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Original Research

Winter Habitat of the Boreal Woodland Caribou (*Rangifer tarandus caribou*) in the Northwestern Region of the Mistik Forest Management Area, Saskatchewan

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Abstract

In January 2017, we surveyed the distribution of boreal woodland caribou (*Rangifer tarandus caribou*) in the northwestern region of the Mistik Forest Management Area (FMA), Saskatchewan, a region known for its extensive jack pine (*Pinus banksiana*) stands. A total of 209 individual caribou tracks were recorded along 10 transects totalizing 126,845 m. Tracks were significantly more frequent than expected in leading (≥60% of stand's composition) jack pine stands ($P<0.001$). Black spruce (*Picea mariana*) and tamarack (*Larix laricinia*) muskegs were used in proportion to their availability ($P>0.05$). Caribou avoided ($P<0.05$) leading aspen (*Populus tremuloides*) stands, and shrub and grass openings. This study showed that caribou preferred jack pine stands in the northwestern region of the Mistik FMA area. These jack pine stands were non-merchantable; most originated from a 25-year-old fire, and were infected with mistletoe (*Arceuthobium pusillum*). Jack pine stands with caribou tracks were found in close proximity to muskegs. Field observations indicated that animals travelled through both habitat types. Although there were many similarities between the findings of this study and those of 2009-2012 in the eastern and southern regions of the FMA area, habitat conservation should be customized at regional level according to the availability of vegetation types, the history of disturbances, and the regeneration capabilities of disturbed landscapes.

Key Words: Boreal Woodland Caribou, Jack Pine, Muskegs, *Rangifer tarandus*, Saskatchewan, Winter Habitat Use.

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INTRODUCTION

In 2002, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) listed the boreal woodland caribou (*Rangifer tarandus caribou*) ecotype as threatened (Thomas and Gray 2002). The main factor affecting the sustainability of caribou populations is habitat loss and fragmentation (Environment Canada 2012). In order to develop an effective recovery program, it is therefore necessary to understand caribou habitat use, particularly in winter when weather conditions are harsher (Proulx 2013). Boreal woodland caribou movements between winter and calving ranges are relatively short so that seasonal home ranges overlap (Rettie and Messier 2000). Therefore, understanding caribou winter distribution is knowing where caribou calving will likely occur.

From 2009 to 2012, habitat queries were developed and tested to predict the distribution of caribou in winter in the southern and eastern regions of the Mistik Forest Management Agreement (FMA) area, Saskatchewan (Proulx 2013). In this study, the majority of caribou tracks occurred in tamarack (*Larix laricinia*) and black spruce (*Picea mariana*) muskegs, and in upland mixed coniferous-deciduous stands located within 2 km from the edge of the muskegs (Proulx 2013). However, only 2.4 km of survey transects crossed pure and mixed jack pine (*Pinus banksiana*) stands (Proulx 2013). In southern and eastern regions of the FMA area, jack pine is often found in association with black spruce in muskegs but extensive stands are relatively scarce. Knowing that jack pine is an important species in the Boreal Plains Ecozone (Environment Canada 2008), it was suggested that caribou track surveys be conducted in other regions of the FMA area where extensive jack pine stands occur (Proulx 2013).

In January 2017, we surveyed the distribution of caribou in the northwestern region of the Mistik FMA area, a region known for its extensive jack pine stands. The objective of this study was to rate the habitat potential of muskegs and forest stands for caribou. We hypothesized that caribou will (H_1) prefer or use in proportion to their availability black spruce- and tamarack- leading muskegs as in the eastern and southern regions of the FMA area, and (H_2) use jack pine stands that are adjacent to these muskegs.

STUDY AREA

The Mistik's FMA area is located in northwest Saskatchewan, north of Meadow Lake (54° 07' N, 108° 25' W), adjacent to the Alberta border (Figure 1). The Mistik FMA area encompasses approximately 1.8 million ha of forests, water, and non-forested land. It is a mosaic of upland deciduous and coniferous boreal forests, open and treed fens and bogs, and water. The area lies within the Boreal Plains Ecozone where white spruce (*Picea glauca*), black spruce, jack pine and tamarack are the dominant conifers (Environment Canada 2008). The study area was located in the northwestern region of the FMA (Figure 1).

