

Caribou Commercialization Project
Environmental Impact Study : Phase 2

ADDENDUM

Submitted by Geoff Klein, Biologist
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VISIT TO MOLLET LAKE

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Nunavik Arctic Foods Incorporated managed a commercial caribou harvest at Nunami Outfitters camp on Mollet Lake in the winters of 1998, 1999, and 2000. The Environmental Quality Commission waived the need for an environmental assessment during those years, but required that one be undertaken before any future harvests occurred. Lanari and others (2001) produced an environmental impact statement for the project that identified the waters near the carcass dumpsite as the most likely area to be affected by the commercial caribou operation. This document is an installment in the environmental assessment of the commercial caribou operation and presents data collected on site in late July, 2002 to address certain environmental concerns surrounding the disposal of the caribou carcasses.

The dumpsite is centered three kilometers from the caribou operation. There are four small ponds on the dumpsite and a small lake at either end (Figure 1). The dumpsite is primarily sandy and rocky ground covered with lichen, shrubs and graminoids.

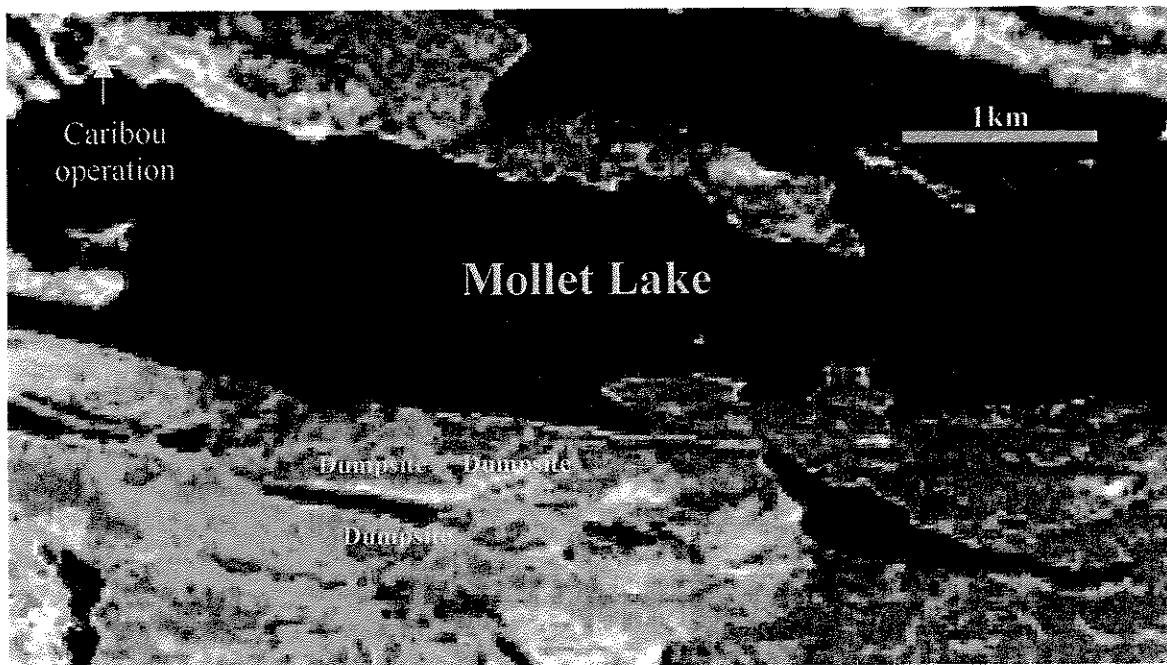


Figure 1: Landsat 5 (1996) false colour image of the study area. Three spectral bands were used to generate the image: red, 630-690nm; near infrared, 760-900nm; and mid-infrared, 1550-1750nm. Water appears black. Light green represents shrubs while dark green represents coniferous forest. Pinkish areas are sandy, but where they fade to light blue and almost white there is increasingly dense lichen growth. Purple is bare rock. Orange represents sedge meadows. Red areas are rock with some vegetation growth.

Receiving waters:

There was a concern that the large input of nutrients from dumping carcasses on the land might eutrophy or otherwise contaminate the waters adjacent to the dumpsites on the south side of Lac Mollet.

