animals would be plentiful that year, lemmings are sure to bring in the bigger game including foxes" (Kilukishak 2008).*

Ecology

Brown and collared lemmings are found in different habitats in the summer reflecting their different foraging preferences (Anand-Wheeler 2002). Collared lemmings use higher and drier sites, and brown lemmings use lower and wetter habitats. In the central Arctic, collared lemming prefer tundra with high hummocks, high percent cover of plants, especially willows and numerous burrows (Predavec and Krebs 2000). Collared lemmings feed mainly on dwarf willow leaves and forbs although they will also eat sedges, grasses, berries, buds, and twigs (Anand-Wheeler, 2002). The brown lemming eats mainly grasses, sedges, and mosses; monocots are always most important.

Mosses increase in importance in winter and in drier habitats (Batzli and Pitelka 1983). They also may eat bark and twigs of willow and birch in winter (Burt and Grossenheider 1976). In winter lemmings occupy runways beneath the snow and dig tunnel systems down to permafrost level. Lemmings do not hibernate and are available as prey for carnivores all year. The coat of the brown lemming during winter is longer and greyer than that of the collared lemming (Anand-Wheeler 2002).

Conservation Concerns

Lemmings constitute the prey base for the terrestrial carnivorous mammals and birds. Coupled with their ecological role as primary consumers, they are key species and can be used as indicators of overall environmental health.

2.4.2 Arctic Hare

Distribution

Arctic hare are a lagomorph found in treeless regions across North America and Greenland. They are restricted to mountains, tundra, and coastal barrens due to their apparent inability to use food resources in forested areas (Small and Keith 1992). Arctic hares are usually solitary but can also live together in large numbers, primarily during the non-breeding season (NatureServe 2006). They may occur in groups of 10–60, or up to thousands on Arctic islands (Canadian Museum of Nature 2004).

Population Status

The current population status of Arctic hare in Nunavut is classified as Secure by CESCC (CESCC 2011). In northern Baffin Island Arctic hare are locally abundant (Zoltai et al. 1982). However, overall population trends may be in decline as groups of thousands seen on Ellesmere Island in the '70s and '80s have not been observed in recent years (Canadian Museum of Nature 2004). In many areas populations fluctuate widely over periods of several years, but it is unknown if these fluctuations represent distinct cycles similar to snowshoe hare (Canadian Museum of Nature 2004).

Ecology

Hares eat twigs and roots of willows and birch, buds and berries of crowberry *(Empetrum nigrum)*, foliage of various other plants, mosses, and lichens. Their winter diet consists mainly of Arctic willow (78–95%; Larter 1999), with a more diverse summer diet dominated by grasses and legumes (50%; Klein and Bay 1994; Larter 1999). At high densities Arctic hares may be an important competitor of caribou during winter when both species feed on willows (NatureServe 2006).

Arctic hares are found on tundra, rocky slopes, hills, and lower mountain slopes (NatureServe 2006). They generally avoid low, flat country lacking shelter. In the winter they frequent windswept, northern slopes of hills where ground is exposed to improve access forage. To survive extreme

winter climates, they seek shelter in depressions, leeward sides of rocks, and burrow into snow during storms.

Major predators of Arctic hare include Arctic fox, wolves, wolverine, and raptors. In some cases, Arctic hare can represent a major food source for predators. For example, adult wolf numbers on Ellesmere Island are positively related to an index of Arctic hare population levels (Mech 2007).

> *"Up near the hills, in the rocky areas, under rocks, that's where they give birth to their young, they don't usually have dens"* (Akoomalik 2008).
>
> *"I don't think rabbits have dens, they are located in rocky places. They are in the bigger rocks"* (Aksarjuk 2008).
>
> *"Rabbits do not have dens; they are usually located around the grassy areas in the arctic"* (Katsak 2008).
>
> *"Yes and the ones closer to the shoreline are fatter. Maybe there is more food for them along the shore. I have never seen a rabbit with a den"* (Katsak 2008).

Conservation Concerns

Arctic hare are not included among the most important game species on northern Baffin Island, but they are prized by Inuit hunters for their excellent tasting meat (Brody 1976). In some mainland areas of Nunavut, eating hare liver and kidney is not recommended due to high cadmium levels, but Arctic hare meat remains below these maximum levels and is safe to eat (Pedersen and Lierhagen 2006). It is unknown if these high cadmium levels effect Arctic hare health and population demography.

> *"We just eat the [hare] meat these days"* (Kilukishak 2008)

Arctic hare population numbers are sensitive to stressors (e.g., predation risk; Boonstra 2004) and poor early winter weather (e.g., 50% reduction in Arctic hare populations; Mech 2000) resulting in population declines. These factors may contribute to the dramatic yearly population fluctuations that in turn would have effects on the rest of the Arctic food web.

2.5 WILDLIFE HEALTH AND CONTAMINANTS

As there is limited information on wildlife health for north Baffin Island, and no information was found on contaminants in north Baffin Island caribou or for other wildlife in the Baffin region, results from other wildlife contaminant studies in northern North America were summarized.

Rangerfine brucellosis was documented on Baffin Island in the 1980s (Ferguson 1997). The Northern Contaminants Program (NCP) documented contaminants in animal tissue across the

north, including a few samples from the Baffin region in the 1990s (INAC 2003). The Qikiqtalluk Wildlife Board and World Wildlife Fund conducted a series of traditional ecological knowledge interviews regarding wildlife health in the Baffin region in 1998 (Qikiqtaaluk Wildlife Board and World Wildlife Fund 2000). Those studies are summarized below with information relevant to the baseline assessment of the Project area where relevant and available.

Overall, the available information tells us little about specific health parameters of north Baffin Island wildlife, but does provide some general information on disease and contaminants in general. The GNDoE is currently conducting a community-based caribou health monitoring program.

The territorial government's regional biologist assessed the prevalence of brucellosis in caribou in response to reported human cases in the Baffin region. In caribou, brucellosis causes abortions or lameness in some infected caribou, but the effects on populations have not been determined (Ferguson 1997). It is suspected that poor nutrition and severe weather may influence population effects of the disease (Neiland et al., 1968, cited in Ferguson 1997), but there is no known documented information on population-level effects. Rangerfine brucellosis was documented on Baffin Island and in samples taken from caribou harvested in the Mary River region from 1983 to 1986. The seroprevalence of brucellosis among north (43%) and northeast (33%) Baffin Island caribou were among the highest reported from any wild population of *R. tarandus* in the world (Ferguson 1997). However, that finding required further investigation due to the fact that there was no standardized serologic test and level of detection could have varied widely across the samples. Based on the broad distribution of human clinical cases and caribou brucellosis, brucellosis probably is present throughout Baffin Island (Ferguson 1997).

The Qikiqtaaluk Wildlife Board and World Wildlife Fund conducted a number of interviews of Inuit hunters and Elders from the Baffin region to determine the level of knowledge of wildlife health in the region (Qikiqtaaluk Wildlife Board and World Wildlife Fund 2000). Thirty-two hunters and Elders from Arctic Bay, Hall Beach, Kimmirut, and Qikirtarjuaq were asked about their experience related to the health and physical condition of their harvested animals, including terrestrial wildlife. Interviewees noted that caribou numbers were cyclic in both south and north Baffin Island, and in Arctic Bay in 1998 there were generally more caribou close to the community than there had been in the past. Additionally, the caribou generally seemed healthier than they had in the past. Swollen joints were noted on caribou in the 1980s, but by 1998 there were fewer showing signs of disease. Preliminary reports from hunters taking part in the community-based caribou health monitoring program indicate that harvested caribou are healthy (Jenkins 2010, pers. comm.). Hunters and Elders from Hall Beach and Arctic Bay believed that adverse effects were due more to injuries, lack of food, or age of the animals. Hunters from south Baffin were more likely to identify contaminants as a source of abnormalities.

The Northern Contaminants Program sampled kidney and liver samples from 15 caribou herds across northern Canada; the closest sampled herd to the Project area is the south Baffin Island caribou (INAC 2003). Of the major elements analyzed, cadmium, total mercury, and zinc increased with the age of the animal (suggesting cumulative uptake). Cadmium levels were low in south Baffin

Island caribou relative to the other North American herds that were sampled. Total mercury was highest in the Beverly and south Baffin Island herds compared to the other North American herds that were sampled. The contaminants report concluded that the only potential health concern was the elevated levels of cadmium found in the kidneys and livers of Yukon caribou. Cadmium in Yukon is thought to come from natural sources and the concentrations have likely been high for thousands of years.

3 BASELINE STUDIES 2006–2011

Based on the review of available knowledge and data described above (in Section 2), it was apparent that there was a lack of site-specific terrestrial wildlife information for northern Baffin Island, and particularly for the Project area. Information requirements for the purposes of baseline environmental studies and mitigation planning included current distribution and abundance of wildlife in the Project area, and baseline habitat and landscape conditions that may be affected by Project activities. Consequently, studies to address the terrestrial wildlife information gaps were completed from 2006 through 2011. Caribou remained the focal species of the terrestrial mammal baseline studies.

The objectives of the baseline inventories were to:

1. Confirm and supplement traditional knowledge information.
2. Determine site-specific sensitive areas.
3. Determine current distribution and abundance of terrestrial wildlife in the Project area.

Information gaps on terrestrial wildlife were addressed by combining:

- Local knowledge and IQ interviews to gather unpublished and previously unrecorded information
- Aerial surveys to determine seasonal abundance, distribution, and den site locations
- Ground surveys to identify specific areas (finer-scale) where habitat use and value were high
- A habitat assessment to assess habitat quality (broader-scale)

The information from all techniques was synthesized to provide a general knowledgebase of the state of wildlife on northern Baffin Island, and to develop an understanding of the seasonal distribution of wildlife in an area surrounding the Potential Disturbance Area (PDA). The methods used to obtain baseline information and a summary of the results of surveys are described in the following sections.

3.1 REGIONAL STUDY AREA

A Regional Study Area (RSA) was identified to ensure that the range of direct and indirect potential disturbances as a result of the Mary River Project's exploration and mining activities could be examined and potential impacts could be spatially quantified. The RSA was chosen to represent wildlife and habitat at ecologically relevant scales, and to reflect regional habitat use and seasonal movement patterns. The RSA also had to be a reasonable size so that surveys and information could be gathered in an economic fashion and provide information that is directly relevant to Project management and mitigation.

The current RSA boundary evolved from 2006 through 2008 as information became available on development infrastructure, logistics of surveys, and information on wildlife distribution and habitat use. Reconnaissance surveys conducted in May and June 2006 identified primary areas of interest in the region surrounding the PDA. RSA boundaries were adjusted as new information became available on Project development (e.g., selection of railway options south to Steensby Inlet) and recurring sightings of wildlife activity in certain areas. Interviews with community members during the Caribou Focus Working Group meetings in early 2008 identified some key areas of interest which required inclusion in the RSA to ensure that key habitats that may be affected by Project activities were appropriately assessed.

The ~21,000 km^2 RSA (see Figure 8) encompasses the proposed Mary River mine site, the tote road to Milne Inlet, the proposed rail route south to Steensby Inlet, the Milne Inlet Site, and the Steensby Port. The RSA is bounded by ecological boundaries (Marshall and Schut 1999) and significant topographic and drainage features. The RSA includes variable topography from higher elevation rugged terrain in the north near Milne Inlet, to low elevation rolling tundra in the south near Steensby Inlet. Determining wildlife distribution and abundance in this area is intended to provide site-specific information on key or sensitive areas for wildlife, to determine zones of continual wildlife use, and determine periods when animals might be more sensitive to disturbances in the region.

A local study area (LSA) centred on Mary River Deposit No. 1 was established to survey the immediate vicinity of the camp. The area is approximately 521 km^2. The LSA was surveyed once by flying 307 km of east-west transects at 2 km intervals on July 31, 2006 and no wildlife were observed. When it became clear that caribou were absent or at least very rare north of Deposit No. 1 and on the high ground to the northwest, the study area was changed to include a greater area to the south, as far as the north shore of Angajurjualuk Lake. However, after two surveys with few wildlife sightings in 2006, and considering the disturbance associated with repeated overhead flights in a small area, the use of an LSA for survey purposes was discontinued for this project.

LEGEND ᑐᑭᓯᔪᖏᑦ

Mary River Project Study Specifics

.......Mary River Project
.......Proposed Rail Alignment
.......Milne Inlet Tote Road
.......Access Road

Regional Study Areas 2006 – 2008

.......2008 RSA -- All surveys
.......2007 Calving Survey RSA
.......2007 Early Fall RSA
.......2007 Late Winter and Late Fall RSA and 2006 Summer and Fall RSA
.......2006 Calving Survey RSA

NOTES:

Proposed Rail Alignment provided by Canarail January 2010.

Study Areas 2006–2007: Adapted from V. Banci.

Milne Inlet Tote Road: Knight Piesold (2007).

Projection: North American Datum 1983 UTM Zone 17N

Scale 0 10 20 30 40 50 Km

Baffinland Iron Mines Corporation

Regional Study Areas 2006 to 2010

EDI Environmental Dynamics Inc.

07 Dec 2010

FIGURE 8

WHITEHORSE, YT SAVED: J:\Yukon\Projects\2010\10_YC_0025\Mapping\Fig8_Regional_Study_Areas_07Dec2010

3.2 CARIBOU INVENTORY

Key information gaps for caribou included identification of seasonal distributions such as calving areas, migration routes, general habitat use and habitat quality; and behavioural responses to exploration and mine-related disturbances. To address those information gaps, caribou information was obtained through IQ studies, aerial surveys, ground surveys, a GNDoE collaring program, habitat assessments and habitat modeling. The IQ studies are discussed throughout section 2.1 North Baffin Island Caribou. The remainder of this section describes the inventory work conducted from 2006–2011.

Baseline surveys started in 2006. Key surveys of caribou abundance and distribution included aerial surveys in late winter (March), calving (mid-June), and fall (September and October). Post-calving aerial surveys were not conducted because this season, generally about three to five weeks, is critical to calf survival (Russell et al. 2000), so disturbances were minimized during that period. Also, visibility of caribou during the snow-free period is low, and so there was no consistent attempt to determine summer distribution outside incidental observations during other surveys. Trail surveys were completed in the summer to determine movement patterns and concentrations.

The 2006 and 2007 surveys used a "back-tracking" method when environmental conditions permitted (i.e., snow cover). Survey lines were flown until trails were observed, when the aircraft then deviated from the survey lines to follow the trails until the trails were lost, or caribou were observed. Back-tracking increased the number of caribou observations, confirmed their presence on the landscape and determined the number of caribou associated with observed tracks. Given the extremely low frequency of caribou observations compared to mainland caribou surveys, the back-tracking technique was useful for initial Mary River surveys to determine potential visibility bias in aerial surveys in the northern Baffin Island landscape. By following tracks, observers were able to confirm visibility of caribou and to develop a general understanding of expected group size and behaviour of caribou in the region. The practice of back-tracking was discontinued in 2008 because the low density of caribou observations had been confirmed in 2006 and 2007, and surveys were standardized in preparation of long-term monitoring. Due to the differences in survey techniques and areas surveyed, inter-annual comparisons are noted only as potential for general trends in abundance.

Survey effort varied with weather, knowledge of wildlife distribution, on-site logistics, available aircraft, and the regional area of interest. Initial survey efforts constituted reconnaissance surveys until preliminary study areas were established. The RSA was identified in March 2008 after the initial IQ surveys were complete (see Figure 8 and Table 2). Attempts were made to standardize survey dates through the three years of baseline data collection. The late-winter (2007 and 2008), calving (2006–2008), and fall (2006–2008) surveys were generally conducted within the estimated seasonal timing windows:

- Late-winter distribution (March–May)
- Calving distribution (mid-June)
- Fall distribution (late September through October)

Standard survey transects were generally east-west oriented transects following a standard 10-km spacing UTM grid on 1:250,000 NTDB maps. Surveys were flown using fixed-wing aircraft when available, or alternatively by helicopter. Fixed-wing aircraft included a Dornier 228, Turbo Otter, or Cessna Grand Caravan flown 150 m above ground level (agl) at an average speed of 120 km/h. Surveys by helicopter were completed using a Bell 206 or AS350 B2 flown 150 m agl at an average speed of approximately 150 km/h.

Ferrying flight height (e.g., return for fuel) was greater than 600 m when possible to avoid disturbance to all wildlife. Methods for helicopter and fixed wing surveys were the same. The survey crew included the pilot, front observer and navigator, and two rear observers. The pilot concentrated on maintaining altitude, ground speed, and staying on transect. The front observer/navigator counted those animals to the side and beneath the aircraft that were out of sight of the rear observers. Rear seat observers called out animals seen on their respective side of the aircraft for the recorder to document the observation details and location. Either the front seat observer or one of the rear seat observers was designated to record waypoints and observation details.

Observations included an estimate of group size and composition if possible, direction of movement, activity, and habitat type. All observations of wildlife and wildlife sign were recorded in a survey database. In 2008, survey transects were uploaded from ESRI ArcGIS shapefiles to on-board GPS units to facilitate pilot navigation, and routes were navigated at appropriate elevation. Track logs were recorded on hand-held GPS units and downloaded on a daily basis (although there was little variation from the programmed track to the actual route followed). The location of all observations of animals and animal signs were recorded in the GPS.

Because of very low abundance of caribou in the RSA, no attempt was made to estimate density or composition (the collected data are unsuitable for distance sampling procedures and overall abundance estimates are not required). For standardized transects, most observations were made at low observation angles (e.g., below the aircraft during helicopter flights), and good visibility was estimated 500 m either side of the aircraft (equivalent to ~11% coverage of the RSA).

Late-Winter Surveys

Late-winter caribou surveys were conducted during the second half of March to estimate caribou distribution before movement to calving areas. Late-winter surveys in 2007 and 2008 in the Project area did not classify caribou by age or sex. Standard survey procedures were followed for both 2007 and 2008 surveys. Late-winter surveys were not conducted in 2006 because the baseline environmental program did not start until after the late-winter survey season.

In 2007, the survey was conducted from March 29–31 using the back-tracking method. The survey covered most of the current RSA (see Figure 9). Fixed-wing aircraft used to complete the survey were the Dornier 228 (half-day) and a Turbo Otter (two days). Thirty-seven caribou were seen during the survey. Most caribou were observed across the centre of the RSA near Angajurjualuk Lake (see Figure 9 and Table 3). Group size ranged from one to 17 caribou. Caribou were feeding in high-centered tundra polygon habitats on the tops of elevated mounds.

In 2008, the survey was conducted from 19–22 March. The survey covered the entire current RSA (see Figure 9). The survey did not use the back-tracking method; instead the 2008 surveys remained on the survey lines and did not follow caribou tracks. However, all observed tracks were associated with observations of animals, except for an observation of a single animal's tracks in the northeast portion of the RSA. An AS350 B2 (AStar) helicopter was used to complete the survey. Nineteen live and one dead caribou were seen during the survey. Most of the observations were in similar areas as in 2007—around Angajurjualuk Lake (see Figure 9). Only four groups were observed and group size ranged from two to nine caribou. The largest group (nine caribou) was found in the high plateau area north of Deposit No. 1 (see Table 3). A group of five caribou (three adults and two yearlings) was observed during a ferrying flight to the survey line from camp.

One wolf-killed young male caribou was observed during the survey. Also in 2008, an aerial survey of the tote road was conducted to determine if there were any crossing attempts by caribou. Crossing attempts were expected to be observed as tracks approaching/departing the roadway—no tracks were observed.

The abundance of caribou observed during the late-winter surveys was very low. Density was not calculated because the occurrence of observations was so low that the estimated density would be meaningless. However, a conservative estimate would be <0.01 caribou/km^2. Compared with southern Baffin Island, this density of caribou is negligible. The highest reported wintering densities for Baffin caribou were near Cape Dorset in 1984 (3.5 caribou/km^2) (Ferguson 1997).

Weather conditions in the survey area can be highly variable. In 2007, weather conditions were mostly ideal for surveys. However, some portions of transects around Milne Inlet could not be flown due to low-lying fog. In 2008, weather conditions were ideal for surveys. A blizzard immediately before the start of the surveys in 2008 likely cleared most trails, so all observations of tracks/trails were recent. The temperature was -40°C to -35°C with very little wind and clear skies. The combination of the bright light conditions and contrast of the low elevation sun creating shadows on the snow surface "highlighted" tracks and animals.

A number of snowmobile trails and hunters from Pond Inlet were evident near Angajurjualuk Lake during the 2007 survey. Trails were also observed around Steensby Inlet, likely from Igloolik hunters. Informal inquiries by Baffinland personnel of Inuit employees indicated that Pond Inlet hunters had harvested between 150 and 300 caribou from this area during the winter (Landry pers. comm. 2007). Given that hunters were known to be in the area beginning in late December, and that no estimate of harvest by other communities is available, this is likely a good guess for the total

number taken from the Project area during the winter harvest. In 2008, fewer than three individual snow machine trails were observed south east of Angajurjualuk Lake, and there is no estimate of the number of caribou harvested in the region during that time.

Calving Surveys

Caribou calving surveys were conducted to determine potentially sensitive calving areas in the Project area. The timing of calving of the north Baffin Island population is not known; however, caribou tend to calve around the same time across their range and calving typically peaks early to mid-June (Russell et al. 2000). Observations from spring 2006 indicated that caribou were calving in the RSA.

The 2006 survey (June 19–20) was conducted with a Bell 206 helicopter flown at 150 m agl and an approximate speed of 160 km/h. East-west transects were established on the UTM grid in an area from south of Angajurjualuk Lake north to Milne Inlet. The survey was centred on Deposit No. 1 and the tote road north of Deposit No. 1 (see Figure 10). A total of 31 caribou were observed, but there was only one observation of an adult female and calf, approximately 19 km northwest of Deposit No. 1 (see Table 4 and Figure 11).

The 2007 survey (June 13 and 17) was conducted with either a Bell 206 or AS350 B2 helicopter flown in two separate areas—one area north of Mary River camp, and one area to the south, centred on the road and proposed rail route, respectively (the 2007 Calving Survey RSA; Figure 10). The survey area focused on higher elevation habitats where IQ and Ferguson (1999a) suggested that calving was most likely. Transects were spaced at 3 km intervals and oriented to follow the altitudinal gradient of the hills—northeast-southwest in the northern area, and east-west in the southern area (see Figure 11). Completion of the survey was hampered by aircraft logistics and poor weather.

The southern half of the survey was flown on June 13; however, fog, flat light, variable ceiling, and snow flurries limited the area that could be covered. The northern half of the survey was attempted on June 17, but extensive melting of snow made it difficult to see caribou. No caribou were observed during the 2007 calving surveys (Table 4). Those surveys were not specific to caribou and were flown at various heights and speeds. Three apparent pregnant cows and two cows with new calves were observed at five locations, including above the proposed rail bridge crossing at Cockburn Lake and the hills above the ice airstrip at Tariujaq Arm at elevations ranging from 261–394 m (see Figure 11).

The 2008 survey (June 8–15) was conducted using a Cessna C-208B Grand Caravan flown at 150 m agl with ground speed varying from 150–190 km/h. Standardized survey transects were flown within the 2008 RSA (see Figure 11). Weather conditions in 2008 were not ideal for surveys due to a persistent low weather system centred over the RSA. Temperatures ranged from -2°C to +8°C with high winds, precipitation (snow and freezing rain depending on elevation), fog, and low clouds. A blizzard on 13 June probably cleared most trails, so observations of tracks/trails were considered

recent. Snow cover varied based on terrain and elevation. For example, snow cover ranged from 100% in the high plateau regions east of Mary River camp, to 5% along the lowland coastal areas near Steensby Inlet and in river valley bottoms. Observed tracks were circled to indentify species, number of animals, and determine if animals were nearby. Twenty-one caribou were observed from four groups ranging in size from one to eight individuals (see Table 4 and Figure 11). Cow and calf observations corresponded to calving areas identified by traditional knowledge surveys with the exception of one location in the southeast of the RSA. Caribou were sparsely distributed throughout the RSA, but the distribution was typical of previous surveys—most observations were south of the Mary River camp. In general, cow and calf pairs were located in isolated snowy ravine systems or in steep, rugged terrain. Five sets of caribou tracks were observed that did not result in visual confirmation of animals.

