Woodland caribou (*Rangifer tarandus caribou*) in the Far North of Ontario: Background information in support of land use planning

Executive summary

The Far North Caribou Project (FNCP) was initiated in 2008 to support land use and resource planning in the Far North of Ontario using caribou knowledge derived from aerial and ground surveys, remote monitoring through the use of caribou tracked by satellite collars, and aboriginal traditional knowledge. The findings described in this report include:

- The distribution and movement patterns of caribou in the Far North,
- How Ontario managers might differentiate between the two boreal woodland caribou ecotypes and use this information to refine the current ecotype boundary,
- Population dynamics for caribou in the Far North, general habitat use patterns including apparent behaviours exhibited during the calving season, and
- Insight into caribou ecology and management.

Moose and wolf sign and observations were recorded during the winter distribution surveys as these species may provide insight into the large-scale distribution patterns of caribou. Wolverine sign and observations were also recorded as part of the funding requirements for the Far North Caribou Project in order to support the wolverine recovery document.

Where are caribou in the Far North

Winter (February and March) distribution of caribou, moose, wolf, and wolverine was evaluated by aerial surveys conducted throughout the Far North during the winters of 2009 to 2011 across a grid consisting of 10 km^2 hexagonal cells. Winter distribution sightings were used to create species occupancy models for the Hudson Bay Lowlands and Ontario Shield ecozones.

All observations of caribou sign (8,007) and caribou (1,807) were recorded during stage one of the winter distribution survey. Caribou were present in 41% of the surveyed hexagons (1,605/3,874), and the proportion of hexagons with observations of caribou was similar between the Ontario Shield (43%; 647/1,502) and Hudson Bay Lowlands (40%; 958/2,372) ecozones. The average probability of occupancy (psi±SE) for caribou across the Far North was 0.535±0.026 and was similar across both the Hudson Bay Lowlands and Ontario Shield ecozones (0.539±0.029 and 0.527±0.021, respectively). Caribou occupancy was most pronounced near the boundary between the Ontario Shield and the Hudson Bay Lowlands ecozones, and lowest along the coasts of Hudson and James bays and in areas with relatively recent fire disturbance (<40 years).

Five hundred and twenty-two moose were observed in the Far North and moose presence was detected on 46% of the surveyed hexagons (1,791/3,874). The proportion of hexagons with moose observations in the Ontario Shield Ecozone (69%; 1,034/1,502) was two times higher than in Hudson Bay Lowlands Ecozone (32%; 757/2,372). The probability of moose occupancy (psi±SE) was generally higher than caribou occupancy throughout the Far North (0.654±0.036), but was highest in the Ontario Shield Ecozone (0.834±0.021) and comparatively lower within the Hudson Bay Lowlands Ecozone (0.547±0.045). The probability of observing moose along the ecozone boundary was lower and inversely related to caribou occupancy across the Far North.

Seventy-four wolves were observed during the caribou surveys and wolf presence was detected on 22% of the surveyed hexagons (868/3,874) and was more frequent within the Ontario Shield Ecozone (29%; 440/1,502) as compared to the Hudson Bay Lowlands Ecozone (18%; 428/2,372). In general, the probability of occupancy by wolves (psi±SE) was moderate throughout the Far North (0.599±0.077), but was higher within the Ontario Shield Ecozone (0.728c±0.086) as compared to the Hudson Bay Lowlands Ecozone (0.523±0.071). The probability of wolf occupancy was more evenly distributed across the Far North as compared to moose or caribou occupancy and shadowed areas of higher probability of occupancy for both moose and caribou.

Three hundred and fifty-one observations of wolverine sign were made within the Far North but only four animals were sighted. Wolverine were detected on 8% of the surveyed hexagons (311/3,874). The proportion of hexagons with wolverine observations was greater within the Ontario Shield (11%; 165/1,502) as compared to the Hudson Bay Lowlands (6%; 144/2,372). This recent survey suggests that wolverine exist predominantly in the northern two-thirds of the Far North. Wolverine were detected as far east and south as Attawapiskat and the Moose River and appear to be recolonizing the James Bay Ecoregion, particularly around Attawapiskat.

How and where do caribou move in the Far North

Analysis of the behaviour patterns of female woodland caribou in the Far North identified three potential discriminators of ecotype: annual travel distance, minimum distance to the coast during calving season, and the proportion of telemetry fixes that occurred within the combined boundaries of the Northern Taiga Ecoregion (1E) and the Hudson Bay Coast Ecoregion (0E) during the calving season. Of the 124 animals used in this analysis, 41 were classified as forest-tundra, and 83 were classified as forest-dwelling. Animals collared in the vicinity of Keewaywin, Pickle Lake, Hearst, and Eabametoong were exclusively of the forest-dwelling ecotype. Animals collared in the Northern Taiga (1E) or Hudson Bay Coast (0E) ecoregions west of the Severn River were most likely to be the forest-tundra ecotype. Both ecotypes were collared within the vicinity of Kitchenuhmaykoosib Inninuwug and Attawapiskat. A reasonable northern limit of the forest-dwelling ecotype, for management purposes, may be the southern boundary of the Northern Taiga (1E) Ecoregion.