The combined surface area of Mollet and Lenormand lakes is 234km². But in a functional sense, the basin on which the commercial operation is located and that the dumpsite drains into is much smaller than that, having an area of less than a hundred square kilometers. In summer and winter when the lake stratifies, the hypolimnion – the area below the thermocline – will be separated into cells that do not interact because of the bottom topography. The entire lake is large enough to absorb any nutrients that enter the water from the caribou dump, but localized anoxia could potentially occur if nutrients are entering the water and settling in a smaller basin. Measurements taken during the site visit showed that anoxia is not an issue. The average depth in the basin of Lac Mollet adjacent to the dumpsites is 13.6 meters. The greatest depth measured was 30.3m close to the outfitting camp. The lake stratifies very weakly at 16.5m, but the epilimnion and hypolimnion remain similar (Table 1). The lake bottom slopes steadily away from the dumpsite so any nutrient loading from the carcasses will be diffuse when it reaches the hypolimnion.

Table 1. Basic water chemistry measurements of late July site visit.

Location	Time	Depth (m)	Temperature (Celsius)	pH	Dissolved Oxygen (mg/L)
Lac Mollet	20:15	0	12.1	7.88	10.95
Lac Mollet	20:20	7.5	11.5	7.82	11.04
Lac Mollet	20:25	22.5	9.5	6.22	11.61
South Pond	14:30	0	14.5	7.72	10.62
South Pond	14:55	Outflow	14.0	7.94	10.27

The locations of the main dumpsites were located on foot, and it was realized that they were concentrated around a long narrow pond to the south of Lac Mollet. The south pond is one kilometer long and about 90 meters wide at the widest point. *Nuphar* is present along the margins and the pond appears well on its way to eutrophication, but brook trout (*Salvelinus fontinalis*) are present nonetheless. Juvenile brook trout were obtained by trapping and adults of almost 30cm in length were observed from shore. The only other aquatic invertebrates observed in the pond were wood frogs (*Rana sylvatica*).

While the dumpsites were on the hilltops, some bones and a plastic, one liter, oil container had been dragged to the shore of the pond near the inflow on the north shore where there is a small grove of trees. This dozen or so bones represents a small nutrient flux to the pond relative to the size of the pond. If the commercial caribou harvest continues, the disposal of the carcasses on the hilltops would not significantly accelerate the rate of eutrophication of the south pond.

Bone scattering by predators was only noticeable for a distance of about half a kilometer from dumpsites. The main vector of nutrient dispersal from the dumpsites appeared to be insects. On some of the more recent dumpsites the caribou remains could not be seen through the heavy layer of shed exoskeletons left behind by metamorphosing insects (Figure 2).



Figure 2. Discarded exoskeletons of macroinvertebrates that developed on the caribou carcasses.

There was a high diversity and density of birds observed during the site visit (Table 2). Insectivory and direct consumption of carrion by birds would have further dispersed nutrients from the dumpsites.

Table 2. List of birds observed during the site visit.

Common loon (*Gavia immer*)
Arctic tern (*Sterna paradisaea*)
Horned lark (*Eremophila alpestris*)
White-crowned sparrow (*Zonotrichia leucophrys*)
American robin (*Turdus migratorius*)
Whiskeyjack (*Perisoreus canadensis*)
Raven (*Corvus corax*)
Pine siskin (*Carduelis pinus*)
Savannah sparrow (*Passerculus sandwichensis*)
White-winged crossbill (*Loxia leucopterus*)
Blackpoll warbler (*Dendroica striata*)
Herring gull (*Larus argentatus*)
Fox sparrow (*Passerella iliaca*)
Gray-cheeked thrush (*Catharus minimus*)
Rusty blackbird (*Euphagus carolinus*)
Surf scoter (*Melanitta fusca*)
Yellow-rumped warbler (*Dendroica coronata*)
Spruce grouse (*Canachites canadensis*)
Northern waterthrush (*Seiurus novaborecsnsis*)
Wilson's warbler (*Wilsonia pusilla*)
Tree sparrow (*Spizella arborea*)
Canada goose (*Branta canadensis*) – droppings
Ptarmigan (*Lagopus lagopus*) – droppings

The nutrient flow over the land proved not to be a concern. Vegetation responded quickly to bind up nutrients at the dumpsites. Fire weed (*Epilobium angustifolium*) and an unidentified flower were the first species to colonize the bare ground resulting when the dumped carcasses smothered the existing vegetation. *Potentilla trilobium* and dogwood (*Cornus canadensis*) also showed very strong herbaceous responses at the edges of the dumps. Woody vegetation adjacent to dumps also showed a growth response. Dwarf birch (*Betula glandulosa*) displayed enhanced leader growth that was no longer evident 3 to 7m from dumpsites, but was intense immediately adjacent to the dumps (Figure 3). Beyond three meters leader growth remained an average 3cm annual growth.