The only other available caribou calving survey data in the Project area was from a survey conducted by the GNDoE in 1997. The GNDoE conducted caribou surveys in 1997 on June 9, 15, 23, and 29 (GNDoE unpublished data, with reference to those data in Ferguson 1999a). That inventory was conducted during the time when caribou numbers were considered "high" in the RSA (Caribou Focus Working Groups, Pond Inlet, and Igloolik 2008). The survey was conducted by helicopter (Ferguson 1999a), and transects appeared to have been spaced at 2 km intervals, but all other details are unknown (e.g., RSA, survey lines, flight altitude, etc.). Based on the observation data from the study, it appears that surveying was conducted from the north shore of Angajurjualuk Lake and went northeast to Pond Inlet (see Figure 11). To account for potential duplicate observations, data from the survey with the most cow-calf sightings (June 23) were analysed to determine cow-calf distribution in June 1997. The results show that 92% (35 of 38 sighting records) of the cow-calf observations were within the northern part of the 2007 calving survey area (see Figure 11). Contrasting the 1997 results with the 2007 results clearly shows the change in caribou abundance in the RSA — no caribou were observed in the same area during the 2007 calving survey. The reported results clearly indicate that calving caribou were frequently observed in the area northwest of the Project site in 1997.

Summer Surveys

One summer survey was conducted as part of the baseline surveys from 27–30 July 2006. The survey area is equivalent to the fall 2006, late-winter 2007, and fall 2007 surveys (see Figure 9). The survey was flown at 61 to 91 m agl and 12 caribou sightings were recorded during the survey. Caribou group sizes ranged from one to eight caribou. Results from the summer survey are likely typical for that time of year.

Visibility of caribou was low due to their dark summer coats, and insect harassment and temperatures are most intense during the summers, driving caribou into marginal habitats. When caribou were seen, they were at higher elevations, typically on patches of snow and ice in boulder fields or adjacent to lakes.

High-elevation habitats lacked vegetation and are likely poor foraging habitat. The presence of caribou in these areas strongly suggests their importance for relief from insects, heat, and potentially from predators.

Summer surveys were abandoned in the following years because of the general low density and low caribou visibility during the snow-free season. Consequently, the following summer work focused on ground-based observations of caribou trails along the tote road and proposed rail alignment.

Fall Surveys

The 2006 fall survey was conducted September 4, 5, 7, and 8. The survey area is smaller and slightly different from the current RSA (see Figure 12). The survey aircraft was flown at 61–91 m agl. Transect lines were shortened to exclude part of the upland areas to the west when it was obvious that caribou were not present in this high-elevation area largely devoid of vegetation. A total of 57 caribou were observed in 21 separate observations foraging on top of tundra polygons and using the lower elevations wetlands for travelling—similar to the spring caribou distribution. Groups ranged from individuals to a group of six adults (see Table 5). Caribou were generally observed using river valleys within a corridor extending from northwest to southeast through the Project site (see Figure 12.

In 2007, two surveys in slightly different study areas were completed: early fall (September 1, 3-5), and late fall (October 3, 5). The early fall survey included the smaller 2007 RSA and a linear survey along the Turner and Tugaat River valleys (see Figure 12). Transects were placed roughly 9 km apart and followed latitude lines on 1:250,000 topographic maps. The northern portion was completed on September 1 and required 4.9 hours of flying. No caribou or caribou sign was observed. The southern portion required 15.2 hours of flying over three days. Weather conditions prohibited flying the Tugaat Canyon, although the delta and river mouth were flown when checking wolf posts on September 9. The Turner River was flown on September 12. The total survey took 20.1 hours, not including the Tugaat River and Turner River linear transect lines. Seven caribou were seen in two groups: a group of four composed of one yearling and three bulls, and a group of three bulls (see Table 5). The late-fall survey was conducted in the same survey area, but followed the UTM grid at 10-km intervals. In late fall 2007, three groups of 3, 7, and 11 caribou, respectively, were observed south of Angajurjualuk Lake (see Figure 12).

In 2008, the fall survey (September 18–19) was flown 150 m agl at 150–166 km/h using a Cessna C-208B Grand Caravan on floats. In some instances flight speed was maintained above 166 km/h to prevent ice forming on the wings. Weather conditions were acceptable for the duration of the survey as temperatures ranged from -2°C to +5°C with light winds, infrequent precipitation (freezing rain), minor fog, and low clouds. Snow cover varied depending on terrain and elevation, ranging from 0% snow cover along lowland coastal areas and river valleys, to 100% snow cover in the high plateau regions east of Mary River camp. Extensive fog and cloud meant that 135 km of transect in the mountainous area in the northern section of the RSA and the high plateau area in the eastern section of the RSA were not surveyed. Twenty-nine caribou were observed during the survey (see Table 5).

Group size ranged from one to eight caribou. Caribou were sparsely distributed throughout the RSA, but typical of previous surveys, most observations were east and south of the Mary River camp (see Figure 12).

Additional tracks were seen on 30 occasions, suggesting groups of 1-12 individuals. Generally, caribou moved single file through valley bottoms, along ridges, and over high passes, or foraged in valley bottoms. Caribou use of areas in fall more closely reflected high-value foraging habitats. This change in habitat use might be because fall foraging behaviour is not driven by calves or insect avoidance. As a result, caribou can spend more time feeding and putting on weight to prepare for the winter.

Table 2. Summary of caribou baseline surveys and data collection efforts for the Mary River Project, Baffin Island, Nunavut, 2006–2011.

Survey year	Survey date	Purpose	RSA km2	km transect	Aircraft	Additional Information
2006	May 25–Jun. 6	Reconnaissance	NA	NA	Helicopter	Survey conducted within general study area described below to delineate potential RSA.
	Jun. 19–20	Caribou calving distribution	8,284	934	Helicopter	
	Jul. 27–30	Summer regional caribou distribution	15,518	1,843	Helicopter	RSA centred on Mary River Camp and potential transportation corridors.
	Aug. 23	Carnivore den survey	NA	NA	Helicopter	Reconnaissance survey in suitable carnivore denning habitat.
	Sept. 4,5,7,8	Fall regional caribou distribution	15,518	1,843	Helicopter	Survey of the summer 2006 RSA.
2007	Mar. 29–31	Late-winter regional caribou distribution	15,518	1,855	Fixed-wing	
	Jun. 13,17	Spring caribou calving	3,594	1,004	Helicopter	Survey dates and area were limited by inclement weather.
	Jul. 21–Aug. 6	Trail survey	NA	NA	Helicopter	Aerial survey for caribou trails.
	Sept. 1, 3–5	Fall distribution	16,750	2,169	Helicopter	Included linear transects along Turner and Tugaat Rivers.
	Oct. 3, 5	Late fall distribution	15,518	1,855	Helicopter	Same transect lines used for 2007 late-winter survey.
2008	Mar. 19–22	Late-winter distribution	21,053	2,239	Helicopter	
	Jun. 8–15	Calving distribution	21,053	2,353	Fixed-wing	
	Aug. 4–5	Trail survey	NA	NA	Helicopter	Survey of transportation corridors (tote road and proposed rail route).
	Sept. 18–19	Fall distribution	21,053	2,224	Fixed-wing	
2010	Jul. 27–Aug. 5	Trail Survey	NA	NA	Ground based	Survey of transportation corridors (tote road and proposed rail route).
2011	-	No surveys	-	-	-	-

Table 3. Late-winter caribou distribution survey results, summarizing visual observations of caribou in the Mary River project area, Baffin Island, Nunavut, 2007–2008.

Year[e]	Date	RSA km²	Transect length	Flying hours	Observations					
					Unspecified adults	♀+ Adult	♂ Adult	Calves	Yearlings	Total
2007	Mar. 29–31	15,518	1,855	24[a]	–	–	–	–	–	37[d]
2008	Mar. 19–22	21,053	2,239	14.2[b]	–	–	–	–	–	20[c,d]

Notes:
[a] Includes ferry time to Pond Inlet.
[b] Includes 0.5 hrs for a survey along the tote road (total flying time = 25.6 h).
[c] Includes one observation of a wolf-killed caribou.
[d] Caribou not specified to age or sex. As per GNDoE Wildlife Research Permit conditions, aircraft remained at minimum 150 m altitude and did not circle to determine age and gender of observed wildlife.
[e] No late-winter survey was done in 2006.

Table 4. Calving caribou survey results, summarizing visual observations of caribou in the Project area, northern Baffin Island, Nunavut.

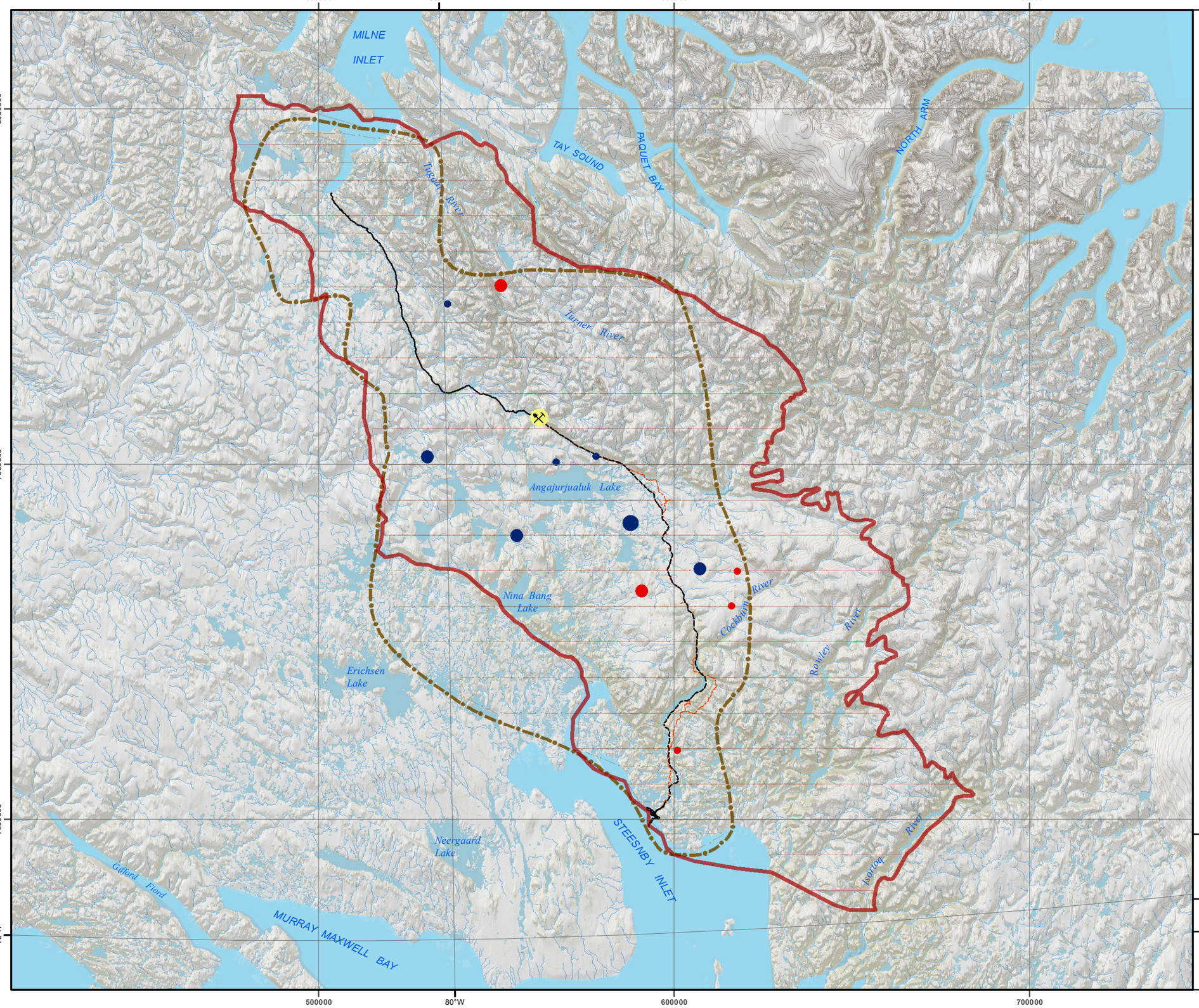
Year	Date	RSA km²	Transect length	Flying hours	Observations					
					Unspecified adults	♀+ Adult	♂ Adult	Calves	Yearlings	Total
2006	Jun. 19–20	8,284	934	–	–	5	5	2	19	31
2007	Jun. 13, 17	3,594	1,004	–	–	–	–	–	–	0[a]
2008	Jun. 8–15	21,053	2,353	22.5[b]	15[c]	–	–	5	1	21

Notes:
[a] Survey limited—data limited to incidental observations from other surveys.
[b] Total flying time, including ferry flights to Igloolik and Pond Inlet.
[c] Caribou not specified to sex.

Table 5. Summary of fall caribou distribution surveys (visual observations), Mary River Project, Baffin Island, Nunavut, 2006–2008.

Year	Date	RSA km²	Transect length	Flying hours	Observations					
					Unspecified adults	♀ Ad.	♂ Ad.	Calves	Yearlings	Total
2006	Sept. 4,5,7,8	15,518	1,843	–	2	36	15	4	–	57
2007	Sept. 1,3–5	16,750	2,169	–	–	–	6	–	1	7
	Oct. 3,5	15,518	1,855	20.1[a]	–	11	6	4	–	21
2008	Sept. 18–19	21,053	2,353	–	–	–	–	–	–	29[b]

Notes:
[a] Does not include time to complete Turner and Tugaat River portion of surveys.
[b] Caribou were not classified by age or sex.



LEGEND

Mary River Project Study Specifics

- .....Mary River Project
- .....Proposed Rail Alignment
- .....Milne Inlet Tote Road
- .....Access Road

Regional Study Areas 2006 – 2008

- .....2008 RSA -- All surveys
- .....2006 Summer and Fall RSA; 2007 Late Winter and Late Fall RSA

Survey Lines 2006 – 2008

- .....2008 Survey Line
- .....2007 Survey Line (Late Winter)

Caribou Visual Observations

2007 Late Winter	2008 Winter
1 - 4	1 - 4
5 - 9	5 - 9
>10	>10

NOTES:

Proposed Rail Alignment provided by Canarail September 2010.

Study Areas 2006–2007: Adapted from V. Banci.

Milne Inlet Tote Road: Knight Piesold (2007).

Projection: North American Datum 1983 UTM Zone 17N

Scale 0 10 20 30 40 50 Km

Baffinland Iron Mines Corporation

Late Winter Caribou Survey Observations, 2007 and 2008

EDI Environmental Dynamics Inc.

07 Sept 2010

FIGURE 9

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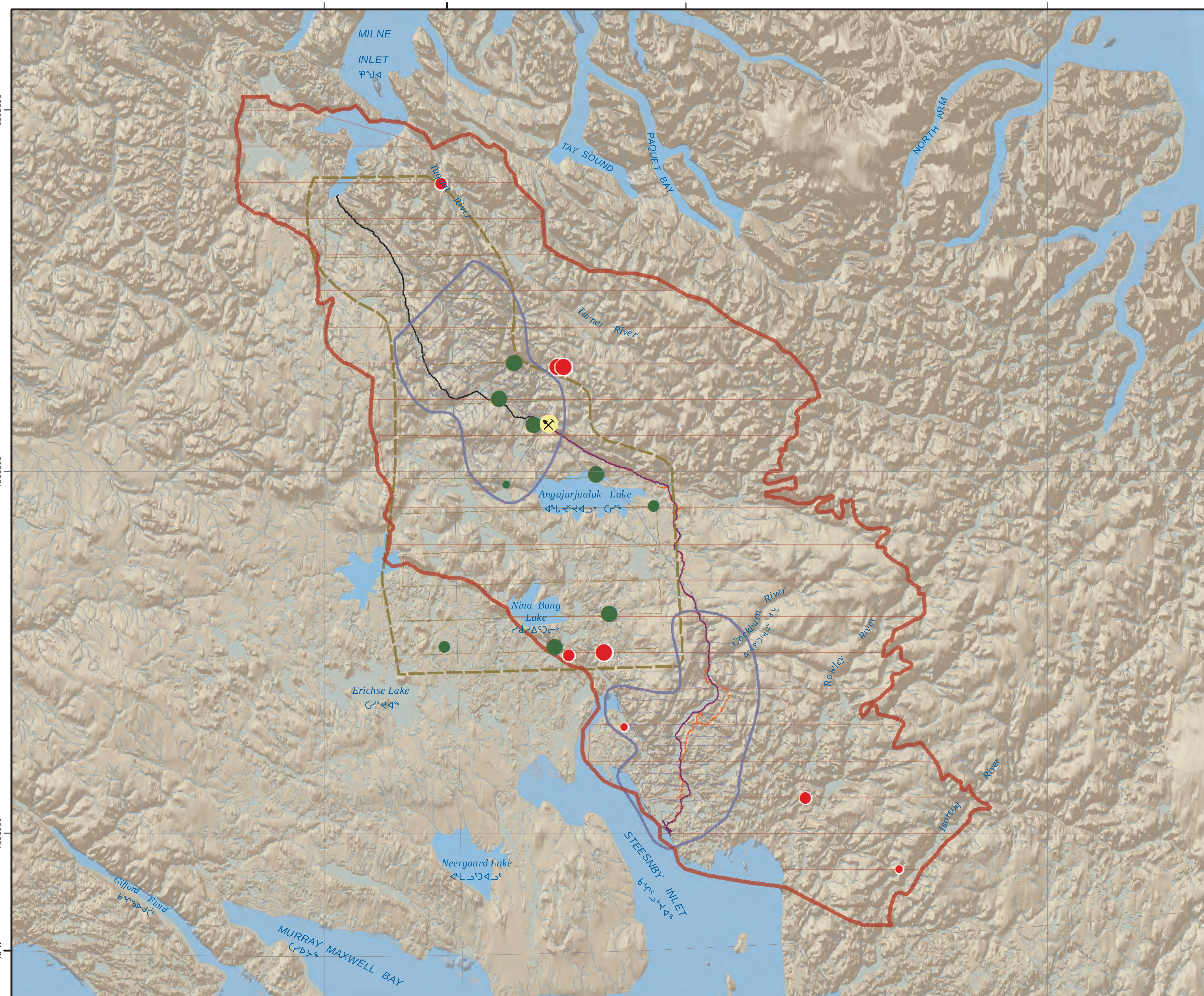

LEGEND

Mary River Project Study Specifics

.......Mary River Project

.......Proposed Rail Alignment

.......Milne Inlet Tote Road

.......Access Road

Regional Study Areas 2006 – 2008

.......RSA

.......2007 Calving Survey RSA

.......2006 Calving Survey RSA

Survey Lines 2006 – 2008

.......2008 Survey Line

.......2007 Survey Line

.......2006 Survey Line

Caribou Calving Observations (2006 and 2008)

2006 June	2008 June
1	1
2 - 3	2 - 3
4 - 5	4 - 5

NOTES:

Proposed Rail Alignment provided by Canarail September 2010.

Study Areas 2006–2007: Adapted from V. Banci.

Milne Inlet Tote Road: Knight Piesold (2007).

Projection: North American Datum 1983 UTM Zone 17N

Scale 0 10 20 30 40 50 Km

Baffinland Iron Mines Corporation

Calving Caribou Survey Observations, 2006 to 2008

EDI Environmental Dynamics Inc.

07 December 2010

FIGURE 10

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LEGEND

Mary River Project Study Specifics

.......Mary River Project
.......Proposed Rail Alignment
.......Milne Inlet Tote Road
.......Access Road

Regional Study Areas 2007 – 2008

.......RSA
.......2007 Calving Survey RSA

1997 GNDoE Calving Survey

.......June 23, 1997 GNDoE Cow-Calf Observations
.......1997 Calving Survey Data Extent (Presumed Survey Area)

NOTES:

1997 Data: GNDoE Unpublished Data

Proposed Rail Alignment provided by Canarail September 2010.

Study Areas 2006–2007: Adapted from V. Banci.

Milne Inlet Tote Road: Knight Piesold (2007).

Projection: North American Datum 1983 UTM Zone 17N

Scale 0 10 20 30 40 50 Km ᑭᓚᒥᑦ

Baffinland Iron Mines Corporation

Calving Caribou Survey Observations, 1997 and 2007

EDI Environmental Dynamics Inc.

07 December 2010

FIGURE 11

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LEGEND

Mary River Project Study Specifics

.......Mary River Project

.......Proposed Rail Alignment

.......Milne Inlet Tote Road

.......Access Road

Regional Study Areas 2006 – 2008

.......2008 RSA -- All surveys

.......2007 Early Fall RSA

Survey Lines 2006 – 2008

.......2008 Survey Line

.......2007 Survey Line

Caribou Visual Observations

2006 Fall	2007 Late Fall	2008 Fall
1 - 4	1 - 4	1 - 4
5 - 9	5 - 9	5 - 9
>10	>10	>10

NOTES:

Proposed Rail Alignment provided by Canarail September 2010.

Study Areas 2006–2007: Adapted from V. Banci.

Milne Inlet Tote Road: Knight Piesold (2007).

Projection: North American Datum 1983 UTM Zone 17N

Scale 0 10 20 30 40 50 Km

Baffinland Iron Mines Corporation

Fall Caribou Survey Observations, 2006 to 2008

EDI Environmental Dynamics Inc.

07 December 2010

FIGURE 12

WHITEHORSE, YT SAVED: J:\Yukon\Projects\2010\10_YC_0025\Mapping\MP_Fall_Caribou_Observations_07Dec2010

3.3 REGIONAL COLLARING PROGRAM

Baffinland supported a regional caribou collaring program conducted by the GNDoE. The collar information was intended to provide knowledge on seasonal habitat use and movement of caribou in northern Baffin Island. Thirty-two collars were deployed on female caribou throughout the area: four in late winter (March) 2008 and 28 in late winter (March) in 2009. For this baseline report, the GNDoE made available collar data from 32 caribou collected from April 12, 2008 to July 31, 2011. Data were used to 1) determine seasonal distribution of female caribou through most of a year and 2) determine habitat use in the RSA using a Resource Selection Function modeling approach (see Section 4.2).

Data from 32 collared caribou cows indicated that caribou were generally sedentary (see Figure 15). The average caribou cow movement for all months collar data were available was less than 2 km within an 11-hour interval. Caribou movement increased during the spring and summer months by an average of about 0.5 km/day except in June, which was more consistent with the winter months (see Figure 14). The reduced movement in June could be the result of calves not being able to travel as quickly and, therefore, restricting collared-female movement. These results suggest that the local caribou are fairly sedentary and non-migratory, in agreement with IQ regarding current caribou movement and the non-migratory nature of caribou currently found on north Baffin Island.

3.3.1 Calving Timing and Location

Caribou collar data for 2009 to 2011 were examined during the calving season (beginning of May to end of July). Collars were set to record locations every 11 hours. Movement distances during each 11 hour period were calculated and a 3-point running average was applied to the data to smooth and simplify interpretation of data. The 3-point running average data were graphed for each caribou to allow visual interpretation of calving dates. Two biologists examined these graphs separately to determine pregnancy status and estimate calving dates. Calving date was estimated by selecting the start of a period of low movement rates, and identifying the day of least movement within that time. Professional judgment was used when numerous low movements were observed within a period; generally the earlier date was chosen (Nagy 2011, Figure 3-3 shows higher rates of movement in the days before calving). Both estimates (from the biologists) were examined and where any discrepancy in dates existed, the graphs were re-examined and a final calving date was determined through consensus.