METHODS

Snowmobile surveys

Survey transects were ≥ 1-km long and ≥ 1-km apart, and were located in a variety of habitats taking into account accessibility, safety and environmental conditions. An attempt was made to choose transects that crossed suitable and unsuitable habitats based on previous findings (Proulx 2013). Transects consisted of unused seismic lines that had been established in the 1990s, and trails used by local communities during the fall hunting season. Previous winter studies have shown that these linear features did not impact on habitat use by boreal caribou (Proulx 2013, 2015). Transects were traversed by snowmobiles (<10 km/h); the location and direction of survey transects were recorded with a Garmin Oregon 550 GPS unit (Garmin International Inc., Olathe, Kansas, USA).

Along transects, because it was impossible to consistently determine if crossings were made by the same animals, all caribou crossings were tallied (D'Eon 2001; Proulx and Kariz 2005). Tracks that followed transects (i.e., parallel to the snowmobile track) were not recorded. Only caribou tracks that were well-defined and judged to be fresh; i.e., less than 24 h old (subjective assessment based on the experience of the researcher) were recorded (Proulx 2006). When caribou tracks were encountered, they were investigated on both sides of transects to find clear hoof prints (Figure 2) and determine the minimum number of crossing animals.

Caribou track distribution and frequency relative to habitat classes

The GPS location of caribou tracks were reported on forestry maps with Saskatchewan Forest Inventory Vegetation datasets (SFVI; Saskatchewan Environment 2004). Notes on the location of caribou tracks in the field were used to ascertain their location on forestry maps and determine relevant habitat characteristics.

Habitat classes were based on Proulx's (2015) vegetation composition: black spruce-leading (≥60% of composition) stands, tamarack-leading stands, jack pine-leading stands, upland deciduous or mixed coniferous stands with <60% black spruce, tamarack or jack pine, and shrub and grass openings.

Data analysis

The distance travelled in each habitat type was used to determine the proportions of habitat types in the overall

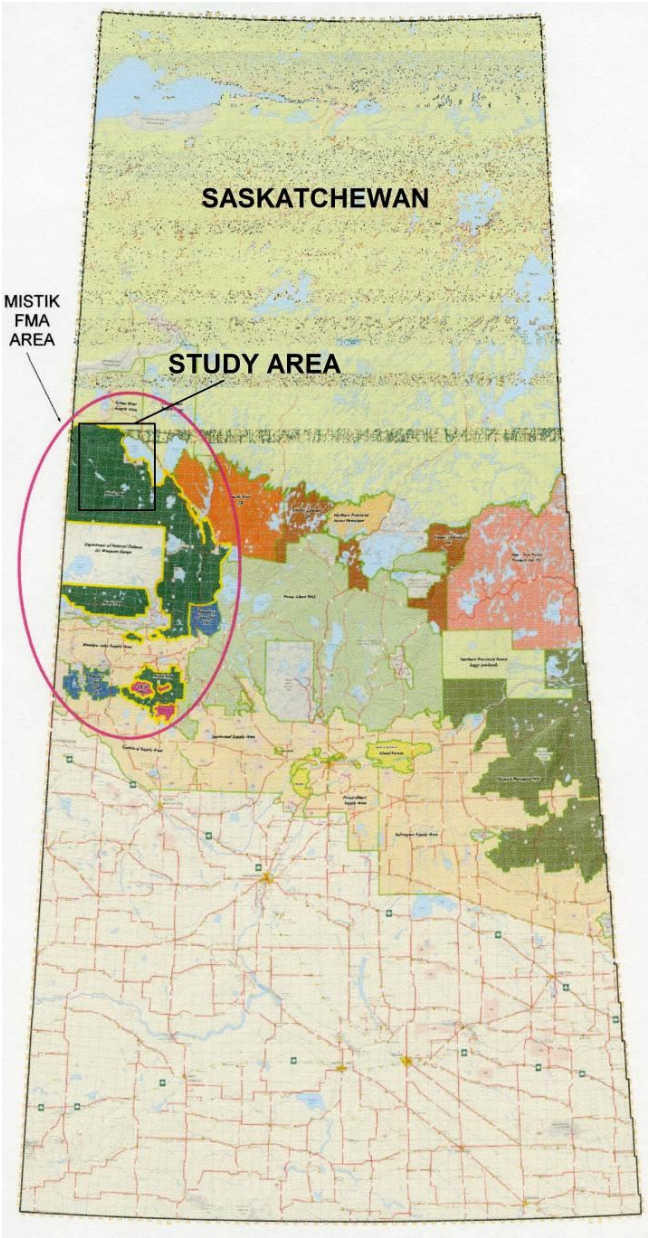

Figure 1. Location of the study area in northwest Saskatchewan.

survey. Such proportions were used to estimate the expected frequency of caribou tracks in each habitat type, i.e., the distribution of tracks according to the availability of habitats surveyed if animals were randomly using all habitats. This expected frequency of caribou tracks per habitat type was compared to the frequency of tracks observed in each habitat type during the snowmobile surveys. Observed versus expected frequencies of caribou tracks in each habitat type were tested with Chi-square statistics and the G-test for correlated proportions to determine which habitats caribou preferred, used as per availability, or avoided (Proulx 2013, 2015). Probability values ≤ 0.05 were considered statistically significant.