Caribou assigned as forest-tundra ecotype had larger mean annual and seasonal home range sizes (95% minimum convex polygon; annual home range size: 42,039 km^2±3,002 km^2 (n=19), and 67,809 km^2±2,472 km^2 (n=32) in years 1 and 2 of the study, respectively) compared to those assigned as forest-dwelling animals (annual home range size: 3,663 km^2±439 km^2 (n=56) and 5,336 km^2±1,193 km^2 (n=85) in years 1 and 2 of the study, respectively). Seasonal home ranges were smallest during the summer, and largest during the winter or pre-calving period as caribou moved to their calving areas.

The calving season, as determined through movement analysis, ranged from 7 May to 9 June in 2009, 1 May to 9 June in 2010, and 6 May to 2 June in 2011. The average calving date for forest-tundra animals was four to 11 days later than forest-dwelling caribou, and the range of calving start dates was also smaller for forest-tundra caribou. The median distance between calving locations in successive years was consistently smaller for forest-dwelling caribou (within 10 km) compared to forest-tundra caribou (within 50 km).

What is the ecological condition of caribou in the Far North of Ontario

Morphology and nutrition, numbers of caribou, mortality, recruitment and pregnancy rates, and genetic structure were examined during the course of the FNCP. Age, chest girth, and hind foot hoof length for collared caribou ranged from 0.5 to 12.5 years, 99 to 136 cm and 46.6 to 69.5 cm, respectively. Body condition and rump palpitation scores differed by ecoregion ($p<0.05$) and ranged from 0.3 to 1.1 cm and 2.4 to 3.7 cm, respectively, and were highest for animals in the combined Northern Taiga (1E) and Hudson Bay Coast (0E) ecoregions. Pregnancy rates, which varied from 82 to 100% by ecoregion, do not appear to be a factor limiting population growth of caribou in Ontario's Far North. Mean annual adult female survival estimates ranged from 72 to 96% depending on year and region, with highest overall survival estimates occurring in the Lake St. Joseph Ecoregion (90%), followed by the Big Trout Lake Ecoregion, (86%), the combined Northern Taiga (1E) and Hudson Bay Coast (0E) ecoregions (84%), James Bay Ecoregion (82%) and the portion of the Hudson Bay Lowlands Ecozone in Manitoba (74%). Overall, the mean recruitment rates based on the number of calves per 100 adult females (AF_{adj}) ranged from 14.4 to 19.2 (by region) for the winter distribution survey and 8.9 to 21.5 for the targeted telemetry survey. Mean population growth (λ) by region ranged from 0.86 to 0.94 using data from the winter distribution survey and 0.76 to 0.94 using data from the targeted telemetry survey, which suggests that caribou were in decline over the course of the three-year study. Spring and summer estimates of number of calves per 100 adult females on the James Bay and Big Trout Lake ecoregions in 2010 ranged from 79 to 85, respectively. This suggests that a reasonable number of calves are being born, although low recruitment levels indicates that calf mortality within the first year may be a major factor limiting population growth. Given the survey methods employed, the recruitment and growth rates should be interpreted as minimum expected estimates.

Population size estimates were not generated. Total minimum animal counts from the winter distribution surveys were generated for the Big Trout Lake Ecoregion (1,603), the Hudson Bay Lowlands Ecoregion (2,803) and the James Bay Lowlands Ecoregion (370). Minimum animal counts were also generated from the summer surveys associated primarily with the forest-tundra caribou in the combined Northern Taiga (1E) and Hudson Bay Coast (0E) ecoregions. Summer surveys (2008–2011) along the Hudson Bay coast in July demonstrated an easterly shift in coastal distribution as compared to historical surveys, with a maximum coastal population of 4,472 animals in 2011. In addition, the combined knowledge gained from collaring data and incidental observations led to a number of large groups of forest-tundra caribou being observed inland in 2011, north of Kitchenuhmaykoosib Inninuwug during the time of the coastal survey. These large inland aggregations represented 12,166 forest-tundra caribou, resulting in a July minimum animal count of coastal and inland forest-tundra caribou of 16,638 in 2011.

Four ancestral genetic groupings (genotypes) were detected in caribou sampled throughout northern Ontario. Samples largely represented forest-dwelling and forest-tundra caribou located in their late winter ranges, including regions where they overlap. No area had only one genotype. Caribou in the Far North had higher genetic diversity and gene flow than caribou further south. One ancestral genotype dominated in the Cochrane-Kapuskasing-Moosonee area, where the three other

ancestries were rare. Near Lake Nipigon, another ancestral genotype was evident in most samples but less so than the Cochrane-Kapuskasing-Moosonee area. Caribou from the Woodland Caribou Provincial Park area and the westernmost portion of northern Ontario were dominated by a third ancestral ecotype.