Estimated pregnancy rates of collared caribou were approximately 89% and 88% in 2009 and 2010, respectively (Table 6). Notably, none of the nine remaining collared cows exhibited movement patterns consistent with calving in 2011. Although they all were located near areas previously used for calving, they did not exhibit movement patterns consistent with calving.

Peak calving date was calculated by using the median calving date (D. Russell pers. comm.). The collar data indicated that peak calving of collared caribou was June 9 for both 2009 and 2010 (Figure 13).

Calving sites were identified by selecting collar locations for the estimated calving date and the following 10 days. This process was done for each caribou (Figure 16). For example, caribou 36835 had an estimated calving date of June 9, 2010, so the collar data for caribou 36835 was selected for June 9–19, 2011. Calving sites of collared caribou are broadly distributed in the steeper terrain east and west of Cockburn Lake, and in the rougher terrain north of the Mine site. The calving locations in the terrain north of the Mine site are consistent with the IQ and survey information that identify it as a calving area (Figure 7 and Figure 11). Detailed calving habitat selection is described in Section 4.2.

Most caribou that calved in consecutive years showed a high degree of fidelity to calving sites. Calving sites were determined by generating minimum convex polygons for each calving caribou. Where data were available in consecutive years 67% of collared caribou returned to almost the identical calving sites (Table 7). The four caribou that did not return to the same calving sites in 2010 still calved relatively close to the 2009 calving sites (4.0–38.5 km apart).

Table 6. Estimated calving dates of collared female caribou, 2009–2011.

Caribou ID	2009	2010	2011
36835	09/06/2009		
36836	09/06/2009		
36837	07/06/2009	09/06/2010	
36838	05/06/2009	09/06/2010	
36840	09/06/2009	09/06/2010	No calving apparent
36841	12/06/2009	03/06/2010	No calving apparent
36842	01/06/2009	10/06/2010	
36843	09/06/2009	10/06/2010	No calving apparent
36844	15/06/2009		
36846	14/06/2009	12/06/2010	No calving apparent
36847	06/06/2009		
36851		12/06/2010	No calving apparent
36852			
37025	13/06/2009	05/06/2010	No calving apparent
37030	12/06/2009		
37033		No	
37035	22/06/2009		
37048	25/05/2009	No	
37050	10/06/2009		
37052	28/05/2009	02/06/2010	No calving apparent
37054	19/06/2009		
37055	28/05/2009	28/05/2010	No calving apparent
37123	08/06/2009		
37407	05/06/2009		
37408	05/06/2009	15/06/2010	
37490	05/06/2009	09/06/2010	No calving apparent
37492	08/06/2009	16/06/2010	
37493	09/06/2009		
Estimated pregnancy rate	**89.3%**	**87.5%**	**0.0%**

Table 7. Summary of calving site fidelity exhibited by North Baffin collared female caribou, 2009–2010.

Caribou ID	Calving site fidelity	% calving polygon overlap
36835	No data	
36836	No data	
36837	No	0 (38.5 km apart)
36838	Yes	0 (0.1 km)
36840	Yes	85%
36841	Yes	0 (0.8 km)
36842	No	0 (4 km apart)
36843	Yes	61%
36844	No data	
36846	No	0 (15.5 km apart)
36847	No data	
36851	No data	
37025	Yes	5%
37030	No data	
37035	No data	
37048	No data	
37050	No data	
37052	No	0 (16.5 km apart)
37054	No data	
37055	No data	
37123	No data	
37407	No data	
37408	Yes	61%
37490	Yes	68%
37492	Yes	0
37493	No data	

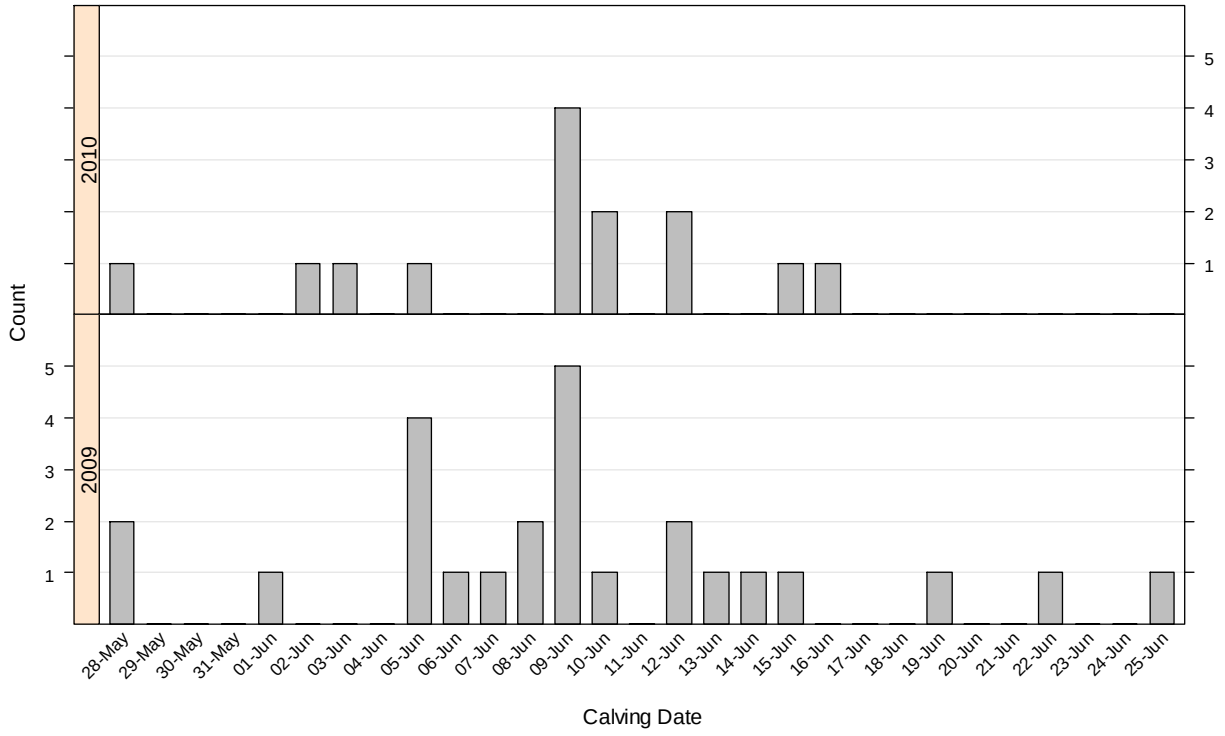


Figure 13. Estimated calving dates of collared female caribou during 2009 and 2010.

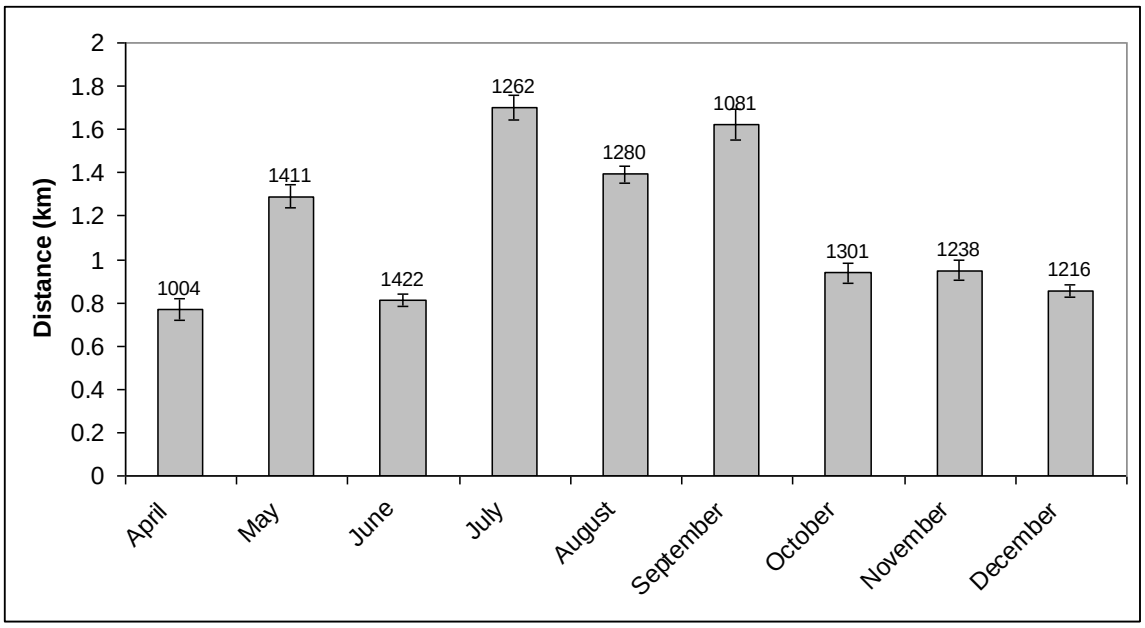
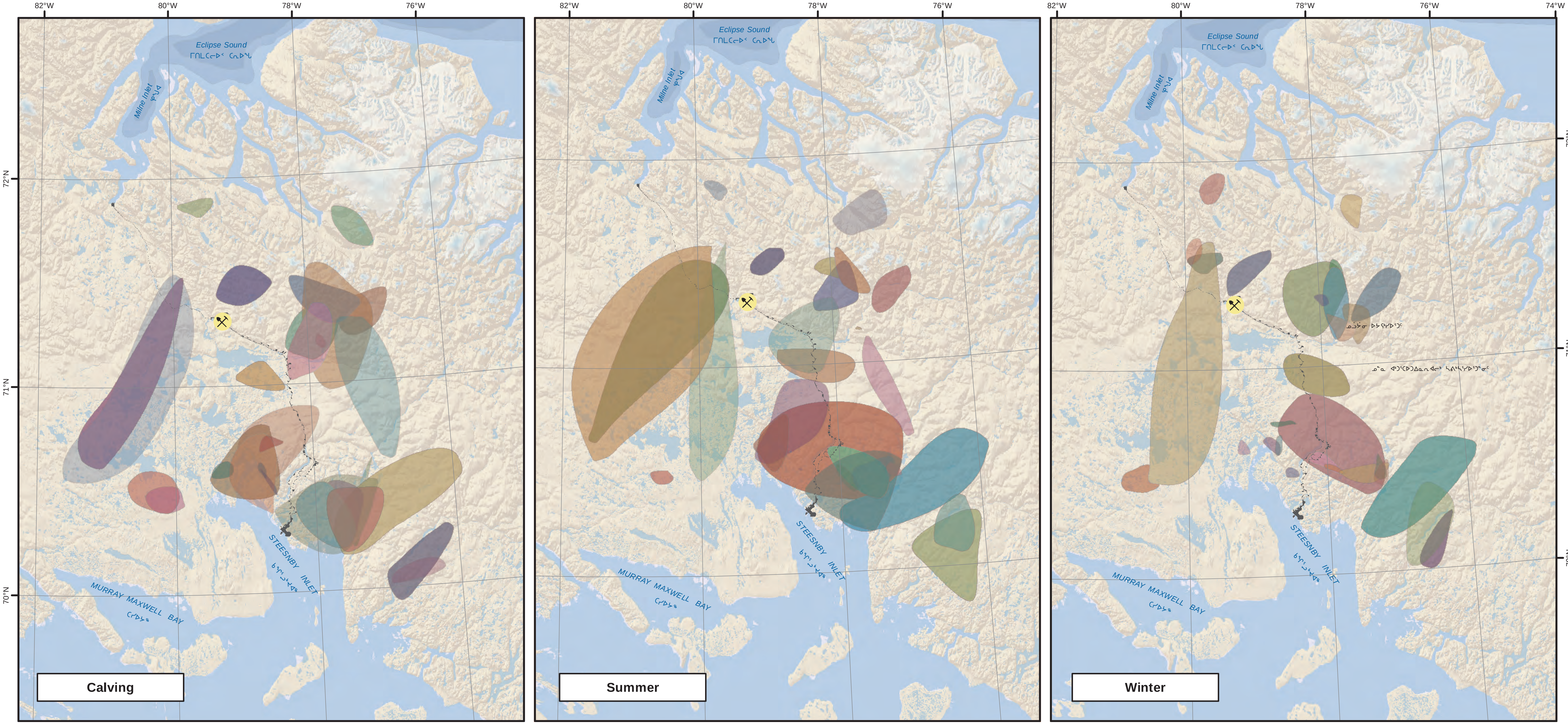


Figure 14. Mean distance travelled (with standard error) by caribou on north Baffin Island during 11-hour intervals.

Note: Values associated with individual bars represent sample sizes of travel bouts.
Data source: GNDoE unpublished.



LEGEND ᑐᑭᒋᔭᕐᒋᑦ

- Mary River Project
- Potential Disturbance Area
- Seasonal Distribution of Caribou (colours vary)

NOTES ᖃᐅᔨᒪᔭᒃᓴᐃᑦ

Map Projection: North American Datum UTM Zone 17N

This document is not an official land survey and the spatial data presented is subject to change without notice.

Scale 0 25 50 100 Km

Baffinland Iron Mines Corporation

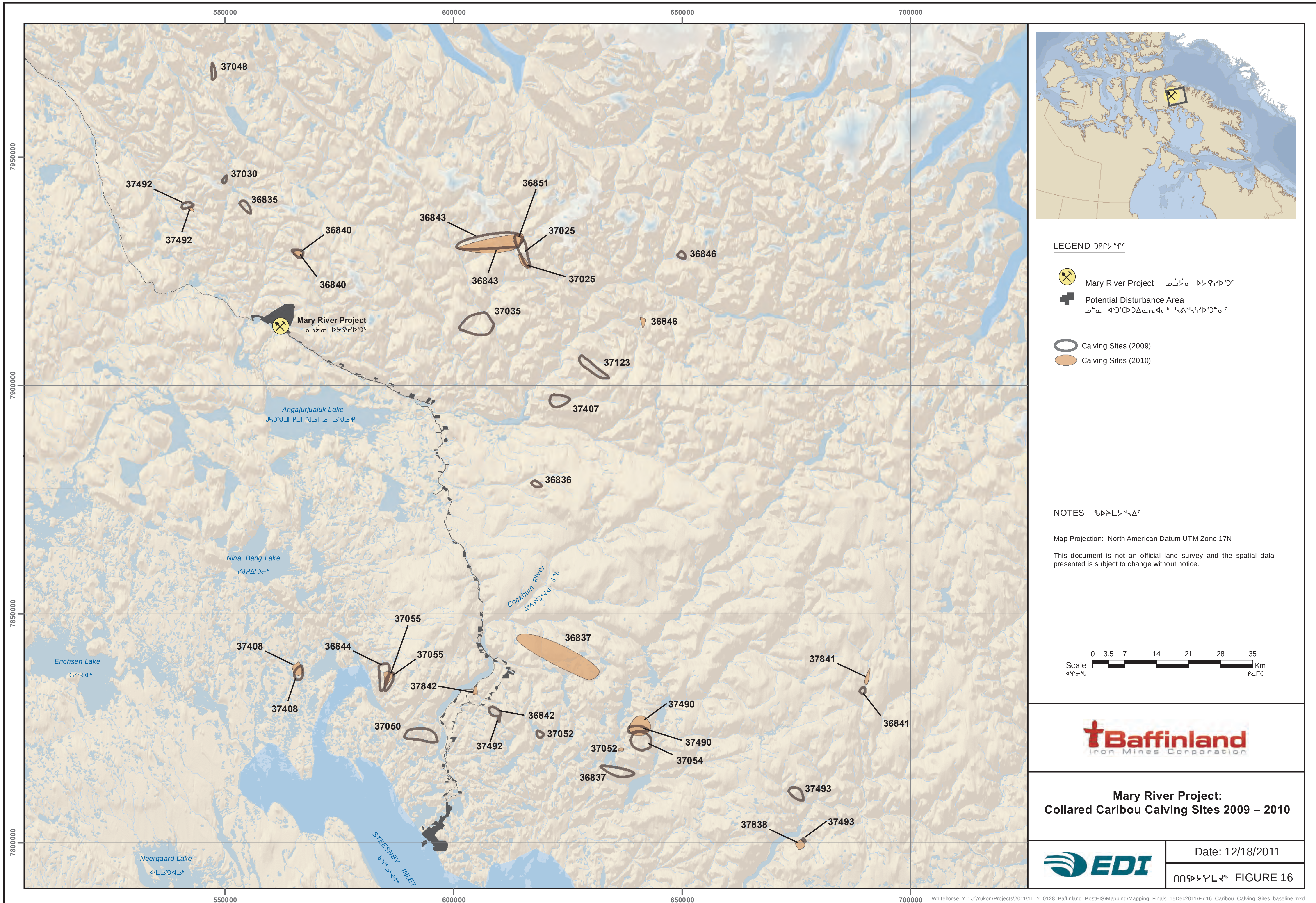
Seasonal distribution of 32 collared female caribou from 2008 to 2011, north Baffin Island, Nunavut.

EDI Environmental Dynamics Inc.

Date: 12/17/2011

FIGURE 15

WHITEHORSE, YT SAVED: J:\Yukon\Projects\2010\10_Y_0550\Mapping\Fig6_3_4_NDep_Deposition_16Dec2010


550000
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700000
7950000
7900000
7850000
7800000
37048
37030
37492
37492
36835
36840
36840
36843
36843
36851
37025
37025
36846
36846
37035
Mary River Project
37123
37407
Angajurjualuk Lake
36836
Nina Bang Lake
Cockburn River
Erichsen Lake
37055
37055
36844
37408
37408
36837
37842
36842
37492
37050
37052
37052
37490
37490
37054
36837
37841
36841
37493
37493
37838
STEESNBY INLET
Neergaard Lake
LEGEND
Mary River Project
Potential Disturbance Area
Calving Sites (2009)
Calving Sites (2010)
NOTES
Map Projection: North American Datum UTM Zone 17N
This document is not an official land survey and the spatial data presented is subject to change without notice.
Scale
0 3.5 7 14 21 28 35
Km
Baffinland
Iron Mines Corporation
Mary River Project:
Collared Caribou Calving Sites 2009 – 2010
EDI
Date: 12/18/2011
FIGURE 16

3.4 CARIBOU TRAIL SURVEYS

Caribou trail surveys were conducted during the summers of 2006–2010. Trails are important for maintenance of animal movement patterns and traditions. The importance of trails is clearer when the process of trail development is considered. Animals tend to move through areas that require minimal energy use, and an animal will likely cause small changes in the environment in which it moves (Couzin and Krause 2003). The next animal that moves through the same area is likely to use the same path because of the small changes the previous animal made to the environment. The second animal causes further incremental changes, which makes movement easier for subsequent animals travelling along this path. This positive feedback eventually results in trail formation if animals move through the area frequently enough that the changes to the environment do not recover between animal movements. Consequently the presence of trails, and trail networks at a broader scale, are likely responsible for at least some of the predictability of caribou movement patterns and traditions.

Caribou movement corridors were quantified by documenting caribou trails in portions of the RSA using four techniques:

1. IQ knowledge
2. Reconnaissance trail surveys
3. Sampling 100 km^2 survey blocks
4. Aerial and ground surveys of the proposed rail route and the existing tote road

Collar data from 2008–2011 displaying locations of female caribou was correlated with the identified major crossing sites; however, the collar data were collected at 11 hour intervals, so they are not detailed enough to delineate any additional trails near or crossing the Railway alignment.

In 2006, the general location of caribou trails and direction of movement were documented during spring reconnaissance caribou surveys (May 25–June 6). Trails were observed in all habitats but were most visible on wetlands and sandy substrates. Caribou movement corridors were located in valley bottoms, skirting high elevation areas and large lakes (Figure 17). These were also areas that were snow-free in the spring. Caribou did not appear to use large lakes for security from predators, but were found on small to mid-size lakes or in the middle of large wetlands.

In 2007, a more quantitative study design was used to characterize caribou movement corridors; 46 100 km^2 (10 x 10 km) blocks and one 60 km^2 block were surveyed by helicopter. All but one (south of Nina Bang Lake) block was adjacent to the proposed linear disturbances (i.e., proposed rail line, Milne Inlet tote road), port sites, or mine site development. The edges and the centre of the block were flown so that any caribou trails through the block were documented. Survey time ranged from 0.5 to 1.5 hours per block, depending on geography and density of caribou trails. Survey heights ranged from 30–90 m agl. Caribou trail use was classified as relatively light, moderate, and heavy. Locations of water crossings indicating use during ice-free seasons were documented.

Results of aerial surveys in coastal habitats adjacent to the proposed Steensby Port had the highest number of caribou trails and were all classed as heavily used (see Figure 18). The Cockburn canyon and valley was also identified as a migration corridor. Trails were abundant near Angajurjualuk Lake and northwest of Mary River camp (see Figure 18). The upper two-thirds of the Milne Inlet tote road had the fewest trails and lowest intensity of trail use. Fourteen water caribou crossings were identified during IQ interviews (see Figure 17). Crossings south of Inuktorfik Lake and the Ravn River inflow at the east end of Angajurjualuk Lake were classified as used by caribou. Of the three crossings on Cockburn Lake, the crossing farthest north showed the greatest evidence of use.

In 2008, caribou trail surveys were concentrated on the proposed rail alignment and the Milne Inlet tote road to determine movement trajectories and identify important crossing areas. The Milne Inlet tote road and proposed rail line for caribou trails were surveyed by helicopter (AS 350 AStar B2) on August 4–5, 2008. Caribou trails were marked with a GPS waypoint. The angle at which the trail approached the rail line (crossing or parallel) and substrate material (wet vegetation, dry vegetation, sand, and rock) were described. Using this information on caribou trail distribution, the proposed rail line was classified as high, medium, and low caribou trail density by visually inspecting the data and making a decision based on professional judgment. Segments within each of the classes were ground-surveyed for animal sign to verify aerial trail survey results, collect finer-scale wildlife use information, and identify broad timing windows (recent and old) of use (see Figure 18).

Three field workers, in addition to a bear monitor, walked approximately 25 m apart along sections of the proposed rail route and recorded animal sign in the form of dropped antlers, scat, caribou trails, bones, tracks, and other wildlife signs/observations. The age of scat and antlers was estimated, and likelihood of recent caribou activity on the trails was determined. Animal sign was classified as either recent (<2 yrs) or old (>2 yrs). Approximately 1 km on the east side of Cockburn Lake, south of the narrows, was ground-surveyed because this area is a geographic feature that naturally funnels caribou towards the narrows and was thought to be an important caribou crossing area.

The 2008 aerial surveys documented 151 individual caribou trails along the proposed railway route and 17 along the Milne Inlet tote road route. Three areas of medium caribou trail density were identified along the tote road, and the remaining areas were considered low (see Figure 18). Six high, six medium, and eight low trail concentration areas were identified along the proposed rail line.

Orientation of caribou trails observed along the tote road and proposed railway was 40% parallel and 59% crossing (see Figure 18). Parallel trails could be within 100 m on either side of the proposed linear feature. In 2008, 27% of the proposed rail line was ground-surveyed, including 21 km of low, 7 km of medium, and 10.5 km of high trail concentration areas. Of the 213 incidences of animal sign, 88% were caribou and 5% were wolf. The remainder included weasel, fox, snowy owl, and lemming sign. The majority of caribou sign was classified as old (87%). Of the 56 trails sampled by ground transect, four had signs of recent caribou use (e.g., tracks). When extrapolated to the rest of the proposed rail line, it was estimated that for the timespan in August (one week), approximately 12 of the 168 trails could have been recently used by caribou.

In 2010, the proposed railway alignment was surveyed on the ground because the alignment changed at the Ravn River crossing and there was interest in a more detailed understanding of caribou movement along and across the proposed railway. Surveying the proposed railway corridor involved walking most of the route to identify caribou trails and other sign (i.e., antlers, pellet groups, bones, and tracks). Along each trail, a series of waypoints was recorded on GPS until the trail became unidentifiable. The recorded waypoints were later turned into lines to be used for mapping and mitigation planning along the rail embankment. Trails were easily identifiable (see Photo 1).