RESULTS

Environmental conditions and caribou tracks

Surveys were conducted during 20-28 January 2017.

Figure 2. Boreal woodland caribou track in snow.

Temperatures ranged from 0 to -22° C. There were no snow precipitations other than some flurries; snow accumulations averaged 30 cm on seismic lines. A total of 209 individual caribou tracks were recorded along 10 transects totalizing 126,845 m.

Frequency of caribou tracks in habitat types

Snowmobile transects crossed a variety of stand types (Figure 3). There was a significant difference between observed and expected frequencies of tracks per habitat type ($\chi^2 = 108.4$, df: 6, $P < 0.001$). Tracks were significantly more frequent than expected in jack pine-leading stands (G = 18.6, $P < 0.001$). Black spruce and tamarack muskegs were used in proportion to their availability ($P>0.05$) (Figure 4). There were few upland coniferous stands and no caribou tracks were recorded in these forests. Caribou avoided aspen-leading stands (G = 45.4, $P < 0.001$), deciduous-coniferous stands with <60% black spruce, tamarack or jack pine (G = 5, $P<0.05$), and shrub and grass openings (G = 5, $P<0.05$) (Figure 4).

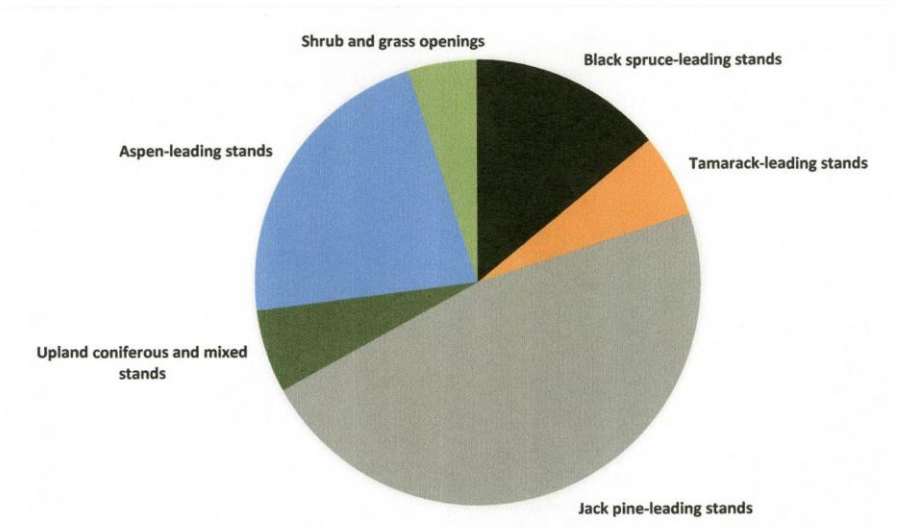

Figure 3. Importance (% of total transect length) of major stand types crossed by snowmobiles, January 2017, northwestern region of the Mistik Forest Management Area.