What habitats do caribou use in the Far North of Ontario

Winter activity areas north of Kitchenuhmaykoosib Inninuwug along the Ontario Shield–Hudson Bay Lowlands ecozone boundary were dominated by peatland complexes consisting of various combinations of fen, bog, and poor to intermediate conifer swamp with small portions of upland conifer forest and waterbodies of various sizes. The same areas, characterized using Landcover 2000, were classed predominantly as a mixture of sparse forest and open and treed bog conditions.

Ground investigations of calving and nursery areas provided a qualitative description of the environmental conditions used by caribou during the calving and nursery periods. These surveys occurred in the vicinity of Kitchenuhmaykoosib Inninuwug and Keewaywin in 2009, Webequie and Marten Falls in 2010, and Webequie, Kitchenuhmaykoosib Inninuwug, and Keewaywin in 2011. Candidate caribou calving sites and nursery areas were identified using movement data from collared adult female caribou (76 sites), or other means such as advice obtained from participating First Nations and subjective analysis of areas that appeared similar to those used by collared caribou (61 sites).

Of the collar reference sites, 16% (12/76) exhibited evidence of a birthing site, 84% (64/76) showed sign of recent caribou use (caribou use during the summer and or related to nursery or calving activities), and 17% (12/76) showed no evidence of summer use. Thirty percent of the candidate calving or nursery areas, identified for surveying based on other means (18/61) were not used, 15% (9/61) showed signs of older use, and 56% (34/61) showed signs of recent caribou use.

The general characteristics of the landform or forest conditions surveyed could all be assigned to one or more of 11 typical ecological conditions or configurations. The majority of sites investigated for summer caribou occupancy contained some form of peatland feature. Peatlands may be highly variable, and the value of individual areas during the calving period may be as much a function of context and configuration of the relative proportion of specific peatland- or forest-cover classes.

The seasonal habitat models created using female forest-dwelling caribou broadly illustrate the current seasonal patterns of habitat use and highlight geographical areas that exhibit greater-than-expected use by collared female caribou. In general, these analyses demonstrate the significance of the ecozone boundary for forest-dwelling woodland caribou, particularly between the Ontario Shield Ecozone and the James Bay Ecoregion from Webequie to Marten Falls, and almost down to Nakina. It also shows great potential for caribou use in the lowlands of the James Bay Ecoregion. Within the Ontario Shield Ecozone, the areas of high suitability are comparatively smaller in size and follow areas of large peatland complexes or tracts of intact older forests (>40 years).

Conclusions and insight

The findings from the FNCP support the notion that caribou conservation in the Far North depends on the maintenance of landscape composition, structure, and ecological functions across broad areas. As such, minimizing cumulative impacts arising from permitted uses, by managing the intensity, extent, and location

of human activities and their interactions will help achieve a balance between development needs and caribou habitat. This may be particularly important along the ecotone of the Ontario Shield–Hudson Bay Lowlands ecozones.

Additional insight into the ecology and management of woodland caribou in the Far North Planning Area (FNPA) include:

1. The interface between the Hudson Bay Lowlands Ecozone and the Ontario Shield Ecozone appears to have ecological significance as both winter and summer habitat, supports calving and nursery functions and may be important as a conduit for travel. The proposed mineral and infrastructure developments associated with the Ring of Fire are located in this area.
2. As caribou travel great distances within the Hudson Bay Lowlands, migratory caribou use habitat in more than one community-based land use planning area and may be hunted by more than one First Nations community. Communication and collaboration among First Nations communities may be beneficial to caribou conservation.
3. Caribou occupancy patterns within the Ontario Shield Ecozone show an inverse relationship to the natural disturbance (forest fire and blowdown) patterns, but also reflect the significance of large areas of peatland ecosystems.
4. Woodland caribou within the FNPA demonstrate a remarkable versatility in adapting their movement patterns and calving site/nursery area selection to various landscapes, and meeting their life requirements on different landscapes.
5. At present, caribou travel freely across the Ontario–Manitoba border, particularly on the Hudson Bay Lowlands. Movement also occurs across the Ontario–Quebec border (not documented in this report).
6. Both the forest-tundra and the forest-dwelling ecotypes exist in Ontario and their extent of occurrence overlaps.
7. A wide variety of ecological conditions is used by caribou to raise their calves. Maintaining caribou habitat function during the calving and nursery season requires an adequate supply of potential calving sites and nursery areas be maintained across the landscape over time.
8. Generally, caribou occupying the FNPA are genetically well-connected and may exhibit a higher level of genetic diversity than caribou to the south, west, and southeast.
9. Caribou within the Hudson Bay Lowlands Ecozone have adapted to living in a low, wet landscape dominated by peatlands that may be susceptible to human activities that alter hydrological patterns.
10. Different investigative methods (collaring, aerial surveys, genetic analysis) reveal different aspects of caribou ecology, and each has strengths and weaknesses. An appropriate balance is required between the various investigative methods given the nature of the planning challenges and the level of investment in knowledge.
11. Population growth rates suggest that there is a risk to caribou within the Far North. Follow-up monitoring (reassessment) is needed to determine whether observed population growth rates indicated a short-term cyclical variation, long-term population trend, or the type and intensity of the survey methods employed (e.g. reassessment in five to 10 years would be appropriate).