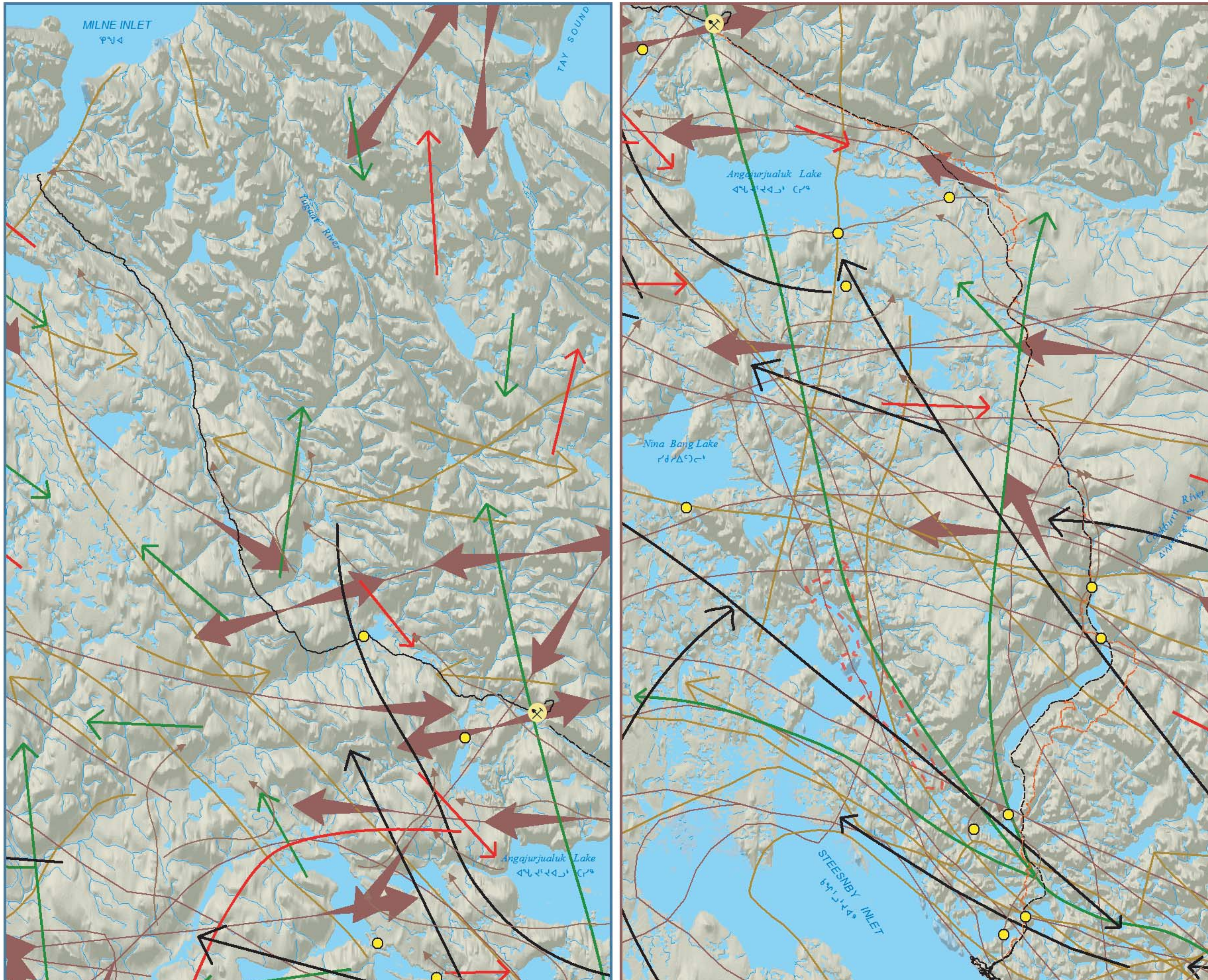
Time limitations precluded walking the entire route, so the initial focus was on high-value movement areas. The high-value movement areas were determined by visual analysis of IQ maps—areas that generally correlated with the 2008 aerial trail survey. Most of the remaining areas were surveyed after the high-value areas. Areas not surveyed were those closest to the mine and port sites, areas ground-surveyed in 2008, and boulder fields in low-value areas where caribou trails are not observable because of the terrain. A total of 117 km were surveyed.

Results of the 2010 ground surveys indicate caribou sign (bones, pellets, antlers, and trails) is present in all habitats and areas. The density of caribou sign is somewhat dependent on the local environment. For example, antlers are more likely to be observed on terrain composed of fine rocks to sand compared with grassy areas. Antlers in wet grassy or vegetated areas will decompose more quickly or eventually be grown over, while antlers in dry rocky areas will persist longer and are more likely to be observed by surveyors. Antlers, pellets, and bones were the most frequent caribou sign. There was little evidence of current use, and only one male caribou was observed during eight days of ground surveys.

Trails were infrequently observed directly on or near the rail alignment. This is likely because the presence of trails depends on the type of habitat the caribou move through. Caribou trails cannot develop on bedrock or bouldery areas and will not persist long in moist and vegetated areas unless regularly used. Trails will persist in drier habitats. Furthermore, trails are more likely to exist in areas where movement is limited to specific terrain and the snow-free season, while movement through adjacent terrain is more difficult. For example, the rail alignment traverses regions with patches of boulder fields separated by lower, vegetated terrain. The vegetated terrain contained several well-used trails that avoided the boulder fields.

During the 2010 ground survey, 53 trails were observed. Trails were found in wet grassy areas and drier upland areas composed of finer substrate (>2 cm diameter). Areas with high-density trails identified during aerial surveys roughly correspond to areas found to contain higher densities of trails during ground surveys. Not all trails observed during aerial surveys were identified during ground surveys because the ground survey was focused directly on the railway alignment. Further, aerial surveys could cover a much broader area, but did not allow identification of specific trails that cross the alignment.

Photo 1. Examples of caribou trails observed along the proposed railway alignment during ground-based fieldwork in 2010.



LEGEND

Mary River Project Study Specifics

- ....Mary River Project
- ....Proposed Rail Alignment
- ....Milne Inlet Tote Road

Caribou Movement (Based on 2006 Aerial Survey)

- ....Caribou Movement - Survey (2006)
- ....Caribou Water Crossing

Caribou Migration (Traditional Knowledge Workshop 2007)

- ....Non-specified Migratory Route
- ....Fall Migratory Route
- ....Spring Migratory Route
- ....Caribou Migration (NLUIS 1980)

Caribou Migration (Traditional Knowledge Interviews)

- ....Migration Route
- ....Movement Over Time

NOTES:

Proposed Rail Alignments provided by Canarail September 2008 and 2010.

Study Areas 2006–2007: Adapted from V. Banci.

Milne Inlet Tote Road: Knight Piesold (2007).

Projection: North American Datum 1983 UTM Zone 17N

Scale 0 5 10 15 20 25 Km

Baffinland Iron Mines Corporation

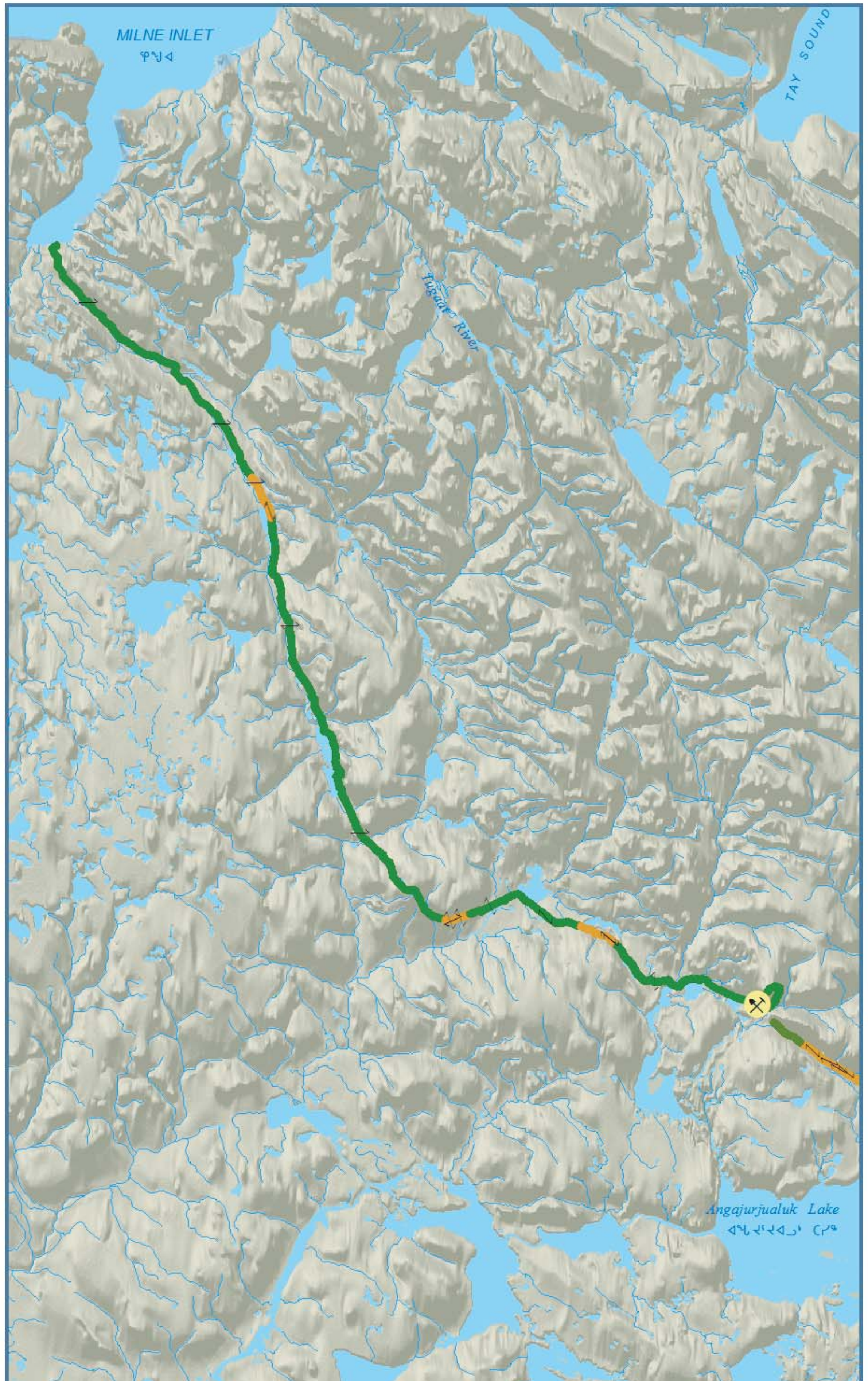
Caribou Movement

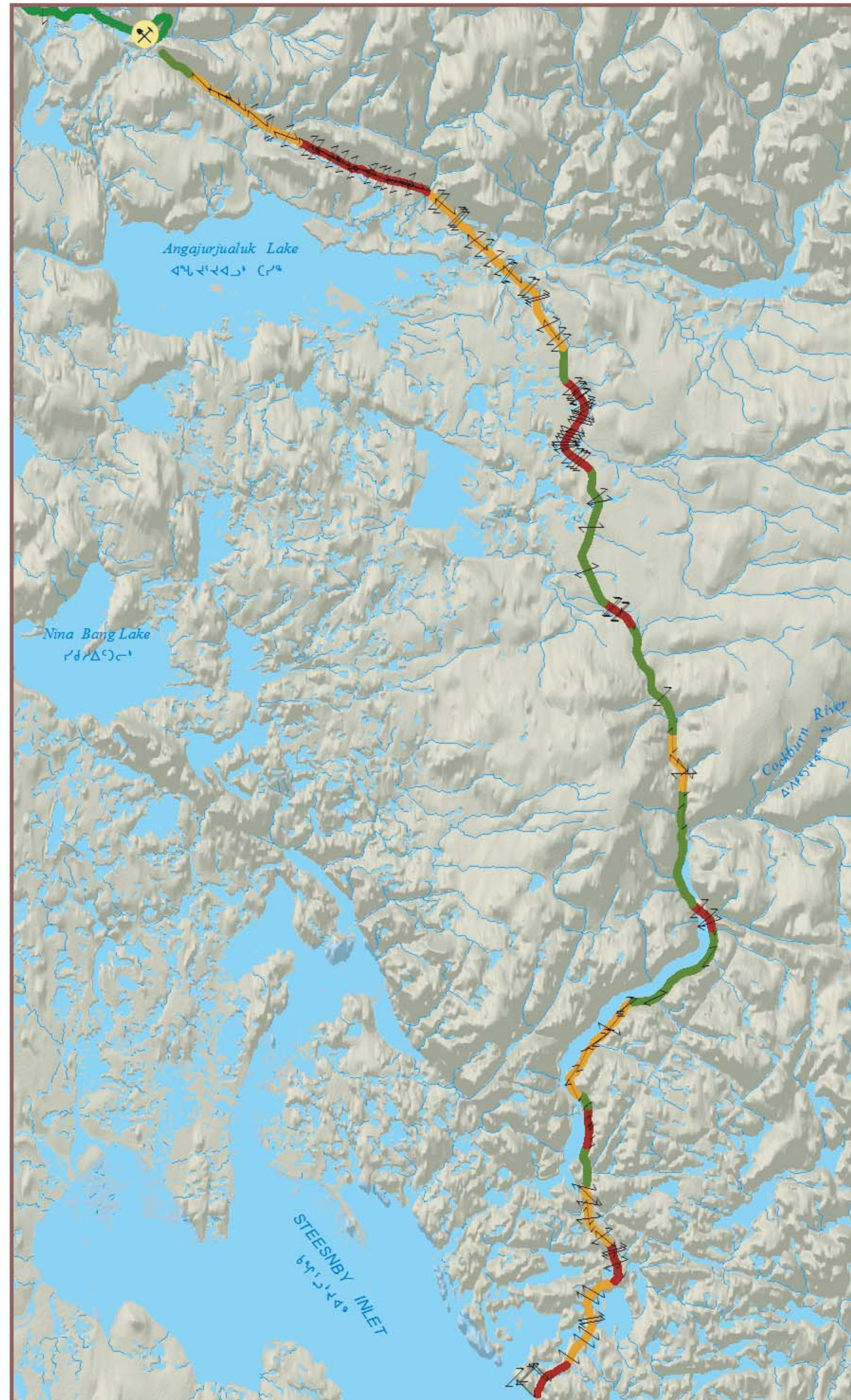
EDI

07 December 2010

FIGURE 17

WHITEHORSE, YT SAVED: J:\Yukon\Projects\2010\10_YC_0025\Mapping\Fig13_Caribou_Movement_07Dec2010





LEGEND

Mary River Project Study Specifics

- ....Mary River Project
- ....Proposed Rail Alignment
- ....Milne Inlet Tote Road

Caribou Trail Concentrations along Survey Line

- ....High
- ....Medium
- ....Low
- ....Caribou Trail Orientation

NOTES:

Proposed Rail Alignments provided by Canarail September 2008 and 2010.

Study Areas 2006–2007: Adapted from V. Banci.

Milne Inlet Tote Road: Knight Piesold (2007).

Projection: North American Datum 1983 UTM Zone 17N

Scale 0 5 10 15 20 25 Km

Baffinland
Iron Mines Corporation

Caribou Trail Aerial Survey Results

EDI ENVIRONMENTAL DYNAMICS INC.

07 December 2010

FIGURE 18

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3.5 LARGE AND SMALL CARNIVORES INVENTORY

3.5.1 Den Surveys and Opportunistic Sightings

Because of low densities of carnivores in the RSA, only one carnivore-specific aerial survey was conducted as part of the baseline surveys. In 2006, an intensive aerial survey of the Milne Inlet tote road corridor was conducted to locate possible fox and wolf den sites. Dens were identified from the air using visual cues such as suitable denning habitat (glaciofluvial, lacustrine, and marine deposits) and the characteristic green of enhanced vegetation growth near the den site. The only other carnivore data collected were visual observations of foxes and wolves, and den sites recorded opportunistically during other baseline surveys from 2006–2010 (see Figure 19, Table 8, and Table 9).

Fewer than 100 wolf and fox observations were recorded during extensive baseline surveys from 2006–2010. Wolf and fox occur at low densities throughout the RSA. Carnivore populations are tied to fluctuating prey densities (e.g., caribou and lemmings). Occurrence of carnivores might increase in the area if caribou populations return in large numbers (see Section 2.1.3: Cyclical Abundance).

Table 8. Wolf and fox den sites proximal to the Mary River Project RSA, Baffin Island, Nunavut.

Den ID	Species	Coordinates		Status (Active — Yes or No))		
		Latitude	Longitude	2006	2007	2008
1	Fox	71.6187	-79.4191	Yes	No	–
2	Fox	70.9909	-79.7485	–	Unknown	–
3	Fox	70.9852	-79.6376	–	No	–
4	Fox	71.2574	-79.1728	–	Yes	–
5	Fox	71.0709	-78.6335	–	Unknown	–
6	Fox	71.1263	-78.5555	–	No	–
7	Fox	71.0730	-78.4908	–	Unknown	–
8	Fox	70.7394	-76.9880	–	Unknown	–
9	Wolf	70.3208	-79.7407	Yes	Yes	–
10	Wolf	70.6725	-79.5239	No	Yes	–
11	Wolf	71.2235	-79.3632	–	Yes	–
12	Fox	71.2566	-79.1712	–	–	No
13	Fox	71.1048	-78.8009	–	–	No
14	Fox	71.0712	-78.3340	–	–	Yes
15	Fox	71.0068	-78.3257	–	–	Yes

Note: Dens located by aerial survey in 2006 and opportunistically in 2007/08.

Table 9. Wolf and fox visual observations from 2006–2010 for the Mary River Project, Baffin Island, Nunavut.

Survey date	Number of individuals	Species	Survey method	Comments
May 25–Sept. 8, 2006	22	Wolf	Reconnaissance	Estimated 2 or 3 breeding pairs
Jun. 5, 2006	1	Red fox	Reconnaissance	
May 27–Sept. 8, 2006	8	Arctic fox	Reconnaissance, fall caribou survey	
Jun. 6–10, 2007	2	Arctic fox	Unspecified aerial surveys	
Jun. 5–Sept. 4, 2007	26	Wolf	Unspecified aerial surveys, fall caribou survey	
Mar.–Aug. 2008	9	Arctic fox	Late-winter and calving caribou surveys (2), caribou trail survey (1), bird surveys (7)	
Mar.–Aug. 2008	9	Wolf	Late-winter (1), calving and fall caribou surveys (1), bird surveys (4)	
Jul 27–Aug. 5, 2010	1	Wolf	Ground-based survey of proposed railway route	

LEGEND

Mary River Project Study Specifics

- ....Mary River Project
- ....Proposed Rail Alignment
- ....Milne Inlet Tote Road
- ....Access Road

Regional Study Areas

- ....RSA

Carnivore Observations and Den Sites

2006 - 2008 Fox Observations

- Fox Den: Active/Inactive
- 2006 - 1 Individual
- 2007 - 1 Individual
- 2008 - 1 Individual

2006 - 2008 Wolf Observations

- Wolf Den: Active/Inactive

2006 Observations	2007 Observations	2008 Observations
1 wolf	1 wolf	1 wolf
2 - 3	2 - 3	2 - 3
4 - 5	4 - 5	4 - 5

NOTES:

Proposed Rail Alignment provided by Canarail September 2010.

Study Areas 2006–2007: Adapted from V. Banci.

Milne Inlet Tote Road: Knight Piesold (2007).

Projection: North American Datum 1983 UTM Zone 17N

Scale 0 10 20 30 40 50 Km

Baffinland
Iron Mines Corporation

Carnivore Survey Observations, 2006 to 2008

EDI

07 December 2010

FIGURE 19

WHITEHORSE, YT SAVED: J:\Yukon\Projects\2010\10_YC_0025\Mapping\Fig17_Inuk_Carnivore_Dens_Observations_07Dec2010

3.5.2 DNA Hair Snagging Posts

DNA hair snagging posts were set up to determine the minimum number of wolves using the Project area. This was an experimental, non-intrusive method being tested to determine its usefulness as a long-term monitoring approach.

Hair snagging posts were constructed from a 4"× 4" (10.2×10.2 cm) post cut 4 ft. (1.2 m) tall (see Photo 2). Two 4-ft.-long 2"x 4"s were cut to form the base and support the posts. Posts were nailed together in the field. Double-stranded barbwire was wrapped around the post and secured with fence staples, and a loose piece of barbwire (about 2 ft. long, not attached) was looped around the bottom of the post. A commercial canid lure (gland or urine, White Mountain Animal Lure Coyote Urine, Forget Extreme 2 Coyote Glands) was applied to a cotton ball at each post. Bait included fish heads secured to the top of the post, if available. Types of bait and lure varied between years (see Table 10). Posts were anchored by piling rocks on the base.

Posts were placed in areas of past wolf sign, along natural travel routes such as rivers and canyons, and on vantage points such as at the tops of hills and crests where wolves rest and scan for prey. Posts were distributed throughout the RSA in an attempt to extensively survey for the presence of carnivores in the region (see Figure 20 and Attachment A). Posts were erected in June 2007 and monitored until August 2008 (see Table 10). Hair samples were sent to Wildlife Genetics International (Nelson, British Columbia) for species identification based on DNA analysis.

Results

Sixty-four percent of samples failed mtDNA testing or lacked suitable material for processing. Of the 36 hair samples suitable for mtDNA analysis, 6% were wolf/dog, 14% Arctic fox, and 14% lagomorph (see Table 11). The recent (ongoing) evolutionary relationship between wolf and dog prevented samples from being separated using mtDNA, but because of the remoteness of DNA posts both samples were assumed to be wolves. No reference sample was available for Arctic hare so samples were compared with another closely related lagomorph (jackrabbit).

Photo 2. Photo of a DNA hair snagging post used in the Mary River project, Baffin Island, Nunavut.

Table 10. DNA hair snagging and re-baiting scheduled from 2007–2008 in the Mary River Project, Baffin Island, Nunavut.

Date sampled	Number of hair samples	Bait	Comments
Jul. 2007	NA	Fish heads	Set up 58 posts
Sept. 2007	10	Unknown	1 post destroyed = 57 posts
Jun. 2008	19	Wolf gland lure	1 post lost = 56 posts
Aug. 2008	7	½ with coyote urine and ½ with wolf gland lure	Sampled 56 posts

Table 11. DNA hair snagging posts with hair samples from 2007–2008 in the Mary River Project area, Baffin Island, Nunavut.