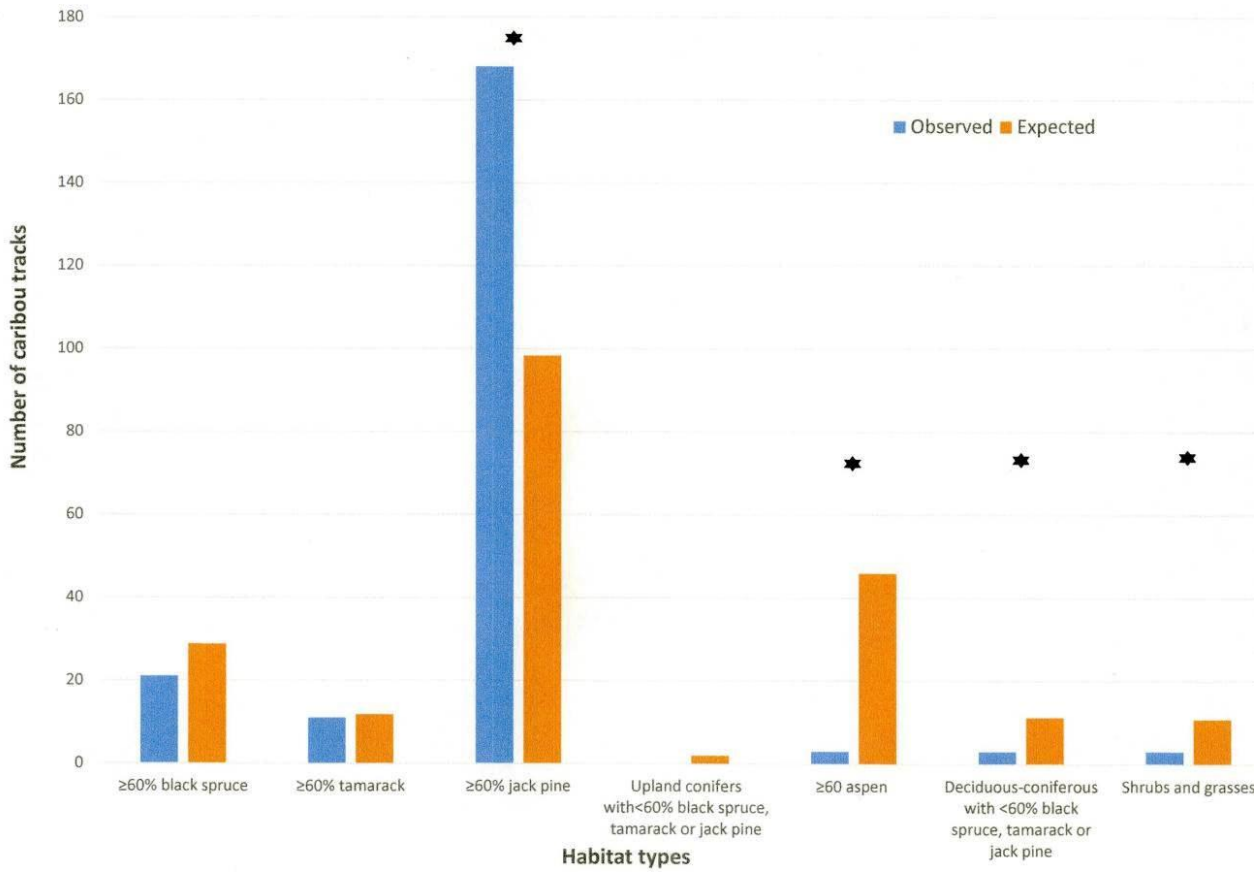

Figure 4. Frequencies of caribou tracks (n = 209) in habitat types, Mistik's FMA northwestern region, January 2017.
✸ - Significant difference between observed and expected frequencies, $P \leq 0.05$.

DISCUSSION

H_1

Our hypothesis that caribou would prefer or use black spruce and tamarack muskegs as in the eastern and southern regions of the FMA area was supported by our findings. Muskegs provide caribou with abundant arboreal lichens and protection against predators. The muskegs' difficult terrain, snow drifts, and vertical cover (Figure 5) impede the pursuit of caribou by wolves (*Canis lupus*). In this study, wolf tracks were present on all forestry roads and seismic lines crossing upland habitats. However, wolves did not enter muskegs.

H_2

This study showed that boreal caribou preferred jack pine stands in the northwestern region of the Mistik FMA area. These jack pine stands were non-merchantable; most originated from a 25-year-old fire, and were infected with mistletoe (*Arceuthobium pusillum*) (Figure 6a). In these stands, caribou pawed and "cratered" down to the ground lichens, particularly on seismic lines (Figure 6b). Jack pine stands with caribou tracks were found in close proximity to black spruce and tamarack muskegs (Figure 7). Field observations indicated that animals travelled through both habitat types. Our findings support H_2, i.e., caribou will use jack pine stands that are adjacent to these muskegs.

The existence of a jack pine-muskeg mosaic is advantageous for caribou. In Alberta, Proulx (2015) showed that muskegs and lodgepole pine (*Pinus contorta*) stands were either preferred types or used in proportion to their availability depending on snow conditions. When snow was deep and the presence of crust interfered with caribou terrestrial feeding, animals re-directed their activities to specific black spruce and tamarack muskegs that provided them with food (e.g., arboreal lichens) and cover. The mosaic of interspersed muskegs and pine stands provided caribou with functional winter habitats during all winter (Proulx 2015).