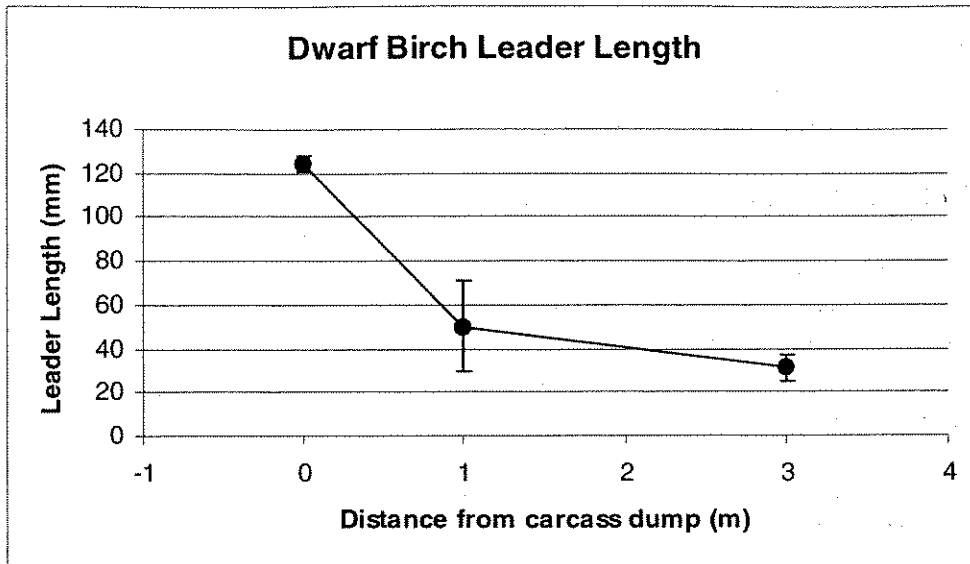


Figure 3. The mean lengths of the longest ten leaders on three dwarf birch (*Betula glandulosa*) plants at three distances from a caribou dumpsite. Error bars represent one standard deviation.

Because of this rapid attenuation of nutrients by vegetation and the dispersal by insects and birds it was determined that there would be no significant impact from dumping caribou carcasses on the waters surrounding the dumpsites.

Threatened and endangered species:

In Phase I of the environmental assessment six species of concern were identified that might be present in the area:

- Endangered: Wolverine (*Gulo gulo*)
Harlequin duck (*Histrionicus histrionicus*)
- Threatened: Peregrine falcon (*Falco peregrinus anatum*)
- At risk: Golden eagle (*Aquila chrysaeto*)
Bald eagle (*Haliaeetus leucocephalus*)
Lynx (*Lynx canadensis*)

Only wolverine and lynx would be present in the winter during the commercial caribou hunt, but investigations were made into all six species nonetheless.

No evidence of the sensitive listed above was found during the four days at the site. Three long-serving guides at the Nunami outfitting camp were interviewed on July 20, 2002 regarding the above species. Dion Skiffington (5 years at Nunami camp), Yvan Simoneau (4 years), and Richard Leblanc (4 years) have seen several harlequin ducks and their young. They note that they are most commonly seen in the rapids of

nearby rivers. They have not seen a nest because the birds are already hatched when they arrive at camp in July. The few harlequin nests that have been found in the north were on riverside cliffs. The study site is ten kilometers from the nearest river. There have been a pair of bald eagles seen near the Nunami camp for the past three years, but this year after three days at camp the eagles have not yet been seen. No nest site is known for these eagles. Golden eagles, peregrine falcons, wolverine and lynx have not been seen in the area while the interviewees worked there. No tracks or other sign of these four species have been seen either.

Some other wildlife were either seen or not seen but evident during the site visit (Table 3).

Table 3. Other wildlife seen on site:

Mammals observed:

Red squirrel (*Tamiascurius hudsonicus*)
Groundhog (*Marmota monax*)

Mammals not observed, but evident:

Black bear (*Ursus americanus*) – tracks and scats
Wolf (*Canis lupus*) – tracks and scats
Caribou (*Rangifer tarandus*) – scats, thrashed spruce
Porcupine (*Erethizon dorsatum*) – gnawings on trees

References:

Lanari, R., C. Burgy, I. Côté, G.M. Klein, and S. Olpinski. 2001. Caribou Commercialization Project. Environmental Impact Study: Phase 1. Report submitted to the Resource Development Department, Makivik Corporation. 57pp. + appendices.