Date	Wolf Post #	Comments	DNA results
5-Sept-07	Mary River camp	Dead wolf at Mary River camp	Wolf/dog
	P15	Short coarse white hairs	Jackrabbit
	P14	Very small clumps of underfur	Mixed
	P13	Too small	Inadequate sample
6-Sept-07	P5	Short fuzzy underfur	Wolf/dog plus
9-Sept-07	P2	White underfur, some visible roots	Jackrabbit
	P32	Yellowish hair	Failed
	P26	Short coarse white hairs	Failed
23-Sept-07	P38	White underfur	Arctic fox
	P43	No sample in envelope	Inadequate sample
	P49	Small underfur	Jackrabbit plus
8-Jun-08	P37	White underfur	Arctic fox
	P39	3 small hairs, no roots	Inadequate sample
	P42	White underfur	Arctic fox
	P44	Fluffy, white underfur	Jackrabbit
	P49	Wolf and hare scats at base of post	Inadequate sample
	P51	Small underfur	Failed
9-Jun-08	P02	Wolf tracks close to post	Inadequate sample
	P03	Wolf scats at base of post and caribou antler nearby, 1 hair no root	Inadequate sample
	P13	Wolf and hare scats at base of post, white underfur	Failed
	P15	Wolf and hare scats at base of post, white underfur	Arctic fox
	P17	Wolf and hare scats at base of post, white underfur	Failed
	P19	Small underfur	Failed
	P23	Fish head partially removed, white underfur	Arctic fox
	P24	Small underfur	Failed
	P26	Caribou antler in the vicinity of post, no roots	Inadequate sample
	P31	1 hair, no roots	Inadequate sample
	P57	Post not found, coordinates in the centre of a pond	No sample

Date	Wolf Post #	Comments	DNA results
10-Jun-08	P28	Hare scats found at base of post, small roots	Jackrabbit
	P30	White underfur	Failed
	P32	Wolf scats found at base of post, decent roots	Wolf/dog
4-Aug-08	P49	1 strand, white	Failed
	P22	Fine underfur, white	Inadequate
	P37	1 strand plus underfur, white	Failed
	P26	Few fine strands, white	Inadequate sample
5-Aug-08	P18	Few thin strands, white	Inadequate
6-Aug-08	P9	Few fine hairs, white (from two barbs)	Failed and inadequate sample

500000 80°W 600000 700000

8000000

7900000

7800000

70°N

MILNE INLET

TAY SOUND

PAQUET BAY

NORTH ARM

Tusiat River

Turner River

Angajurjualuk Lake

Nina Bang Lake

Coachman River

Rowley River

Erichsen Lake

Neergaard Lake

STEESNBY INLET

Gifford Fjord

MURRAY MAXWELL BAY

Innuit River

LEGEND

Mary River Project Study Specifics

- Mary River Project
- Proposed Rail Alignment
- Milne Inlet Tote Road

Regional Study Areas

- 2008 RSA -- All surveys

Hair Snag Stations

Samples Collected 2007 - 2008

- No sample
- Samples Collected

NOTES:

Proposed Rail Alignment provided by Canarail September 2010.

Study Areas 2006–2007: Adapted from V. Banci.

Milne Inlet Tote Road: Knight Piesold (2007).

Projection: North American Datum 1983 UTM Zone 17N

Scale 0 10 20 30 40 50 Km

Baffinland Iron Mines Corporation

DNA Hair Sampling Stations

EDI Environmental Dynamics Inc.

07 December 2010

FIGURE 20

3.6 RODENTS INVENTORY

A lemming live-trapping study was used to monitor abundance as a means to gauge prey availability, and changes in habitat. Lemmings are a keystone species in the Arctic food web, important to all carnivorous wildlife, including foxes, wolves, and raptors. Knowing the status of the lemming cycle can help explain the status of more sensitive wildlife species, particularly raptors. Small-mammal trapping was conducted during 2006–2008 at select locations in the RSA.

In 2006, a 50-trap grid of Sherman live-traps was set up in nine transects running perpendicular every 250 m across the access road between the Mary River camp and Deposit No. 1. Traps were placed in all available habitats. Sampling protocols changed in 2007 and 2008 with the establishment of two trap sites. In 2007, traplines were established southeast of the Mary Lake camp (SMT-1) and near the Ravn River east of Angajurjualuk Lake (SMT-2) adjacent to the proposed rail route. In 2008, SMT-2 was re-sampled and a new trapline was established approximately 3 km southwest of Mary River (SMT-3). The original SMT-1 site sampled in 2007 could not be located and was likely disturbed by nearby road construction.

In 2007 and 2008, each trapline consisted of 100 Sherman live-traps deployed on two 250-m-long parallel lines. One line was placed in an upland, drier site, and one in a wetter site to reflect different habitat use by collared and brown lemmings. A trap station consisted of two traps placed every 10 m on each line—25 stations and 50 traps per line. Traps were placed within 1 m of the centre of each trap station. Traps were baited with peanut butter, rolled oats, and a slice of apple for moisture and protected from the weather with plastic bags and rock covers. Cotton batting or cotton balls were provided for bedding. Plastic bags and apples were not used in 2008. Traps were checked at the beginning of each shift (once per day). In 2008, catch/effort calculations were corrected for sprung traps using calculations from Nelson and Clark (1973):

$$\frac{}{}$$

Where: CE = catch/effort (expressed as animals caught per 100 trap nights)
A = number of animals captured of the desired species
TU = number of trapping units ($P \times I \times N$)
I = length of trapping interval
S = total traps sprung by all causes
N = number of traps
P = number of trapping intervals

Results indicated that lemming populations were at the peak of their cycle in northern Baffin Island in 2008 (see Table 12). On Bylot Island, Nunavut, lemming populations peak every 3–4 years with peaks reflected by 2–4 captures/100 trap nights for brown lemmings and 0.5 captures/100 trap nights for collared lemmings (Gruyer et al. 2008). Trapping results in 2008 also illustrated the different habitat preferences of brown lemmings for wet sites and collared lemmings for dry sites

(Table 12). Although lemming sign was abundant in 2006 and 2007 (e.g., animal sightings, winter nests, fecal pellets, remains in carnivore scats, and frequent sightings of falcons, hawks, and snowy owls) few lemmings were caught. Low trapping success might be attributed to reduced effectiveness of new traps or the proximity of trapping transects to fox dens that might have had an impact on local lemming populations. Two ermines were captured during the study; one in 2006 and another in 2008.

Table 12. Catch/effort for lemmings at sites in Mary River project's Regional Study Area, Baffin Island, Nunavut, 2006–2008.

Year	Month	Site		Location		Trap nights	No. of traps	No. of misfires	No. of captures	Captures per 100 trap nights	
				Lat	Long					Brown	Collared
2006	July			Unknown	Unknown	14	50	N/A	0	0	0
2007	July	SMT-1		71.2703	-79.4456	10	100	N/A	1	0.1	0
		SMT-2		71.1368	-78.4820	10	100	N/A	0	0	0
2008	August	SMT-2	Dry	71.1381	-78.4829	6	50	6	8[a]	0.00	2.73
			Wet	71.1376	-78.4840	6	50	5	11	3.41	0.34
		SMT-3	Dry	71.3080	-79.3872	5	49	9	6	0.00	2.05
			Wet	71.3082	-79.3894	5	50	4	18	6.14	0.00

Note: [a] Five recaptures (collared lemmings only).

3.7 INCIDENTAL WILDLIFE OBSERVATIONS

Incidental wildlife observations include sightings obtained opportunistically without a specific method. Often these observations were recorded when biologists were out collecting other types of information; for example, observations of wolves during caribou surveys. Also, personnel working on other components of the Mary River Project observed and reported terrestrial wildlife sightings. Incidental sightings were recorded in the Wildlife Sightings Logbook. The Wildlife Sightings Logbook is a summary of wildlife sighting log sheets, which were posted in various locations around Milne Inlet, Mary River, and Steensby Inlet camps. Project personnel used wildlife log sheets to include observation details, dates, locations, and observer names. Use of the wildlife logs was fairly informal in 2007, but in the following years all environmental staff were instructed to record observations each day. Wildlife logs were intended as a general reference to identify significant observations and observe general trends in wildlife abundance around camp facilities.

There were more observations in the wildlife logs in 2008 and 2010, reflecting increased activity in the Project area and vigilance of environmental staff recording observations in 2008 (see Attachment A). Wildlife log summaries focused on the months April to September when the camp was most active and migratory birds were present. Excluding probable duplicate observations (e.g., similar accounts from the same location by separate observers) there were 1264 separate observations (see Table 13), only 77 of which were caribou (group size ranging from 1–12). The majority of the 278 observations of medium and small mammals were Arctic foxes and Arctic hares, many of which could have been repeated observations of the same individuals near camp and drill sites. Most observations occurred in May and were associated with new sightings of migratory birds.

Table 13. Seasonal occurrences of frequently reported wildlife in the Mary River Project camp wildlife log sheets, 2007–2010.

Species group	Month										Total
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Dec.	
Birds				4	460	135	132	76	55		862
Caribou					6	29	11	27	4		77
Marine mammal				1	16	2	7	5			31
Medium and small mammal	1	3	2	3	49	68	59	54	37	2	278
Polar Bear				1	7		2	6			16
Total	1	3	2	43	667	313	303	217	119	2	1264

4 HABITAT CLASSIFICATION AND MODELLING

Additional to the baseline assessment of the distribution and abundance of animals in the Project area described in previous sections, this section describes the distribution and abundance of caribou habitat in the Project area, and the process used to determine the quality of those habitats. A variety of habitat models have been developed to predict wildlife habitat use. Two modeling approaches are habitat suitability index (HSI) and resource selection function (RSF). Using HSI is a more conventional approach to assessing habitat and the procedures were developed by the United States Fish and Wildlife Service (USFWS 1980a, 1980b, 1981), while using RSF is a newer approach that uses information from recorded animal locations. Selecting the most appropriate model depends on the type and availability of data. For the Project baseline, both an HSI and RSF were used to predict caribou habitat use. The two methods provide similar outputs, but use different approaches and the results of each are interpreted differently.

The HSI uses professional expertise, local knowledge, and past experience to define the habitat characteristics caribou are expected to select in the Project area. The information is then applied to a habitat map of the RSA and the quality of habitat categorized, quantified, and presented in spatial (map) and tabulated formats. The advantage of an HSI is it does not require direct animal location data, which are often not available and expensive to collect. To accommodate the HSI approach, an ecological land classification (ELC) survey was completed as another component of the baseline studies for the Project. ELC identifies landscape units that share similar abiotic and biotic features such as terrain, slope, aspect, soil type, soil moisture, and vegetation cover. The resulting classification results in a number of ecological units, distributed through a given landscape, which can generally be described by their common ecological features (e.g., wet sedge tundra, dry boulder field). In relation to terrestrial wildlife, an HSI-type approach was created for caribou foraging habitat during the growing and winter seasons. For a summary of important features of Arctic caribou habitat used to develop the HSI, see Section 4.1.

The RSF method for determining potential habitat use is based on an evaluation of habitat features associated with caribou collar locations. RSFs rely on point-location data, usually obtained by collaring animals with GPS/satellite collars. The point data are analyzed relative to spatial topographic and vegetation data to determine what characteristics are more commonly associated with caribou locations. The advantage of the RSF is that results of the analyses describe the habitat the collared animals are using, as opposed to the HSI, which reflects professional judgement about habitat the caribou should be selecting. The limitations of an RSF for this Project are the lack of continuous vegetation data in the Project area, and caribou point-location data are expensive to collect. For a description of RSF models and results, see Section 4.2.

4.1 CARIBOU HABITAT SUITABILITY

A general habitat classification describing seasonal habitat important to caribou was required to supplement information on caribou distribution in the RSA. Because no information is available on caribou forage selection, diet, or habitat use specific to northern Baffin Island, a literature review was completed to:

1. Identify foraging preferences of northern caribou.
2. Summarize the nutritional value of plants.
3. Identify principle habitats selected by northern caribou.
4. Summarize geographic predictors of caribou habitat use.

Habitat was classified and rated in order of expected quality for caribou forage in the RSA. Habitat was classified based on knowledge of caribou forage documented in the literature and from information gathered during the Caribou Focus Working Groups.

Following is a summary of documented seasonal diets and habitat selection of northern and Arctic caribou, using examples from study results in similar ecosystems. The acquired information was then used to predict the quantity and quality of local habitat for caribou in north Baffin Island to develop HSIs. The review makes it apparent that the diet of caribou can be quite specific to the regional landscape.

Summer

Summer is the time of year when vegetation is greatest in quantity and quality, so caribou are able to access abundant high-quality vegetation. During summer, caribou need to restore fat reserves used to get through the coming winter and pregnancy (Ouellet et al. 1997). Vegetation quality is highest in early summer and decreases as vegetation matures (Hebblewhite et al. 2008), so caribou summer movement can be determined by regional plant phenology. Other factors thought to influence caribou distribution in the summer are thermoregulation, predator avoidance, and insect avoidance.

Summer foraging areas are on mesic habitats that contain sedges, Arctic willow, grasses, and forbs, especially purple saxifrage (COSEWIC 2004). Parker (1978), sampling rumen and fecal content on Melville and Axel Heiberg Islands, found that Arctic willow is the most important food item, especially in summer. Willow dominated the diet of caribou on Banks Island during the summer, and in general was composed primarily of sedge, willow, legumes (*Astragalus* spp., *Oxytropis* spp.), and mountain avens (Larter and Nagy 2004). The diet of Cape Bathurst caribou found on the NWT mainland was greater than 85% willow during late June and July (Larter and Nagy unpublished data from COSEWIC 2004). Other studies have shown that purple saxifrage is especially important in summer when caribou consume the flowers (Miller 1991). Caribou pellet densities on Melville Island were greatest in mesic sites where lichens, willow, wood rushes (*Luzula* spp.), Arctic poppy, and chickweed (*Stellaria longipes*) were abundant (Thomas et al. 1999). Heather (*Cassiope* spp.) is not a preferred food source, but is consumed when other forage is limited (Ferguson et al. 2001).

Winter

Late winter is when populations of caribou are most limited by habitat (Tyler et al. 2008). Vegetation availability is driven by snow depth and hardness (Adamczewski et al. 1988; Turney and Heard 1991). Snow depth and hardness make acquisition of food more energetically costly because caribou are required to spend an increasing amount of their energy accessing food (Tucker et al. 1990). Caribou therefore use more exposed sites with shallower snow cover for easier access to vegetation. On Somerset Island, Nunavut, winter range is mainly broken rock outcrops where snow depth is variable but usually soft and less often crusted (COSEWIC 2004). On Banks Island, caribou often feed in winter by cratering in the snow on upland habitats (upland barrens, hummock tundra, and stony barrens) where it is shallower and softer than in wet meadows (Larter and Nagy 2000).

Vegetation selected by Peary caribou on the Queen Elizabeth Islands in winter included willows, forbs, grasses, and sedges; caribou maintain better nutritive and reproductive condition, however, on a high willow diet (Miller 1998).

Riewe (1973) found that willow is "vital" to caribou on Ellesmere Island, and Adamczewski et al. (1988) reported that willow, followed by grasses, was the most common vegetation in caribou rumens on Banks Island. Caribou winter range use on Melville Island showed a significant positive correlation with *Cetraria delisei*, *Thamnolia vermicularis*, *Juncus bigumis*, *Alopecurus alpines*, and crustose lichens (Thomas et al. 1999). Thomas et al. (1999) concluded that *Luzula* spp. are survival foods, used in severe winters when more palatable foods are unavailable. *Luzula* is only 28% digestible compared with *Thamnola vermicularis* (57% to 62%) and *Cetraria* spp. (61% to 81%). Legumes made up substantial portions of the monthly caribou diets from October through May (Larter and Nagy 2004).

Legumes make ideal forage for caribou during the winter because they contain higher crude protein compared with other available vegetation, and can be found throughout upland habitats (Larter and Nagy 2000). *Cladina* spp. and *Cladonia* spp. are the lichens most selected by caribou if they are available and accessible. These lichens and *Cetraria* spp. are highly digestible and are important energy sources during the winter (Ferguson et al. 2001). Caribou wintering on tundra often consume relatively little lichen (Shank et al. 1978) compared with herds in forested areas. Barren ground caribou rumens usually contain 30–60% lichen, while Peary caribou contain only 0–2%. Lichen content in rumens was 10% on Prince of Wales Island and 32% on Melville Island. Low standing crop of lichens precludes their use as a major food source (Parker 1978). A substantial proportion (25.8% of fragments) of caribou diets were composed of lichens in March in Norwegian reindeer (~37 species; Mathiesen et al. 2000). Peary caribou concentrate in all seasons on upland monocots (Shank et al. 1978).

Nutritional Value of Plants

Caribou tend to select the most palatable and digestible forage. In the Arctic these include lichens and fresh vascular plants (e.g., grasses, willows, and legumes). Caribou are widely known for their

relationship with lichen; however, caribou have been recorded eating a wide range of vascular plants (Storeheier et al. 2002; Adamczewski et al. 1988). In summer and late fall caribou have been documented feeding on shrubs, grasses, lichens, and mushrooms, and they are able to gain weight relatively quickly (Boertje 1984). New vegetation is the most desirable food source in summer, and part of the migratory behaviour of caribou is thought to be a strategy to acquire this vegetation (Post and Forchhammer 2008). Though moss is commonly observed in caribou feces and rumens, moss is a poor source of energy and nutrition because it is not easily digestible by Arctic ruminants (Ihl and Barboza 2007). Presence of moss in feces could indicate decreasing quality of winter range or difficult winter conditions.

In general, caribou are able to digest lichen very efficiently (Storeheier et al. 2002). The digestibility of lichens varies by species and there is some indication that the digestibility of lichens is dependent on the availability of nitrogen-rich vascular plants in the diet (Ferguson et al. 2001). However, the hypothesis that vascular plants are a catalyst for lichen digestion is currently inconclusive (Storeheier et al. 2002). Lichens like *Cetraria islandica, Cladonia nivalis* and *Cladonia arbuscula* are highly digestible; less-digestible lichen species include *Cladonia stellaris*, *Cladonia gracilis* and *Stereocaulon paschale* (Storeheier et al. 2002).

Plant species that caribou are known to forage on are found throughout the Project area. There are, however, only a few vegetation/ELC units that can be considered high-quality foraging habitat in the Project area. Based on vegetation units identified in the Vegetation Baseline report, during the growing season, the sedge community (SE) and mega-polygon (MP) habitat complexes provided some of the better forage habitat.

Higher-quality foraging sites would be sites that provide at least moderate forage but are near medium to large ponds that can be used as escape cover (Pond Inlet Caribou Focus Working Group 2008). Low-quality growing season habitats were found in barren habitats (BPs, Bax) and lichen-rock boulder fields (LRb).

4.2 CARIBOU RESOURCE SELECTION

The RSF approach uses animal locations, and topographic and vegetative features to define likelihood of animal use. RSFs rely on point-location data usually obtained by collaring animals with GPS/satellite collars. The point data are analyzed relative to spatial habitat data to determine the habitat characteristics that explain where caribou were located. The advantage of the RSF is that results of the analysis describe what habitat the collared animals are most strongly associated with, as opposed to the HSI, which reflects what biologists think the caribou should be selecting. The limitations of an RSF are the lack of continuous vegetation data in the RSA and caribou point-location data are expensive. Results of the RSF are described below.

With new wildlife collaring techniques, more and better location data have become available. Baffinland's contribution to the GNDoE north Baffin Island caribou collaring program has provided access to caribou location data that have increased the ability to predict habitat use based on multiple observations of many caribou for extended periods. RSF is an analytical technique that helps identify habitat that might be more important than other habitat based on frequency of caribou locations in different habitat types.

RSFs have recently been refined and the new approach is known as resource selection probability function (RSPF). RSPF describes the probability that an animal will choose a particular area (habitat) based on its abiotic (e.g., topography, adjacency to lakes) and biotic (e.g., vegetation) features. Technically, an RSPF describes the probability that an animal will use a particular resource as described by a series of environmental covariates (Manly et al. 2002). The RSPF values represent actual probabilities of caribou selecting a given location in a landscape based on quantified behaviour of observed (i.e., collared) animals.

The abundant caribou location data provided by the GNDoE north Baffin Island caribou collaring program (see Section 3.3) were used to estimate RSPFs (Lele and Keim 2006) to model caribou habitat selection in the Project area.

Caribou Location Data

Baffinland financially supported the GNDoE collaring program on north Baffin Island. Consequently, caribou location data were made available by the GNDoE from March 2009 to July 2011 for this baseline report. GPS collars were programmed to acquire fixes twice per day (every 11 hours). Collar data were restricted to remove incomplete and abnormal data. One caribou was removed from the analysis because it was harvested one month after being equipped with a GPS collar. The original dataset contained 24,721 locations from 30 caribou. All duplicate locations (372) and first (30) and last (30) locations for each caribou were deleted because we could not calculate speed for these locations. All locations that had time intervals greater than 44 hours since the last fix (44) were also removed. Lastly, all data that had speeds greater than 80km/h were removed (9) and all data with speeds in the top 99th percentile were individually scanned for accuracy (12 removed). The remaining cleaned dataset contained 24, 223 locations.

For all three seasons (calving, growing, and winter), individual covariates between years were compared. In all cases, the relationships between the probability of selection and the covariates were similar. For example, there was no instance where caribou showed a selection for rivers in one year and avoidance the next. The form of the relationship was also visually inspected and no obvious changes between years were found. Therefore, all available data within each season was merged to increase the sample size of caribou locations.

Study Area

The model did not extend over the entire RSA because caribou collar data did not cover the northwest portion of the RSA (Figure 15). To delimit the caribou RSPF study area, a 100%

minimum convex polygon, buffered by 10 km, was generated around all caribou locations. The model then incorporated the collar location data available (2009–2011), and was then extrapolated to the entire north Baffin Island caribou herd range. Random locations (15,000) that were later compared with caribou collar locations, were queried in this area and restricted from falling in the water cells (i.e. no randomly generated points were located within water bodies).

Spatial Data Layers

Digital Elevation Models (DEMs) at 1:250,000 scale were downloaded from Geobase (www.geobase.ca) and 14 DEMs were merged in a single map to cover the study area. The DEM was used to derive slope and aspect layers. Aspect was converted to a categorical variable with flat terrain as the reference category as another option for model covariates. Terrain ruggedness was described with the vector ruggedness measure (VRM), which, compared with other ruggedness indices, has the advantage of being uncorrelated to slope (Sappington et al. 2007).

Lakes and river layers were extracted from National Topographic Series (NTS) maps (1:250,000) downloaded from Geogratis (www.geogratis.ca). Fifteen maps were merged in each case to obtain analysis maps covering the study area. These layers were used to generate layers for distance to river and distance to lakes. In addition, rivers and lakes were merged to obtain distance to all water layers.

Four Landsat images were downloaded from the Global Land Cover Facility (GLCF; www.landcover.org) and used to develop a greenness map of the study area. Values near zero and decreasing negative values indicate non-vegetated features such as barren surfaces (rock and soil) and water, snow, ice, and clouds. For modeling purposes, therefore, negative values were reclassified to 0 to discern the shape of the response to varying levels of green vegetation.

Maps were projected in Albers Equal Area Conic, a common projection for North American datasets (Danks and Klein 2002) and converted to 50 m×50 m rasters for analyses. For details of model covariates extracted from raster layers (Table 14).

The covariates represent topographical features that are correlated with caribou habitat use in different seasons. The greenness index does not provide data specific to vegetation communities; however, it is correlated with vegetation cover and type, thus it can be used as an appropriate proxy for vegetation.

Table 14. Description of covariates used to model the probability of caribou occurrence in the Project Area, Baffin Island, Nunavut.

Covariate		Source	Range in study area
Dist_rivers	Distance to rivers (km)	1:250,000 topographic maps	0–17.259
Dist_lakes	Distance to lakes (km)		0–17.271
Dist_water	Distance to water (km)		0–6.670
Greenness	Green growth	Landsat transformation	0–1
Elevation	Elevation (km)	1/250000 DEMs	0–1.196
Aspect_5	Aspect categories (Flat, N, E, S, W)		1–5
Aspect	Aspect in degrees		0–360
Slope	Terrain steepness in degrees		0–70.694
VRM	Terrain ruggedness		0–1

Results

Calving Season

Based on individual inspection of covariates, caribou selected for south or east facing slopes of approximately 10–20 degrees and elevations between 300 and 600 meters. Caribou were more likely to select for areas closer to rivers and farther from lakes.

The best model used to predict caribou selection was M6 (Table 15). Although AIC scores were lower for M3 and M4, inclusion of elevation reduced model fit based on the Hosmer-Lemeshaw goodness of fit statistic. This is likely a result of spatial correlation with slope. Therefore, M6 was used as the final model to predict caribou selection. The fit of log-log, probit, and exponential models were also tested (Table 16); however, the logit link provided the best fit to the data. Therefore, caribou habitat selection was best predicted by the combination of south or east facing slopes of approximately 10-20 degrees and proximity to rivers (Table 17). This model was used to generate a visual representation of the probability of caribou selection of the study area during the calving season (Figure 21).

Table 15. Key statistics for logit RSPF models describing probability of caribou occurrence during the calving season (May 23 or 24 – June 26 or 27, 2009–2011).