Although this study and Proulx's (2013) work involved the same caribou population inhabiting the Boreal Plains Ecozone, caribou functional winter habitat (and likely habitats used during the calving period) differed according to regional environmental conditions. This suggests that, although muskegs were commonly used by caribou in both studies, functional habitats will vary at the regional level according to vegetation characteristics, type of disturbance, etc. In the absence of jack pine stands, caribou will survive in muskegs that are properly inter-connected. Where jack pine stands are available, they may take advantage of the jack pine-muskeg mosaic.

Figure 5. Tamarack muskeg used by boreal woodland caribou.

Figure 6. Jack pine stands generated from a 25-year-old fire. Note the presence of a) trees infected with mistletoe, and b) signs of caribou feeding on terrestrial lichens.

Figure 7. Caribou used jack pine stands that were adjacent to black spruce and tamarack muskegs.

MANAGEMENT IMPLICATIONS

This study and Proulx's (2013) findings showed that boreal woodland caribou habitats occurred throughout the Mistik's FMA area. Although this area is subject to frequent and relatively large fires (e.g., Parisien *et al.* 2004, Mistik Management Ltd. 2012), and is crossed by a forestry road and seismic line network (Mistik Management Ltd. 2012), the caribou population continues to persist by using muskegs and adjacent forests, namely non-merchantable jack pine stands.

On the basis of this study's findings, it appears that the habitat management recommendations proposed by Proulx (2013, 2015) would ensure the future of caribou functional habitat in the northwestern region of the Mistik FMA area. A habitat conservation plan should identify high-priority zones consisting of habitats that are preferred or used in proportion to their availability by caribou. In the northwestern region of the Mistik FMA area, these will correspond to black spruce and tamarack muskegs, and jack pine stands found within 2 km from these muskegs. These high-priority habitats should be interconnected, and protected from logging and further oil & gas development activities including exploration and the establishment of seismic lines and pipelines.

Because jack pine stands and muskegs change with time, some may grow into high-quality habitats and others may become less desirable due to a loss of accessible arboreal lichens or a greater predominance of a single species (e.g., black spruce) and tall trees (Proulx 2015). When such habitats become unsuitable, silvicultural interventions should be considered to re-establish the functionality of these habitats and maintain their connectivity.

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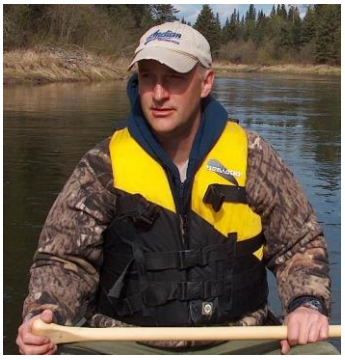
Gilbert Proulx is Director of Science at Alpha Wildlife Research & Management Ltd., and Editor of the scientific journal *Canadian Wildlife Biology & Management*. Gilbert obtained a BSc in Biology from the University of Montreal, a MSc in Biology from the University of Quebec at Montreal, and a PhD in Zoology from the University of Guelph. From 1989 to 1993, he was Head of the Wildlife Section of the Alberta Research Council. In the 1990s, he was an Adjunct Professor at the University of Alberta. Gilbert has 41 years of field experience as a wildlife biologist. He has published 149 refereed papers in scientific journals and books, and 15 textbooks and field guides. His main research interests focus on mammals, particularly in forest and agriculture ecosystems, and on technology development, mainly on mammal trapping and detection methods. In recent years, Gilbert investigated the habitat ecology of boreal woodland caribou in Saskatchewan and Alberta, the food habits of wolves and coyotes in Alberta Counties with and without bounties, the ecology of American badgers in the Prairies, and the ability of killing neck snares to humanely capture wild canids.

Kevin Gillis is the certification coordinator at Mistik Management Ltd and maintains 4 current registrations for the company (FSC Canadian Boreal Standard, FSC Controlled Wood & Chain of Custody, PEFC:CSA Z809 Sustainable Forest Management and ISO 14001 Environmental Management System). Kevin is a Registered Provincial Forester with the Association of Saskatchewan Forestry Professional since 2007. He is an Integrated Resource Management Diploma graduate from the Saskatchewan



Institute of Applied Sciences and Technology. He also has a Wildlife Technician Certificate from the North American Wildlife Technology Association. Since 2013, he serves as a committee member of FSC Canada's Standards Development Group. Kevin has worked in Saskatchewan forests for the past 24 years integrating and implementing forestry activities in socially and environmentally sensitive landscapes. He has led and developed Mistik's species at risk program for the last 10 years. Kevin is currently participating in the federally developed program *Climate Change and Sustainable Forest Management in Canada: a Guideline for Assessing Vulnerability and Mainstream Adaptation into Decision Making*.

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