Model	Slope + Slope^2	river	DEM + DEM^2	Aspect	Greenness	AIC	AUC	H-L p value	Max VIF
M1	X					-2267.97	0.752092	0.044602	2.2
M2	X	X				-2920.84	0.778422	0.074746	2.3
M3	X		X			-3077.64	0.784747	0	2.7
M4	X	X	X			-3533.00	0.802873	0	2.7
M5		X	X			-2125.33	0.745251	0	1.4
M6	**X**	**X**		**X**		**-2975.94**	**0.781108**	**0.917819**	**2.8**
M7	X	X			X	-2918.89	0.77843	0.076581	2.3
M8	X	X		X	X	-2970.78	0.780992	0.646763	2.8

Table 16. Fit statistics for M6 with each of the three link functions for Model M6 in Table 15.

Link	AIC	AUC	H-L p-value
logit	-2975.94	0.781108	0.917819
exponential	-2968.2	0.780908	0.186242
loglog	-2601.52	0.773188	0
probit	-2975.52	0.781127	0.713499

Table 17. Estimates and standard errors for caribou RSPF parameters for the calving season (May 23 or 24 to June 26 or 27, 2009–2011).

Coefficient	Estimate	SE	t	p	VIF
Intercept	-3.0999	0.2952	-10.5	<0.0001	NA
Slope	1.6026	0.0747	21.45	<0.0001	2.7
Slope^2	-0.4186	0.0235	-17.83	<0.0001	2.4
Dist_rivers	-1.4366	0.0779	-18.44	<0.0001	1.2
Aspect_North	0.0846	0.1666	0.51	<0.0001	2.8
Aspect_East	0.4593	0.1619	2.84	<0.0001	2.5
Aspect_South	0.5345	0.1595	3.35	<0.0001	3.3
Aspect_West	0.3435	0.1624	2.12	<0.0001	2.7

Growing Season

Based on individual inspection of covariates, caribou selected for south or east facing slopes of approximately 5–25 degrees and elevations between 300 and 600 meters. Caribou were more likely to select for areas closer to rivers, farther from lakes and with higher greenness scores.

The best model used to predict caribou selection was M15 (Table 18). Although AIC scores were lower for M13 and M16, inclusion of elevation reduced model fit based on the Hosmer-Lemeshaw goodness of fit statistic. This is likely a result of spatial correlation with slope. Therefore, M15 was used as the final model to predict caribou selection. We also tested the fit of log-log, probit, and exponential models (Table 19); however, the logit link provided the best fit to the data. Therefore, caribou habitat selection was best predicted by the combination of slopes of approximately 5-25 degrees, proximity to rivers, and higher greenness scores (Table 20). This model was used to generate a visual representation of the probability of caribou selection of the study area during the calving season (Figure 22).

Table 18. Summary of key statistics for logit RSPF models describing the probability of caribou occurrence throughout the RSA during the growing season (June 27 or 28 to October 31 or November 1, 2009–2011).

Model	Slope + Slope^2	river	DEM + DEM^2	aspect5	Greenness	AIC	AUC	H-L p value	Max VIF
M9	X					-3082.83	0.6659	<0.0001	NA
M10	X	X				-4391.51	0.6894	0.0803	2.3
M11	X	X	X			-4944.89	0.6995	<0.0001	2.7
M12	X		X			-3947.02	0.6807	<0.0001	2.6
M13	X	X	X	X		-5164.9	0.7037	<0.0001	4.2
M14	X	X		X		-4593.5	0.6932	0.0872	3.9
M15	**X**	**X**			**X**	**-5016.2**	**0.7028**	**0.2879**	**2.3**
M16	X	X		X	X	-5170.16	0.7056	0.0078	3.9

Table 19. Fit statistics for M15 with each of the three link functions for Model M15 in Table 18.

Link	AIC	AUC	H-L p-value
logit	-5016.2	0.702803	0.287882
exponential	-4898.61	0.70219	0.00129
loglog	-5012.77	0.702814	0.25046
probit	-5012.77	0.702814	0.25046

Table 20. Estimates and standard errors for caribou RSPF parameters for the growing season (June 27 or 28 to October 31 or November 1, 2009–2011).

Coefficient	Estimate	SE	t	p	VIF
Intercept	-1.4999	0.1143	-13.13	<0.0001	NA
Slope	1.2511	0.047	26.63	<0.0001	2.3
Slope^2	-0.3348	0.0146	-22.89	<0.0001	2.3
Dist_rivers	-1.0815	0.041	-26.4	<0.0001	1
Greenness	0.3711	0.0199	18.7	<0.0001	1

Winter Season

Based on individual inspection of covariates, caribou selected for south facing slopes of approximately 10–25 degrees and lower elevations. Caribou were more likely to select for areas closer to rivers with higher greenness scores and there was no relationship with distance to lakes.

The best model used to predict caribou selection was M19 (Table 21) with a very low AIC score and the best fit based on the Hosmer-Lemeshaw goodness of fit statistic. The fit of log-log, probit, and exponential models was also tested (Table 22); however, the logit link provided the best fit to the data. Therefore, caribou habitat selection was best predicted by the combination of higher greenness scores, slopes of approximately 10–25 degrees, and proximity to rivers (Table 23). This model was used to generate a visual representation of the probability of caribou selection of the study area during the calving season (Figure 23).

Table 21. Summary of key statistics for logit RSPF models describing the probability of caribou occurrence throughout the RSA during the winter season (November 1 or 2 to May 22 or 23, 2009–2011).

Model	Green-ness	Slope + Slope2	Dist_river	DEM	Aspect 5	AIC	AUC	H-L p value	Max VIF
M17	X					-3088.02	0.6358	<0.0001	NA
M18	X	X				-6235.56	0.6957	0.6736	2.7
M19	**X**	**X**	**X**			**-8682.71**	**0.7298**	**0.7457**	**2.7**
M20	X		X			-5863.75	0.6893	<0.0001	1
M21	X	X	X	X		-10085.9	0.7455	0.0169	2.9
M22	X	X		X		-7561.35	0.7114	<0.0001	2.9
M23	X	X	X		X	-8949.37	0.7332	0.04970	3.2

Table 22. Fit statistics for M19 with each of the three link functions for Model M19 in Table 21.

Link	AIC	AUC	H-L p-value
logit	-8682.71	0.729762	0.745729
exponential	-8180.38	0.727295	<0.0001
loglog	-8598.12	0.729537	0.549983
probit	-8634.72	0.729613	0.508981

Table 23. Estimates and standard errors for caribou RSPF parameters for the winter season (November 1 or 2 to May 22 or 23, 2009–2011).

Coefficient	Estimate	SE	t	p	VIF
Intercept	-2.076	0.0665	-31.22	<0.0001	NA
Slope	0.8779	0.0239	36.75	<0.0001	2.7
$Slope^2$	-0.1391	0.0065	-21.33	<0.0001	2.7
Dist_rivers	-1.2619	0.0342	-36.94	<0.0001	1
Greenness	0.6717	0.0188	35.79	<0.0001	1

LEGEND

Mary River Project

Potential Disturbance Area

Caribou Calving Habitat Selection Probability

High Probability

Low Probability

NOTES

Map Projection: North American Datum UTM Zone 17N

Ferguson, M. 1989. Baffin caribou. Pp. 142 in Hall, E. (ed). People and caribou in the Northwest Territories. Department of Renewable Resources, Government of the Northwest Territories. Yellowknife, NT. 190 pp.

This document is not an official land survey and the spatial data presented is subject to change without notice.

Scale 0 10 20 40 60 80 100 Km

Baffinland Iron Mines Corporation

Mary River Project: Caribou Habitat Selection During the Calving Season.

EDI

Date: 12/18/2011

FIGURE 21

Whitehorse, YT: J:\Yukon\Projects\2011\11_Y_0128_Baffinland_PostEIS\Mapping\Mapping_Finals_15Dec2011\Fig21_RSPF_Caribou_Calving.mxd

LEGEND

Mary River Project

Potential Disturbance Area

Caribou Summer Habitat Selection Probability

High Probability

Low Probability

NOTES

Map Projection: North American Datum UTM Zone 17N

Ferguson, M. 1989. Baffin caribou. Pp. 142 in Hall, E. (ed). People and caribou in the Northwest Territories. Department of Renewable Resources, Government of the Northwest Territories. Yellowknife, NT. 190 pp.

This document is not an official land survey and the spatial data presented is subject to change without notice.

Scale 0 10 20 40 60 80 100 Km

Baffinland Iron Mines Corporation

Mary River Project:
Caribou Habitat Selection
During the Summer Season.

EDI

Date: 12/18/2011

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Whitehorse, YT: J:\Yukon\Projects\2011\11_Y_0128_Baffinland_PostEIS\Mapping\Mapping_Finals_15Dec2011\Fig22_RSPF_Caribou_Summer.mxd

LEGEND

Mary River Project

Potential Disturbance Area

Caribou Winter Habitat Selection Probability

High Probability

Low Probability

NOTES

Map Projection: North American Datum UTM Zone 17N

Ferguson, M. 1989. Baffin caribou. Pp. 142 in Hall, E. (ed). People and caribou in the Northwest Territories. Department of Renewable Resources, Government of the Northwest Territories. Yellowknife, NT. 190 pp.

This document is not an official land survey and the spatial data presented is subject to change without notice.

Scale 0 10 20 40 60 80 100 Km

Baffinland Iron Mines Corporation

Mary River Project: Caribou Habitat Selection During the Winter Season.

EDI

Date: 12/18/2011

FIGURE 23

Whitehorse, YT: J:\Yukon\Projects\2011\11_Y_0128_Baffinland_PostEIS\Mapping\Mapping_Finals_15Dec2011\Fig23_RSPF_Caribou_Winter.mxd

5 SUMMARY: TERRESTRIAL WILDLIFE

Caribou Abundance

- The caribou population on north Baffin Island cycles in abundance. A complete cycle is thought to be about 60–70 years. The cause of the cycle is unknown, but is likely related to availability of forage.
- The last peak in caribou abundance ended in the mid-1990s. The north Baffin Island caribou population is currently at a low. Caribou numbers are expected to gradually increase in the Mary River region, but might not recover to historical "highs" until the 2050s.

Caribou Distribution and Movement

- Caribou occur throughout the RSA, so the entire RSA is considered usable caribou habitat.
- Caribou appear to calve throughout the north Baffin Island caribou range. There are no identifiable calving grounds where caribou are known to congregate.
- Caribou do not perform large-scale migrations to seasonal habitats. These are sedentary caribou; average daily movement of caribou is under 4 km/day throughout the year.
- When caribou numbers peak, movements might become more migratory. IQ indentified caribou migration routes and key crossing areas along the proposed railway route used during population peaks.
- High-density trail areas were concentrated near Steensby Inlet, and east and north of Angajurjualuk Lake.

Carnivores

- Wolves and foxes, the dominant carnivores in the Project area, currently occur at low densities. Few foxes and wolves were observed during baseline inventories.

Small Prey

- Lemmings and hares occur in the Project area. Lemming abundance is cyclical and population peaks occur every 3–4 years. The most recent peak in abundance occurred in 2008. Hares are considered ubiquitous in the Project area.

Wildlife Health

- There is limited information on wildlife health for north Baffin Island. No information was found on contaminants in north Baffin Island caribou or for other wildlife in the Baffin region.
- Brucellosis was reported in the Project area during the 1990s. The current prevalence of brucellosis is unknown.

- Local hunters participating in a recent caribou health monitoring program reported harvesting only healthy caribou.

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6.1 PERSONAL COMMUNICATION

Arctic Bay Caribou Focus Working Group. 2008. Caribou focus group meeting with Knight Piésold, Inuit Qaujimajatuqangit Working Group, Hunter and Trapper Organization members, invited Elders and hunters. April 3, 2008. Arctic Bay, Nunavut.

Clyde River Caribou Focus Working Group. 2008. Caribou focus group meeting with Knight Piésold, Inuit Qaujimajatuqangit Working Group, Hunter and Trapper Organization members, invited Elders and hunters. February 15, 2008. Clyde River, Nunavut.

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6.2 INUIT QAUJIMAJATUQANGIT INTERVIEWEES

Akoomalik, Matthew. 2008. Inuit Qaujimajatuqangit interview for the Mary River Project Inuit Qaujimajatuqangit Study. Pond Inlet, Nunavut.

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ATTACHMENT A ADDITIONAL INFORMATION

Table A1. Human population statistics for north Baffin Island communities, 1931–2006.

Years	Arctic Bay	Nanisivik	Pond Inlet	Clyde River	Hall Beach	Igloolik	Source
1931				32			Kemp (1976)
1941			798				"Northern News" 1954—Presumed population for entire north Baffin
1951			940	128			Kemp (1976) for Clyde River; "Northern News" for Pond Inlet—presumed population for entire north Baffin
1961	49			210			Kemp (1976) for Clyde River; Brubacher and Associates (2002) for Arctic Bay
1966	217		315	252		701	Bissett (1968)
1971	123						Brubacher and Associates (2002) for Arctic Bay
1974			550	357	315	611	Brody (1976a) for Pond Inlet, Hall Beach, Igloolik; Kemp (1976) for Clyde River
1976	388						Brubacher and Associates (2002) for Arctic Bay
1981	375	231	705	443	349	746	Nunavut Bureau of Statistics (http://www.gov.nu.ca/eia/stats/census.html)
1984	427	261	790	465	417	784	Pattimore (1984, citing NWT Dept. Gov. Services)
1986	477	315	796	471	451	857	Nunavut Bureau of Statistics (http://www.gov.nu.ca/eia/stats/census.html)
1991	543	294	974	565	526	936	Nunavut Bureau of Statistics (http://www.gov.nu.ca/eia/stats/census.html)
1996	639	287	1,154	708	543	1,174	Nunavut Bureau of Statistics (http://www.gov.nu.ca/eia/stats/census.html)
1999	627	23	1,240	737	585	1,246	Nunavut Bureau of Statistics (cited in Priest and Usher 2004)
2001	646	77	1,220	785	609	1,286	Nunavut Bureau of Statistics (http://www.gov.nu.ca/eia/stats/census.html)
2006	690	0	1,315	820	654	1,538	Nunavut Bureau of Statistics (http://www.gov.nu.ca/eia/stats/census.html)

Table A2: Locations of DNA hair-snagging posts for the Mary River project, Baffin Island, Nunavut.

Post ID	Latitude	Longitude	Description
P01	72.04540	-80.29918	Milne Inlet inland
P02	71.98861	-80.65582	Milne at ocean
P03	71.98354	-80.50911	Milne Inlet inland
P04	71.90321	-81.00197	NW Milne
P05	71.89242	-80.85024	Milne, just east of port site, toward east, second set of barrels (old culverts)
P06	71.81253	-80.66908	Tote road north end, paired with 76
P07	71.80031	-80.68148	Tote road north end, paired with 77
P08	71.78221	-80.48910	E valley, Milne corridor
P09	71.83139	-79.97287	Tugaat delta
P10	71.71231	-80.29161	E valley, Milne corridor
P11	71.59923	-80.01366	E valley, Milne corridor on hill
P12	71.52710	-80.28811	North Kakitok Lake Milne tote road
P13	71.46701	-80.23314	South Kakitok Lake Milne tote road
P14	71.50302	-79.87266	E valley, Milne corridor near creek
P15	71.49390	-79.61188	Valley to north off of E valley, Milne corridor
P16	71.41932	-79.69684	Where valley joins main E valley and opens up
P17	71.29741	-80.31796	Hill overlooking Octopus Lake
P18	71.36467	-79.57934	Tote road south
P19	71.32701	-79.53238	Tote road south
P20	71.28068	-79.14680	River valley to east of Inuktorfik
P21	71.43631	-78.42830	Upper Turner River valley
P22	71.22795	-79.57441	Mary Lake
P23	71.18839	-79.95349	North Inuktorfik Lake
P24	71.16719	-80.22791	Ravn River (N part between Inuktorfik and Quartz Lake)
P25	71.07607	-79.80825	South Inuktorfik Lake
P26	71.14668	-79.44236	Ravn River west of Angajurjualuk Lake
P27	71.20683	-79.08056	N Angajurjualuk Lake
P28	71.20745	-78.98777	N Angajurjualuk Lake
P29	71.19824	-78.68943	Further up valley
P30	71.21552	-78.12771	Lower-mid Turner River valley
P31	71.08243	-78.97562	South shore Angajurjualuk Lake
P32	71.12794	-78.61839	River mouth inflow to Angajurjualuk Lake
P33	71.15467	-78.14803	Turner River canyon at mouth
P34	71.11639	-77.85482	Hill east Ravn River
P35	71.01163	-80.48715	North Quartz Lake; old exploration camp, garbage
P36	70.96668	-80.15306	S Inuktorfik lake
P37	70.86122	-80.21150	Ravn River (between Quartz and Erichesen Lakes)
P38	70.87819	-79.64589	West Nina Bang Lake
P39	70.80987	-79.42715	South Nina Bang Lake

Post ID	Latitude	Longitude	Description
P40	70.98512	-78.64810	SE Angajurjualuk Lake
P41	70.81079	-79.07710	Constriction in waterway east of Nina Bang Lake
P42	70.62708	-80.31519	Where Ravn enters E side of Erichsen Lake
P43	70.66846	-79.52502	Across from wolf den
P44	70.74489	-78.72909	South of Angajurjualuk Lake
P45	70.75922	-78.10639	Cockburn River start of canyon on proposed rail line
P46	70.71698	-77.96317	Cockburn River above waterfall
P47	70.65086	-78.08430	Cockburn Lake rail crossing
P48	70.59634	-78.82510	Constriction in Tarijuaq arm
P49	70.58660	-79.06299	West Tariujaq Arm
P50	70.50334	-79.60635	Ravn River (near mouth of Steensby Inlet)
P51	70.42848	-79.41861	North arm of Steensby Inlet
P52	70.40482	-78.31609	Inland from Steensby Inlet
P53	70.31220	-78.54214	Past Steensby Inlet camp above HTO cabin
P54	70.21481	-78.32835	On ocean
P55	70.25118	-78.06217	On bedrock hill overlooking goose wetland and ocean
P56	70.25190	-77.83340	Mouth of Rowley River
P57	71.31702	-79.34146	Tote road south—not found after June 2008

Table A3: Wildlife sighting logbook entries for 2007– September 2010 for the Mary River Project, Baffin Island, Nunavut.

Date	Animal	No.	Location	East	North	Comments
26-Apr-07	Polar bear	1	Steensby islands			New tracks around worksite
26-Apr-07	Unspec. Seal	1	Steensby islands			One seal den and seal pup. Bear dug out den and killed pups
26-Apr-07	Unspec. Fox	1	Steensby islands			Tracks
01-May-07	Snow Bunting	1	Steensby islands			Flew out W
01-May-07	Common Raven	2	Mary			"Two crows" looking for food
03-May-07	Snow Bunting	1				Singing
02-May-07	Arctic Hare	1	Deposit No. 2			Drill 3
06-May-07	Unspec. Eider	10	Heading north			"Many eiders" Unusual at this time of year
08-May-07	Domestic Dog	1	Steensby			Stray husky
08-May-07	Common Raven	2	Steensby			
09-May-07	Unspec. Seal	3	Steensby			
09-May-07	Unspec. Seal	4	Steensby			
11-May-07	Common Raven	1	Milne			
15-May-07	Arctic Hare	1	Camp site			Looked hungry
16-May-07	Polar bear	1	1/2 mile from west Steensby island			Hunting seal, caught 1
18-May-07	Caribou	2	14 miles away from Mary River			
May-07	Arctic Hare	1	Mary River			In snow
27-May-07	Sandhill Crane	5	Just above the camp			Have not seen in a long time
29-May-07	Canada Goose		Flying			Just flying
26-May-07	Walrus	5	Flow edge SW of Steensby			Sitting on edge of iceberg
29-May-07	Sandhill Crane	1	just above Mary River			Possibly heading northwest
06-Jun-07	Caribou	12	15 miles from camp			good condition
06-Jun-07	Unspec. Goose	1000	Sky			
09-Jun-07	Arctic Hare	2	Wandering around the camp			
07-Jun-07	Unspec. Lemming	1	Mary River			Running around
12-Jun-07	Arctic Hare	1				

Date	Animal	No.	Location	East	North	Comments
14-Jun-07	Caribou	5	North of Camp Lake			Headed north
14-Jun-07	Caribou	5	NE ridge			Running
14-Jun-07	Arctic Hare	1	Near the camp			Running
15-Jun-07	Snow Goose	12	Over Mary River camp			Headed ENE
15-Jun-07	Arctic Hare	1	Behind toilet			Resting
20-Jun-07	Unspec. Goose	2	Lakeshore			Eating
20-Jun-07	Unspec. Shorebird	1	Lakeshore			Eating, "sandpiper"
20-Jun-07	Arctic Hare	1	PS2			Eating fresh grass
20-Jun-07	Arctic Hare	1	PST2			
21-Jun-07	Canada Goose	2	Near camp			
24-Jun-07	Arctic Hare	2	Behind/Beside 6D			Resting and eating
24-Jun-07	Canada Goose	4	Steensby			Flying over the ice
24-Jun-07	Unspec. Seal	9				
26-Jun-07	Arctic Hare	2	On mountain			
29-Jun-07	Unspec. Loon	1	Lake			Fishing
03-Jul-07	Unspec. Goose	2	By the lake			Eating
03-Jul-07	Unspec. Falcon	1	PS2			Eating
03-Jul-07	Arctic Hare	1	PS2			Eating
06-Jul-07	Wolf	1	50 feet away from Milne Inlet kitchen			Eating
06-Jul-07	Snowy Owl	1	Just south of camp			Flying
11-Jul-07	Wolf	1	50 yds south of camp			White/walking
12-Jul-07	Wolf	2	On road near HTO camp			
17-Jul-07	Wolf	1	In Milne camp			Not scared
18-Jul-07	Arctic Hare	1	By MEC tents			Grey
25-Jul-07	Arctic Hare	1	Camp site			Grey
27-Jul-07	Wolf	1				Not scared
27-Jul-07	Wheater	1	2 mi NE (?) of camp			Feeding in nest
27-Jul-07	Ptarmigan	1	1 mi SE of camp			Female with ~10 young
31-Jul-07	Snowy Owl	1	2 mi SW of camp			Sitting
31-Jul-07	Sandhill Crane	2	Lake 2 km SW of camp			Feeding along lakeshore
31-Jul-07	Purple Sandpiper	2	On road (?) 2.5 SW of camp			Feeding
31-Jul-07	Peregrine Falcon	2	1.5 m NWN			Near sewer

Date	Animal	No.	Location	East	North	Comments
01-Aug-07	Wolf	2	End of the runway (eastside)			
03-Aug-07	Wolf	1	Near the salt station			
10-Aug-07	Arctic Hare	1	Near PS2			Running toward drillers
10-Aug-07	Caribou	2	S. of Ravin R. ~5km	595914	7885805	Curious
Aug-07	Polar bear	1	Milne Inlet			(Polar bear observation not recorded in camp log but added to list)
19-Aug-07	Arctic Hare	1	Airstrip			
19-Aug-07	Wolf	1	pump station III			
20-Aug-07	Arctic Hare	2	pump station III			
23-Aug-07	Wolf	1	airstrip			
11-Sep-07	Arctic Fox	1	beside incinerator			
16-Sep-07	Unspec. Goose	152	flying by			heading south for winter
18-Sep-07	Arctic Hare	2	acrossing runway			
22-Sep-07	Unspec. Fox	1	acrossing runway			
24-Sep-07	Arctic Hare	1	rd. to pit			
26-Sep-07	Unspec. Fox	1	rd. to pit			
27-Sep-07	Unspec. Fox	1	rd t ps			
23-Nov-07	Unspec. Fox	1	incinerator			Looking for food (Note: everyday)
26-Nov-07	Unspec. Fox	1	incinerator			Looking for food
13-Dec-07	Unspec. Fox	1	behind kitchen			Wandering around
19-Dec-07	Arctic Hare	1	MTN. RD.			
19-Mar-08	Arctic Fox	1	end of airstrip			Running
22-Mar-08	Polar bear	1	70º 53' 88" N : 79º 01' 81"			Coming this way (?????)
24-Mar-08	Arctic Fox	1	incinerator			Jogging
28-Mar-08	Arctic Fox	1	Crusher			Walking/ looking around
5-Apr-08	Arctic Fox	1	drill 38			Running
5-Apr-08	Arctic Hare	1	km94			
12-Apr-08	Arctic Fox	1	99km			Crossing road
13-Apr-08	Arctic Fox	2	Switch Back			Running From truck
14-Apr-08	Arctic Fox	2	mountain top (?)			Fox running from owl
14-Apr-08	Unspec. Owl	1	mountain top (?)			Chasing fox
14-Apr-08	Arctic Fox	2	crusher			Checking out crusher
14-Apr-08	Arctic Fox	1	airstrip			Wandering around camp
15-Apr-08	Arctic Hare	2	top of hill			
16-Apr-08	Arctic Fox	2	mountain (??)			Standing on the road
16-Apr-08	Unspec. Fox	2				
19-Apr-08	Unspec. Bird	1	at hole BH3-2008-40	7892	593108	White bird, flying ~700m

Date	Animal	No.	Location	East	North	Comments
				83		from site
20-Apr-08	Arctic Fox	1	incinerator			Around the incinerator
22-Apr-08	Unspec. Fox	1	incinerator			
22-Apr-08	Unspec. Fox	1	crusher			
23-Apr-08	Arctic Fox	1	incinerator			Prowling
23-Apr-08	Unspec. Fox	1	crusher			
24-Apr-08	Arctic Fox	1	incinerator			Prowling
24-Apr-08	Snow Bunting	1	incinerator			Flying
24-Apr-08	Unspec. Fox	1	crusher			
25-Apr-08	Unspec. Falcon	1	run way			Flying across runway
25-Apr-08	Unspec. Fox	1	crusher			
26-Apr-08	Unspec. Fox	1	crusher			
27-Apr-08	Arctic Fox	1	crusher			Wandering around crusher
28-Apr-08	Arctic Fox	1	crusher			Walking slowly
28-Apr-08	Wolf	1	mountain top			Walking
29-Apr-08	Unspec. Fox	1	kitchen garbage			Limping/malnourished
29-Apr-08	Arctic Fox	1	front entrance			Walking around camp
29-Apr-08	Arctic Fox	1	front entrance			
30-Apr-08	Unspec. Fox	1	km97			
30-Apr-08	Arctic Char	1	crusher			
3-May-08	Wolf	1	drill site	7826 421	597200	
3-May-08	Snow Bunting	2	near QL office			Flying
3-May-08	Unspec. Bird	1	rail alignment			Small white bird; flying by, no sign of agitation
3-May-08	Arctic Fox	1	rail alignment			Wandering around pond
5-May-08	Arctic Fox	1	near sea cans			Eating garbage
5-May-08	Arctic Fox	1	kitchen deck door			Playing in snow
5-May-08	Arctic Fox	1	back kitchen door			Feeding on food
7-May-08	Polar bear	2	In front of teensy camp, on ice	7800 300	594384	Female polar bear and cub. walking on ice, did not seem agitated
7-May-08	Polar bear	3	teensy			On the ice
8-May-08	Arctic Fox	1	drill site	7901 246	581658	Walking away from drill
9-May-08	Polar bear	1	near drillhole BH3-2008-19	7901 169	330459	Tracks
9-May-08	Snowy Owl	1	76km			
9-May-08	Arctic Hare	1	84km			
9-May-08	Arctic Fox	1	?			?
9-May-08	Unspec. Fox	1				"Yellow fox"; feeding on

Date	Animal	No.	Location	East	North	Comments
						food
10-May-08	Snowy Owl	1	drill site one			Flying
10-May-08	Arctic Hare	1	BH2-2007-31			Running from chopper
10-May-08	Unspec. Fox	1	near crusher			Walking along road
11-May-08	Ptarmigan	1	Steensby camp			
11-May-08	Caribou	6	between teensy camp and BH3-2008-166			Flew over head, did not seem agitated
11-May-08	Unspec. Bird	2	at BH3-2008-166	7811 056	601060	White birds; medium sized birds near the drill (ptarmigans?)
11-May-08	Unspec. Bird	1	at BH3-2008-166	7811 056	601060	Small and flying in the distance
11-May-08	Unspec. Goose	1	at BH3-2008-166	7811 056	601060	"Brown goose" in the distance
12-May-08	Arctic Hare	2	at BH4-2008-90	7840 770	607964	Observed ~500m from drill site. Not distressed.
12-May-08	Unspec. Goose	3	BH3-2008-176	7807 904	598659	Near the drill
13-May-08	Unspec. Seal	2	Steensby Bay			
13-May-08	Unspec. Goose	8				
13-May-08	Unspec. Bird	1	BH3-2008-176	7807 904	598659	"White bird" near the drill
13-May-08	Unspec. Goose	7	BH3-2008-176	7807 904	598659	Flying ~250 m from drill
13-May-08	Unspec. Bird	2	BH3-2008-177	7807 834	598680	"White birds" ptarmigans
13-May-08	Caribou	7	Springdale dill 4			Walking
14-May-08	Unspec. Goose	1	At BH3-2008-177	7807 834		
14-May-08	Unspec. Gull	1	At BH3-2008-177	7807 834	598680	
14-May-08	Snow Bunting	1	At BH3-2008-177	7807 834	598680	
14-May-08	Wolf	2	At BH4-2008-90	7840 773	607972	Bear monitor say them crossing the ice at Cockburn Lake
14-May-08	Ptarmigan	2	At BH3-2008-175	7807 960	598653	Near drill
14-May-08	Common Raven	1	BH3-2008-177	7807 834	598680	Approached drill and landed on tower. Not distressed.
14-May-08	Unspec. Goose	7	BH3-2008-177	7807 834	598680	Flew by at a distance. Not distressed.
14-May-08	Caribou	7	Springdale drill 5			Walking along river
14-May-08	Snowy Owl	1	BH3-2008-43			
15-May-08	Ptarmigan	3	At BH3-2008-175	7807 960	598653	Near drill

Date	Animal	No.	Location	East	North	Comments
15-May-08	Unspec. Goose	1	At BH3-2008-174	7807 960	598653	Near drill
15-May-08	Unspec. Seal	2	Steensby Bay			
15-May-08	Common Raven	1	BH3-2008-82			
16-May-08	Ptarmigan	1	At BH3-2008-176	7808 020	598634	Near drill
16-May-08	Ptarmigan	2	BH3-2008-43			Flying around site
16-May-08	Caribou	2	BH3-2008-82			Scarred of humans
16-May-08	Snowy Owl	1	end runway			Flying around site
16-May-08	Arctic Hare	2	end runway			Climbing hill
17-May-08	Unspec. Goose	3	At BH3-2008-174	7808 028	598633	Near drill -didn't appear disturbed
17-May-08	Snow Bunting	2	At BH3-2008-43	7891 388	594297	Flying near site – not disturbed
17-May-08	Unspec. Bird	1	At BH3-2008-173	7809 055	598442	Large white bird (owl?); observed near drillhole, didn't seem to notice people
17-May-08	Unspec. Lemming	1	BH3-2008-43			
17-May-08	Snowy Owl	1	km98			On ground on a hill
18-May-08	Ptarmigan	1	At BH3-2008-173	7808 742	598863	Landed on pump shack – not disturbed
18-May-08	Ptarmigan	2	At BH3-2008-184	7803 844	596964	Near drill
18-May-08	Common Raven	1	Steensby Bay			
18-May-08	Unspec. Goose	100	Steensby Bay			
18-May-08	Polar bear	3	steensby			Travelling south
18-May-08	Snow Goose	1	At BH3-2008-172	7809 077	598249	Near drill
19-May-08	Snow Bunting	2	At BH3-2008-173	7809 077	598249	Near drill
19-May-08	Wolf		At BH3-2008-177	7807 834	598680	Fresh wolf tracks at drill
19-May-08	Unspec. Bird	2	At BH3-2008-183	7804 980	597986	Flying near drill
19-May-08	Unspec. Goose	1	At BH3-2008-183	7804 980	597986	Flying near drill
19-May-08	Ptarmigan	3	At BH3-2008-183	7804 980	597986	Flying near drill
19-May-08	Unspec. Fox	1	laundry room door			
19-May-08	Arctic Hare	1	91km			
20-May-08	Arctic Hare	3	BH3-2008-183	7804 984	597496	Not distressed

Date	Animal	No.	Location	East	North	Comments
20-May-08	Polar bear	3				
20-May-08	Arctic Hare	3	haul rls			
20-May-08	Arctic Hare	1	84km			
20-May-08	Unspec. Lemming	1				
20-May-08	Arctic Fox	1				
21-May-08	Unspec. Seal	1	PSD-2008-01	7799 172	592601	2 km away, not agitated
21-May-08	Unspec. Seal	8	Steensby Bay			
22-May-08	Unspec. Seal	1	PSD-2008-01	7799 173	592598	2 km away, not agitated
22-May-08	Unspec. Seal	2	Steensby Bay			
23-May-08	Unspec. Bird	4	BH3-2008-181	7806 071	598458	Small black and white birds 100 m from drill
24-May-08	Unspec. Bird	1	At Steensby main alignment	7807 175	598174	White bird; flying by chopper, not agitated
24-May-08	Unspec. Goose	50				
24-May-08	Unspec. Goose	2				
25-May-08	Unspec. Seal	1	PSD-2008-03	7796 819	592991	200m from drill
25-May-08	Unspec. Goose	13	At Steensby Port site			Flying by camp
25-May-08	Unspec. Falcon	1	Steensby service dock	7803 331	592668	Flying and calling, nest in rock cliff
25-May-08	Arctic Hare	1	Steensby camp			
25-May-08	Unspec. Seal	6				
26-May-08	Polar bear	1	PSD-2008-05	7797 915	592910	1 km from drill walking toward drill
27-May-08	Unspec. Seal	1	PSD-2008-10	7803 314	592611	Not distressed
27-May-08	Unspec. Seal	1	PSD-2008-10	7803 316	592612	
27-May-08	Unspec. Bird	2	BH3-2008-141	7823 171	598652	200 m fin from drill
27-May-08	Unspec. Seal	3	PSD-2008-11	7803 007	592555	
27-May-08	Unspec. Goose	7	Steensby Airstrip			
27-May-08	Unspec. Seal	7	Steensby Inlet			
28-May-08	Ptarmigan	2	Drill 1			Walk about and fly, 2 fox mating
28-May-08	Arctic Fox	2	Drill 1			Walk about and fly, 2 fox mating
28-May-08	Common	2	Steensby Port site			Flying by camp, didn't

Date	Animal	No.	Location	East	North	Comments
	Raven					appear agitated
28-May-08	Arctic Hare	1	BH3-2008-179	7807 326	598800	
28-May-08	Unspec. Falcon	1	BH3-2008-179			
28-May-08	Caribou	2		7811 798	17W05 99085	Male
28-May-08	Arctic Hare	1		7923 865	17W05 46163	
29-May-08	Unspec. Goose	7	Steensby			"White geese" looking down at the camp
29-May-08	Arctic Hare	1	BH3-2008-179			
29-May-08	Unspec. Seal	3	PSD-2008-11	7803 005	592256	20 m from drill site
29-May-08	Unspec. Goose	5	BH3-2008-178	7807 477	598768	
29-May-08	Arctic Hare	3		7951 427	17W05 20753	
29-May-08	Caribou			7904 969	17W05 70565	Antler
29-May-08	Caribou			7927 071	17W05 38369	Old leg bone
29-May-08	Caribou			7913 085	17W05 63894	Antler
29-May-08	Unspec. Fox			7926 543	17W05 36789	Tracks
29-May-08	Arctic Hare	2		7901 265	17W05 82136	
29-May-08	Arctic Hare	1		7927 030	17W05 38743	
29-May-08	Arctic Hare			7926 472	17W05 37623	Tracks
29-May-08	Canada Goose	1	Km 96 500			
30-May-08	Arctic Hare	1		7959 762	17W05 23548	
30-May-08	Arctic Hare	3		7914 793	17W05 61618	
30-May-08	Arctic Hare	1		7913 225	17W05 62032	
30-May-08	Sandhill Crane	2	SW of Mary River Camp N of Sheardown L			Calling, courting
31-May-08	Wolf	1		7924 488	17W05 65477	
1-Jun-08	Unspec. Falcon	5	Steensby Airstrip			Flocks of geese
1-Jun-08	Unspec.	75	Steensby Airstrip			Flocks of geese

Date	Animal	No.	Location	East	North	Comments
	Goose					
1-Jun-08	Arctic Hare	1	PSD-2008-13	7800 337	594375	
1-Jun-08	Unspec. Goose	13	Steensby camp			Didn't appear agitated
1-Jun-08	Wolf	1	Garbage pit (Crusher)			Eating garbage
1-Jun-08	Wolf	1	Crusher			
2-Jun-08	Unspec. Falcon	5	Cockburn Lake			
2-Jun-08	Unspec. Eagle	2	Cockburn Lake			
2-Jun-08	Unspec. Eagle	2	Cockburn Lake			"Eagle"
2-Jun-08	Unspec. Goose	2	BH3-2008-153	7818 064	398269	Didn't appear agitated
2-Jun-08	Unspec. Eagle	1	BH3-2008-141	7823 190	598649	"Eagle" squeaking constantly
2-Jun-08	Unspec. Falcon	4	BH3-2008-149	7820 253	598398	Observed in cliff
2-Jun-08	Unspec. Goose	12	BH3-2008-149			
3-Jun-08	Unspec. Falcon	2	BH3-2008-149			Fighting off seagull
3-Jun-08	Snow Bunting	2	BH3-2008-113	7827 598	597321	
6-Jun-08	Wolf	1		7916 006	17W05 56981	
6-Jun-08	Unspec. Hawk	1	Drill 5			"Hawk" flying
6-Jun-08	Arctic Hare	1	Drill 6			
6-Jun-08	Snow Goose	12	Drill 7			Flying
6-Jun-08	Snow Bunting	1	I0-04 - Tom River - upper reaches			Flying near river
6-Jun-08	Unspec. Bird	1	I1-02 - Tom River - upper reaches			White bird – just smaller than a duck – black on tail feathers
6-Jun-08	Snowy Owl	1	Milne inlet Camp			Flying over camp NW.
7-Jun-08	Canada Goose	1	S2-100 - Rowley River			
7-Jun-08	Snow Goose	10	between Rowley River and Steensby Camp			Estimated, noted as "lots"
7-Jun-08	Canada Goose	2	SL3-out (km 10 Lake)			
7-Jun-08	Unspec. Bird		SL3-out (km 10 Lake)			Heard songbirds
7-Jun-08	Unspec. Bird		Km 3 Lake			Heard songbirds
7-Jun-08	Glaucous Gull	1	S2-070 - flowing water between basins of			Was seen when landing in helicopter – Matt Evans was

Date	Animal	No.	Location	East	North	Comments
			Cockburn Lake			present and recorded the sighting
7-Jun-08	Unspec. Fox	1	Nivek-out: outlet of Nivek Lake (near Rail Camp)			Running away from area as helicopter landed - had been close to stake marking Rail camp site
7-Jun-08	Snowy Owl	1	Nivek-in: inlet of Nivek Lake (near Rail Camp)			Saw owls before landing at site – Matt Evans was present and recorded owl sightings
7-Jun-08	Short-eared Owl	1	Nivek-in: inlet of Nivek Lake (near Rail Camp)			Saw owls before landing at site – Matt Evans was present and recorded owl sightings
7-Jun-08	Snow Bunting	1	Nivek-in: inlet of Nivek Lake (near Rail Camp)			Saw owls before landing at site – Matt Evans was present and recorded owl sightings
8-Jun-08	Wolf	1		7858 385	17W05 67592	
8-Jun-08	Glaucous Gull	2	S2-030: Turner River			
8-Jun-08	Ptarmigan	1	A0-10: outflow from Mary Lake			
8-Jun-08	Long-tailed Duck	2	C0-05: Mary River between Sheardown and Mary Lakes			Swimming along river – came very close
8-Jun-08	Unspec. Seal	4 approx	M-camp-ds: sea ice at Milne camp			On sea ice
8-Jun-08	Horned Lark	1	D4-080: Deposit 4			
8-Jun-08	Sandhill Crane		D4-040: Deposit 4			
9-Jun-08	Peregrine Falcon	1	D4-010: deposit 4			Heard peregrine falcon
9-Jun-08	Snow Bunting	2	G0-07: Mary River			
9-Jun-08	Snow Bunting	2	G3-01: tributary to Mary River			
9-Jun-08	Snow Bunting	2	K1-01: stream north of Camp Lake			Heard snow buntings
9-Jun-08	Peregrine Falcon	1	L1-08: northeast of Camp - just west and south of deposit			
9-Jun-08	Glaucous Gull	1	E2-01: tributary to Mary River			
9-Jun-08	Unspec. Bird	1	E0-01: Mary River just south of Sheardown Lake			Unidentified ducks: black and white markings; in flight

Date	Animal	No.	Location	East	North	Comments
10-Jun-08	Snow Bunting	1	J2-01: southeast tributary of Camp Lake			
10-Jun-08	Snow Bunting	1	D-stream-1: tributary to Sheardown Lake			
10-Jun-08	Long-tailed Duck	1	D-stream-2: tributary to Sheardown Lake			
10-Jun-08	Unspec. Bird	1	D-stream-2: tributary to Sheardown Lake			
10-Jun-08	Glaucous Gull	5	D-stream-2: tributary to Sheardown Lake			
12-Jun-08	Caribou			7914 534	17W05 57994	Female and calf
12-Jun-08	Unspec. Lemming	1		7919 401	17W05 57485	Squiring to hole
12-Jun-08	Arctic Hare	1	MR camp			Walking
13-Jun-08	Unspec. Goose	10	MR camp			Flying
13-Jun-08	Snowy Owl	1	24K			Flying over the tundra
14-Jun-08	Ptarmigan	50	near the ocean			Flying
15-Jun-08	Snow Goose	4	containers incinerator			Flying
16-Jun-08	Snowy Owl	1	KM 72			100 feet from road flew away when truck approached
16-Jun-08	Wolf	1	SE of MR between Steensby			Walking
26-Jun-08	Unspec. Loon	1	km 83.5			Swimming
28-Jun-08	Caribou	2	km65			Mother and calf
29-Jun-08	Arctic Hare	1	km 89			
1-Jul-08	Unspec. Bird	1	Km 74 TOTE Road			"Small snow bird" coming up to equipment
2-Jul-08	Unspec. Fox	1	km97			
3-Jul-08	Arctic Hare	1	BH3-2008-150	7819 773	598479	Hopped around drill site, did not seem distressed
4-Jul-08	Arctic Hare	2	BH3-2008-151	7819 773	598479	Hopped around drill site, did not seem distressed
4-Jul-08	Unspec. Bird	1	Salt mining area			"Snow bird" dead near the creek
5-Jul-08	Wolf	1	Km 73 TOTE Road			Grey, brown, white, looked to be eating something (Lemming)
6-Jul-08	Sandhill Crane	2	Milne inlet Camp	Going	North East	"Canada Crane" Flying over camp
6-Jul-08	Unspec. Bird	1	Milne Inlet Camp			"Robin" flying
7-Jul-08	Unspec. Fox	1	Milne inlet Camp			Here in Milne inlet
8-Jul-08	Snowy Owl	2	River valley	N 7118.	W 7828.9	Nesting in area

Date	Animal	No.	Location	East	North	Comments
				51	65	
9-Jul-08	Caribou	2				
9-Jul-08	Unspec. Shorebird	1	G0-05: Mary River			Not killdeer or similar
9-Jul-08	Arctic Hare	1	24k on the road			Eating and walking
10-Jul-08	Caribou	1				
10-Jul-08	Canada Goose	2	km3-lake			
10-Jul-08	Glaucous Gull	2	Nivek-out: outflow from Nivek Lake (near Rail Camp)			
11-Jul-08	Wolf	1	Camp Lake			White wolf walking by lake
11-Jul-08	horned lark	1	S2-030: Turner River			
12-Jul-08	Unspec. Goose	2	SW-121	7808 412	598818	
12-Jul-08	Arctic Hare	1	km 62, km 76			Did not notice me, noticed me bur went away
12-Jul-08	Wolf	1	km 62, km 76			Did not notice me, noticed me bur went away
12-Jul-08	Unspec. Fox	1	Km 64			Black and tan standing by borrow area
12-Jul-08	American Golden Plover	1	D4-100: Deposit 4			
12-Jul-08	Arctic Char	2	D4-040: Deposit 4			Small char in stream
12-Jul-08	Peregrine Falcon	1	D4-010: Deposit 4			Heard peregrine falcon
12-Jul-08	American Golden Plover	10	A0-01: downstream of outflow of Mary Lake			Plovers: Saw before helicopter landed – gone by the time we landed
12-Jul-08	Horned Lark	1	A0-01: downstream of outflow of Mary Lake			
12-Jul-08	Glaucous Gull	2	A0-10: outflow from Mary Lake			Very agitated, dive-bombing
12-Jul-08	Sandhill Crane	1	C0-05: between Sheardown and Mary Lakes			Crane: walking along opposite bank, calling and cautious
12-Jul-08	Horned Lark	1	C0-05: between Sheardown and Mary Lakes			crane: walking along opposite bank, calling and cautious
12-Jul-08	Unspec. Shorebird	1	C0-05: between Sheardown and Mary Lakes			Unidentified shorebird (sandpiper)
12-Jul-08	Unspec. Bird		E0-01: Mary River just south of Sheardown Lake			Heard songbirds
13-Jul-08	Snow Bunting	2	H1-01: tributary to Mary River			Heard snow buntings

Date	Animal	No.	Location	East	North	Comments
13-Jul-08	Snow Bunting	1	H1-02: upper reaches of tributary to Mary River			
13-Jul-08	Peregrine Falcon	1	L1-08: northeast of camp area - west of base of deposit			Flying and calling at distance – not too agitated, not dive bombing
13-Jul-08	Snow Bunting	1	K0-05: north of Camp Lake			
13-Jul-08	Snow Bunting	2	K1-01: north of Camp Lake			
13-Jul-08	Unspec. Bird	1	K1-01: north of Camp Lake			Brown bird
13-Jul-08	Snow Bunting	2	K0-01: tributary entering north side of Camp Lake			
13-Jul-08	Unspec. Bird	1	J2-01: tributary entering east side of Camp Lake			Small brown songbird
13-Jul-08	Unspec. Fish	2	J2-01: tributary entering east side of Camp Lake			Small char in stream
13-Jul-08	Horned Lark	2	D-stream-1			Larks: very agitated, dive bombing
13-Jul-08	Snow Bunting	2	D-stream-1			Buntings: fluttering around a lot, somewhat agitated
13-Jul-08	Snow Bunting	2	D-stream-3			
13-Jul-08	Unspec. Lemming	1	D-stream-3			Lemming: running away
13-Jul-08	Unspec. Bird	1	D1-05: north of Sheardown lake			Brown songbird
13-Jul-08	Glaucous Gull	2	D1-00: mouth of Sheardown Lake			
14-Jul-08	Unspec. Falcon	1	Km 69 Tale Road			
14-Jul-08	Unspec. Fox	1	Km 69 Tale Road			
14-Jul-08	Snow Goose	7	Lake at Km 93			4 adult, 3 young on lakeshore
14-Jul-08	Glaucous Gull	1	D1-01: tributary entering Sheardown lake			
14-Jul-08	Unspec. Bird	1	J0-01: outflow from Camp Lake			Brown songbird
14-Jul-08	Sandhill Crane	1	J0-01: outflow from Camp Lake			Heard SACR
14-Jul-08	Snow Bunting	2	I0-06: upper reaches of Tom River			
14-Jul-08	Snow	2	I1-02: Tributary			

Date	Animal	No.	Location	East	North	Comments
	Bunting		entering Tom River			
14-Jul-08	Unspec. Bird	1	I0-01: Tom River			Brown songbird
14-Jul-08	Lapland Longspur	1	J1-01: northwest tributary entering Camp Lake			
14-Jul-08	Snow Bunting	2	M0-01: tributary entering east side of Camp Lake			
14-Jul-08	Horned Lark	2	M0-01: tributary entering east side of Camp Lake			
15-Jul-08	Arctic Hare	2	Salt mining area			Running around in grass
15-Jul-08	Caribou	1	Km 40			Standing by Lake
16-Jul-08	Arctic Hare	1	Km 56 of TOTE Road			Running across road
17-Jul-08	Arctic Fox	2	Between km 40 to 50			Running by road
17-Jul-08	Arctic Fox	1	Km 25Along TOTE road			Drinking from a river by Mary River Camp
17-Jul-08	Snowy Owl	2	Km 13 Along TOTE Road			
18-Jul-08	Snow Goose	12	Km 78-400 along TOTE Road			Six adults and at least 6 hatchlings
18-Jul-08	Snow Goose	9	Km 78-400 along TOTE Road			4 adults – 5 hatchlings
23-Jul-08	Unspec. Fox	4	944100			Running across road
25-Jul-08	Walrus	1	PSI-2008-04	7803 003	17W05 92599	
25-Jul-08	Unspec. Seal	1	PSI-2008-04	7803 003	17W05 92599	
25-Jul-08	Unspec. Fox		lat (71deg.4.27') long (78deg.20.04)			
27-Jul-08	Polar bear	1	SRL-2008-23	7803 172	17W05 98182	Approaching camp, ran into water and swam to island when helicopter flew by
28-Jul-08	Unspec. Bird	1	SW-145	7825 436	17W06 01907	White bird; flew by lake
28-Jul-08	Polar bear	1	SRL-2008-03	7802 050	17W05 94592	Same one seen at drill, Polar bear went into water and swam to island offshore from camp when seeing chopper.
30-Jul-08	Unspec. Fox	5	Tote Road-Km 70			Fox (1 adult)/ Fox (4 young); off side of road
31-Jul-08	Common Raven	3	SRL-2008-12	7800 576	17W05 95016	
31-Jul-08	Arctic Hare	1	To4e Road 444700			Running across road
1-Aug-08	Common Raven	3	SRL-2008-12	7800 576	17W05 95016	

Date	Animal	No.	Location	East	North	Comments
2-Aug-08	Unspec. Seal	1	SRL-2008-13	7800 462	17W05 95267	
2-Aug-08	Arctic Hare	1	SRL-2008-13	7800 462	17W05 95267	
2-Aug-08	Unspec. Lemming	3	SRL-2008-13	7800 462	17W05 95267	
2-Aug-08	Sandhill Crane	2	Km97			Flew away
2-Aug-08	Ross' Goose	3	Km 82			2 adults + Babies
3-Aug-08	Unspec. Seal	7	PSI-2008-16	7800 204	17W05 93845	
3-Aug-08	Arctic Hare	7	PSI-2008-16	7800 204	17W05 93845	
4-Aug-08	Arctic Hare	1	PSI-2008-20	7799 305	17W05 93313	Checked out drill location before set up. Appeared curious; licked salty tower. Left site shortly.
4-Aug-08	Caribou	1	SRL-2008-14	7800 362	17W05 95596	~100 feet from drill. Left after 15 min.
4-Aug-08	Unspec. Fox	1	BH4-2008-145	7803 103	17W05 930	ran away when chopper landed
5-Aug-08	Unspec. Seal	1	PSI-2008-20	7799 306	17W05 99331	
5-Aug-08	Unspec. Gull	3	PSI-2008-20	7799 306	17W05 99331	
6-Aug-08	Unspec. Weasel	1	BH4-2008-153	7855 707	605578	~10 feet from drill not distressed
7-Aug-08	Caribou	1		7803 103	17W05 93859	Bull, nice antlers, wandered of bored, slept on hill side
7-Aug-08	Snowy Owl	1	Km 25			Sitting on a rock flew away
7-Aug-08	Snowy Owl	1	Km 95			Sitting on a rock looking around
8-Aug-08	Caribou	2	SW-136	7800 092	17W05 97054	North end of water source
8-Aug-08	Unspec. Fox	1	BOR 12B-DHI	7868 662	600176	Running around drill site
8-Aug-08	Unspec. Fox	1	BOR12B-DHI	7868 662	176	Ran around drill site
9-Aug-08	Unspec. Weasel	2	BH4-2008-87	7840 876	607843	Curious but not agitated
9-Aug-08	Polar bear	3	Southern part of Cockburn lake (South of fuantable, corner-flat area)			1 mother, 2 cubs walking. Pilot notified camp manager at Steensby
9-Aug-08	Unspec. Fox	1	BOR12B-DHI	7868 662	176	Ran around drill site
12-Aug-08	Unspec. Fox	1	BH4-2008-193	7888 192	596914	Watching drill/ running around

Date	Animal	No.	Location	East	North	Comments
13-Aug-08	Snow Goose	25	BH4-2008-193l	7888 400	597160	25 snow geese, Snowy
13-Aug-08	Snowy Owl	1	BH4-2008-193l	7888 400	597160	25 snow geese, Snowy
14-Aug-08	Snowy Owl	1	200m From Bh4-2008-192/ 30m From BH4-2008-141	7840 343	597225	Nest: Flew around and made noises
14-Aug-08	Unspec. Bird	1	Nivek (Midrail) Camp			"Small brown bird" hopping around camp, Did not appear agitated
15-Aug-08	Caribou	5	BH4-2008-182	7892 647	595933	Spotted 5 caribou~2-3KM away South of drill site. Did not seem distressed
23-Aug-08	Caribou	2	BH4-2008-175	7896 006	594862	(after drilling completed) About 100m from drill site. Calm
27-Aug-08	Arctic Hare	2	BH3-2008-92	7840 735	608015	Ran away from me ! About 75m from drill site, Calm
27-Aug-08	Unspec. Fox	1	MPO-2008-09			Curious about drill, Later fox chasing hare
27-Aug-08	Arctic Hare	1	MPO-2008-09			Curious about drill, Later fox chasing hare
28-Aug-08	Arctic Hare	3	BH4-2008-92	7840 703	608059	Curious, friendly until pump turned on, not scared, agitated
29-Aug-08	Long Tailed Weasel	1	Nortin Tunnel, Rocky cliffs	7835 701	606046	Curious fellow,scampard around rocks for 5min, before leaving, no sounds.
30-Aug-08	Caribou	2	Half way between Niveks ravn crossing			Cow and calf walking to the lake
30-Aug-08	Unspec. Lemming	1	Nivek (Midrail) Camp			Running and hiding, Seems a bit distressed
30-Aug-08	Arctic Fox	1	In front of tent 7c			Ran past my tent toward the bathrooms
30-Aug-08	Unspec. Fox	1	TOTE Road-Km 75.5			Slowly ran off road once truck came around corner
31-Aug-08	Caribou	2	Half way between Niveks ravn crossing			Cow and calf walking to the lake
3-Sep-08	Unspec. Fox	1	MWD-2008-03			Got into the garbage bag
3-Sep-08	Unspec. Weasel	1	500m N of Drills on mountain			Appeared to have something in mouth
3-Sep-08	Unspec. Hawk	1	TOTE Road-Km 10			"Hawk" on the side of the road looking at truck passing
3-Sep-08	Snow Goose	16	TOTE Road-Km 15			Some adults some young, 15+
4-Sep-08	Unspec. Goose	49	Stream crossing at 874710			Possible snow geese; (18 white geese, 31 grey) seemed undisturbed, slowly

Date	Animal	No.	Location	East	North	Comments
						moving toward nearby lake
4-Sep-08	Unspec. Lemming	1	KP Sea cans			Ran from KP's Sea cans to AnMars.
4-Sep-08	Snow Goose	16	TOTE Road-Km 75			Some adults some young, 15+
4-Sep-08	Caribou	1	TOTE-Road- 72+200			Large male near stream
5-Sep-08	Unspec. Fox	1	MSI-2008-05 Across from the crusher			Fox got into garbage bag(We think never saw him) Rabbit curious about drill
5-Sep-08	Arctic Hare	1	MSI-2008-05 Across from the crusher			Fox got into garbage bag (likely, never saw him). Rabbit curious about drill.
5-Sep-08	Unspec. Fox	1	TOTE Road-Km31			Near borrow pit
5-Sep-08	Snow Goose	16	TOTE Road-Km 59			Some adults some young, 15+
5-Sep-08	Snow Goose	61	TOTE Road-Km74			Some adults some young, 60+
6-Sep-08	Unspec. Fox	1	MSI-2008-06			Running around drill, probably looking for food.
6-Sep-08	Sandhill Crane	3	Mary River camp, other side of airstrip			Ivan (anmars) saw them.
7-Sep-08	Snow Goose	100	Km 74			
6-Oct-08	Unspec. Bird	1	Milne inlet Camp			"White belly swallow" flying over the tundra
09-Jun-09	Arctic Hare	2	Mary River Camp site			Wandering around camp
10-Jun-09	Arctic Hare	1	water pump intake at Mary River			Wandering around camp
10-Jun-09	Crane	2	Camp Lake			Wandering around
10-Jun-09	Wolf	1	KM15 Milne Inlet Tote Road			Running
10-Jun-09	Crane	3	KM12 Milne Inlet Tote Road			Standing
10-Jun-09	Arctic Hare	2	KM18 Milne Inlet Tote Road			Wandering around
10-Jun-09	Arctic Hare	1	KM20 Milne Inlet Tote Road			Wandering around
10-Jun-09	Arctic Hare	1	KM30 Milne Inlet Tote Road			Wandering around
17-Jun-09	Arctic Hare	1	behind Mary River camp			Running by camp
24-Jun-09	Arctic Hare	1	Mary River Camp site			Roaming around
10-Jul-09	Geese	2	near Mary River airpstrip			Swimming in pond
10-Jul-09	Arctic Hare	2	Mary River Camp site			Wandering around camp
10-Jul-09	Geese	2	near Mary River airpstrip			Swimming in pond
10-Jul-09	Arrctic fox	1	salt station			

Date	Animal	No.	Location	East	North	Comments
19-Jul-09	Arctic Hare	2	07 laydown			Wandering around
11-Aug-09	Fox	1	salt station			Roaming around
11-Aug-09	Arctic Hare	1	salt station			
14-Aug-09	Caribou	2	between deposits 4 and 5			Grazing near water edge
18-Aug-09	Arctic Hare	2	beside tent 8c			Feeding on food
24-Aug-09	Wolf	2	KM19 Milne Inlet Tote Road			Standing on hill
24-Aug-09	Arctic Hare	1	KM53 Milne Inlet Tote Road			
30-Aug-09	Fox	1	Deposit 1			
31-Aug-09	Falcon	1	Deposit 1			Sitting on boulder
31-Aug-09	Crane	2	inert waste storage area			
07-Sep-09	Ptarmigan	5	Deposit 5 p			
07-Sep-09	Crane	3	Deposit 5			
14-Sep-09	Falcon	2	Milne inlet Camp			Low-level flying over road
13-Dec-09	Arctic Hare	1	Mary River Camp site			Running
30-Dec-09	Fox	1	Mary River Camp site			
2-Jan-10	arctic fox	1	Mary River Camp			
10-Feb-10	arctic fox	1	Mary River Camp			
11-Feb-10	fox	1	Mary River Camp			
15-Feb-10	fox	1	Mary River Camp			
4-Mar-10	arctic fox	1	km 99			
9-Mar-10	fox	1	Mary River Camp			
12-May-10	arctic fox	1	Mary River Camp			
19-May-10	Sandhill cranes	2	Mary River Camp			
21-May-10	Sandhill crane	2	Airstrip - Mary River Camp			mating
21-May-10	Falcon	1	Mary River Camp			
21-May-10	snow geese	20	Mary River Camp			flying north
24-May-10	Sandhill crane	2	Camp Lake			
24-May-10	Pintail Ducks	100	Camp lake			
25-May-10	snow geese	150	km 58			
26-May-10	arctic hare and hawk	2	km 57			hawk chasing hare
26-May-10	ptarmigan	1	km 64			
26-May-10	sandhill cranes	2	Mary River Camp			
27-May-10	arctic fox	2	Mary River Camp			
27-May-10	ptarmigans	6	km 85			

Date	Animal	No.	Location	East	North	Comments
27-May-10	snow geese	12	Mary River Camp			
27-May-10	fox	1	Mary River Camp			
27-May-10	arctic fox	1	Mary River Camp			
28-May-10	snow geese	60	NE of runway - MR Camp			
28-May-10	snow geese	12	km 76			
28-May-10	Sandhill crane	3	km 76			
28-May-10	Ptarmigans	20	km 85			
28-May-10	fox	1	km 80			
29-May-10	Ptarmigans	2	km 71			
30-May-10	Sandhill crane	2	Near Runway - MR Camp			
30-May-10	arctic hare	1	Mary River Camp			
31-May-10	arctic hares	3	Mary River Camp			
1-Jun-10	fox	1	Mary River Camp site			
1-Jun-10	snow geese	2	Mary River Camp site			nesting
1-Jun-10	Sand crane	1	km 99			
1-Jun-10	Sand crane	1	south of Mary River Camp			
1-Jun-10	Ptarmigans	2	km 71			running
1-Jun-10	barn swallow	1	Mary River Camp site			dead
2-Jun-10	fox	1	Mary River Camp site			running
3-Jun-10	geese	2	pond at 97			swimming
4-Jun-10	bird	2	km 79			
6-Jun-10	fox	1	Mary River Camp site			flying
6-Jun-10	Sandhill crane	2	near 1960s camp			territorial
7-Jun-10	caribou	3	Cockburn Lake			running
8-Jun-10	snow bunting	1	Mary River Camp site			foraging
8-Jun-10	arctic hare	3				foraging
8-Jun-10	arctic hare	1	deposit 1			
9-Jun-10	snow geese	10	deposit 1			flying
9-Jun-10	Sandhill crane	2	deposit 1			territorial
10-Jun-10	arctic hare	1	Mary River Camp site			
12-Jun-10	Peregrine falcon	1	km 77			soaring
12-Jun-10	whooping crane	2	Mary River Camp site			
15-Jun-10	caribou	4	km 102			eating
15-Jun-10	Canadian geese	3	Mary River Camp site			

Date	Animal	No.	Location	East	North	Comments
15-Jun-10	caribou	2	km 52			moving upland
15-Jun-10	caribou	4	crusher area			moving NW
17-Jun-10	Canadian geese	3	crusher area			flying
18-Jun-10	Sandhill crane	2	deposit 1			flying
18-Jun-10	arctic hare	3	deposit 1			1 adult and 2 babies
18-Jun-10	fox	1	exploration camp			wandering around
19-Jun-10	fox	1	Mary River Camp site			running
19-Jun-10	arctic hare	3	km 104			hopping
19-Jun-10	crane	2	km 97			
19-Jun-10	fox	1				
20-Jun-10	bird	1	Mary River Camp site			
22-Jun-10	fox	1	Mary River Camp site			running
22-Jun-10	American golden plover	1	West of Deposit 4			
22-Jun-10	Peregrine falcon	1	West of Deposit 4			flying
23-Jun-10	arctic hare	9	Tote road			eating
23-Jun-10	arctic hare	1	Mary River Camp			wandering around
24-Jun-10	arctic hare	2	Tote road			eating
24-Jun-10	caribou	7	km 8			drinking from river
24-Jun-10	small bird	2	deposit 4			flying
24-Jun-10	arctic hare	2	km 59			eating
24-Jun-10	snow geese	14	km 59			eating
24-Jun-10	arctic hare	2	km 61			running
24-Jun-10	arctic hare	1	km 86			running
26-Jun-10	arctic hare	1	by runway			
26-Jun-10	arctic hare	1	core shack			
27-Jun-10	caribou	4	Cockburn Lake			running
27-Jun-10	caribou	1	km 11			
28-Jun-10	arctic hare	1	deposit 4			
28-Jun-10	snow geese	4	Iron Lake			flying
29-Jun-10	bird	1	Mary River Camp site			nesting
30-Jun-10	duck	10	Raven River			swimming
30-Jun-10	geese	1	Isortoq River			flying
30-Jun-10	seagull	2	Raven River			flying
30-Jun-10	Ptarmigan	1	East of Deposit 3			dead
2-Jul-10	arctic hare	1	Mary River Camp			wandering around
3-Jul-10	caribou	1	km 90			lying down in snow
3-Jul-10	fox	1	incinerator MR Camp			cheeky and sly

Date	Animal	No.	Location	East	North	Comments
4-Jul-10	fox	4	generators MR Camp			eating
6-Jul-10	Peregrine falcon	1	East of Deposit 4			flying
6-Jul-10	arctic hare	1	East of Deposit 4			
6-Jul-10	caribou	1	km 50			
6-Jul-10	Peregrine falcon	1	Mary River Camp			
6-Jul-10	snow geese	40	Mary River Camp			
7-Jul-10	arctic hare	`	Tote road			
8-Jul-10	Peregrine falcon	2	South of Deposit 4			cliffs/protecting nest
9-Jul-10	Sandhill crane	1	near lagoons			wandering around
10-Jul-10	hare	2	km 83			adult and baby
11-Jul-10	large bird	1	SE of Deposit 4			
13-Jul-10	arctic hare	1	Deposit 3			
13-Jul-10	arctic hare	1	km 85			
15-Jul-10	caribou	1	West of Mary River Camp			
17-Jul-10	falcon / raven	1	salt area			
17-Jul-10	lemming	1				
17-Jul-10	lemming	1	Deposit 4			
18-Jul-10	arctic hares	2	Deposit 5			
19-Jul-10	lemming	1	Deposit 4			
21-Jul-10	caribou	2	Deposit 6			cow and calf
21-Jul-10	arctic hare	1	2 km N of Steensby			
21-Jul-10	Peregrine falcon	2	1.5 km N of Steensby			
22-Jul-10	Sandhill crane	2	1/2 km SE of Steensby			
22-Jul-10	arctic hare	1	1/2 km SE of Steensby			
23-Jul-10	arctic hare	1	Steensby Camp			
24-Jul-10	arctic hare	4	Steensby Camp			
25-Jul-10	Peregrine falcon	1	km 88			flying low
26-Jul-10	Canadian geese	10	km 82.5			
26-Jul-10	caribou	1	SE of Deposit 5, Zone E			
26-Jul-10	ptarmigans	2	N of Deposit 5, Zone E			
27-Jul-10	caribou	1				
27-Jul-10	Peregrine falcon	1	km 90			flying
27-Jul-10	arctic hare	1	800 m SE of Steensby			

Date	Animal	No.	Location	East	North	Comments
			Camp			
27-Jul-10	bearded seal	5	Bay South of Steensby Camp			
28-Jul-10	Peregrine falcon	1	1.5 km N of Steensby			
28-Jul-10	arctic hare	1	2 km N of Steensby			
29-Jul-10	Peregrine falcon	3	East side of Deposit 4			soaring
29-Jul-10	snowy owl	1	Mary River Camp			flying
30-Jul-10	wolf	1	N/A			male and healthy
30-Jul-10	Peregrine falcon	2	SE of Deposit 4			defending nest
31-Jul-10	caribou	1	Turner River			looking around
31-Jul-10	arctic fox	1	Top of Deposit 2			
1-Aug-10	Yellow-billed loon	1	Near Deposit 1			foraging
1-Aug-10	whooping crane	1	km 90			eating
1-Aug-10	arctic hare	1	Deposit 5			
3-Aug-10	caribou	1	Near Steensby Camp			male
3-Aug-10	arctic hare + babies	3	Road on Deposit 1			
4-Aug-10	caribou	1	North of Steensby Camp			male
4-Aug-10	arctic hare	1	Road on Deposit 1			grazing
4-Aug-10	caribou	1	North of Steensby Camp			male
5-Aug-10	arctic hare	1	Deposit 4			
5-Aug-10	wolf (white)	1	1/2 km S of Steensby Camp			
6-Aug-10	Ducks	4	km 80			family
6-Aug-10	Hare	1	km 80			
7-Aug-10	arctic hare	1	tote road			
7-Aug-10	seals	2	Inlet to North of Steensby			
9-Aug-10	caribou	2	East End of Deposit 4			Cow and Calf
12-Aug-10	fox	1	N. limb of deposit 1			trotting away
13-Aug-10	polar bear	1	km 18			
13-Aug-10	arctic hare	1	km 25			
13-Aug-10	fox	1	km 37			
13-Aug-10	polar bear	1	4.0 km N of Steensby Camp			swimming away from camp
15-Aug-10	caribou	2	20 km N of 10 km Lake			Cow and Calf
17-Aug-10	caribou	1	17 W 0588263, 7931273			Big male

Date	Animal	No.	Location	East	North	Comments
17-Aug-10	caribou	2	Turner River			
17-Aug-10	caribou	2	Turner River			
18-Aug-10	caribou	1	18 W 0413824, 7881873			Medium sized male
18-Aug-10	caribou	1	18 W 0452109, 7869840			Big male
21-Aug-10	fox	1	Helipad			
22-Aug-10	fox	1	Deposit 1			
22-Aug-10	Arctic Loon	3	NE pond by Mid-Rail Lake			1 - adult, 2 -young
24-Aug-10	Snow Geese	50	Mary River			Pass by
24-Aug-10	caribou	3	E. of Nina Bang			
24-Aug-10	hare	1	Deposit 1			running away
28-Aug-10	hare	1	BH10-15			nomming moss
28-Aug-10	Peregrin Falcon	4	H5 - 2 km East of camp			Adult guarding 3 in a nest
29-Aug-10	Polar Bears	2	Isortoq Fjord/Grant Scuttle Bay			
29-Aug-10	Wolves	2	East side Big 'A' Lake			
29-Aug-10	wolf	2	30 km SE of MR camp			
1-Sep-10	Ptarmigan	6	Deposit 3			Family? Walking around
2-Sep-10	Hare	1	Deposit 3			pretneding to be a dog
4-Sep-10	Fox	1	Office Area - Mary River Camp			
4-Sep-10	Fox	1	km 96			running away
5-Sep-10	Sandhill Cranes	7	km 96			Standing in a Group
6-Sep-10	Peregrin Falcon	1	km 72			Flying low
6-Sep-10	Hare	1	2 km West of Steensby			grazing
7-Sep-10	hares	2	Deposit 1 - km 107			scooting up the mtn
9-Sep-10	Peregrin Falcon	2	H5 - 2 km E of MR Camp			chasing one another
10-Sep-10	Caribou	3	10 km lake 598670, 7807780			chillin
10-Sep-10	hare	5	Tay Sound			
11-Sep-10	Hare	1	behind kitchen			eating
12-Sep-10	Falcons	4	Air strip - Mary River			
12-Sep-10	Hare	1	Air strip - Mary River			
12-Sep-10	Ptarmigan	1	Air strip - Mary River			
13-Sep-10	Hare	1	between front door and smokeshack			running
17-Sep-10	Hares	4	Haul road to Deposit 1			
17-Sep-10	Raven	1	Haul road to Deposit 1			

Date	Animal	No.	Location	East	North	Comments
17-Sep-10	Common Loon	1	Haul road to Deposit 1			
22-Sep-10	Arctic Hare	1	Back of Kitchen			White
22-Sep-10	Falcon	1	Deposit 1			flying
22-Sep-10	fox	2	Air strip - Mary River			
22-Sep-10	fox	1	km 98			carrying gull wing
23-Sep-10	arctic fox	2	Deposit 1			slowly walking
23-Sep-10	geese	12	along rd to deposit 1			in a pond