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Status of woodland caribou in Saskatchewan

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Abstract: Recent research has shown that woodland caribou in Saskatchewan exist as relatively separate populations within a metapopulation. Preliminary analyses show that individuals within all populations are selecting peatland habitat types (i.e., fens and bogs) throughout the year. Despite an absence of hunting, populations south of the Precambrian shield appear to be declining slowly, while those on the southern margin of the shield may be declining more rapidly. The apparent population decline is likely due to high rates of predation, especially on neonates. To maintain viable caribou populations in the region, forestry operations must be managed to maintain adequate amounts of preferred habitat types and connections among populations. At a coarse scale, preferred habitat is that which acts as a refuge from predators. Additional information is required to categorize specific peatland types, as data in the existing provincial forest inventory are inadequate for both selection analysis and management purposes. Ongoing research into revisions to the forest inventory and analyses of bog and fen types selected by caribou are needed to focus future management strategies.

Key words: demography, forestry, habitat,management, metapopulation, peatland, population.

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Background

Woodland caribou (*Rangifer tarandus caribou*) in Saskatchewan range from the southern limits of the ranges occupied by the Beverly and Qamanirjuaq herds to the southern margin of the boreal forest (Fig. 1). Kelsall (1984) estimated the provincial population at 2500 animals (ca. 0.01 caribou·km^{-2}) and Edmonds (1991) considered all woodland caribou in the province to belong to the boreal ecotype. Furthermore, Ruttan (1960) observed few interactions among individual groups of caribou in the region, suggestive of several populations within a metapopulation (*sensu* Wells & Richmond, 1995).

Rock (1992) concluded that most human impacts on caribou habitat in Saskatchewan have been restricted to the area south of the Churchill River, particularly in the area south of the Precambrian shield that contains the province's commercial forestry operations (Fig. 1). In 1966 the province's first pulp mill was constructed, and road building began in the southern boreal forest. Logging and other habitat disturbances that favour early seral stages are thought to support higher moose (*Alces alces*) and white-tailed deer (*Odocoileus virginianus*) densities, leading to a subsequent increase in wolf (*Canis lupus*) density (e.g., Schwartz & Franzmann, 1989). Holleman & Stephenson (1981) documented the preference of wolves for caribou and other small ungulates when they were available. An increase in moose density can therefore facilitate predation on caribou by wolves (Bergerud & Ballard, 1988). Although wolves have been observed preying upon caribou throughout the region, moose and white-tailed deer have been thought to be more common prey (Ruttan, 1960; Trottier, 1986).

Prior to the mid 1980's, data available on caribou demography were largely limited to information on the success rates of sport hunters. The provincial licensed caribou harvest peaked in the early 1970's, and was followed by 13 years of steadily declining

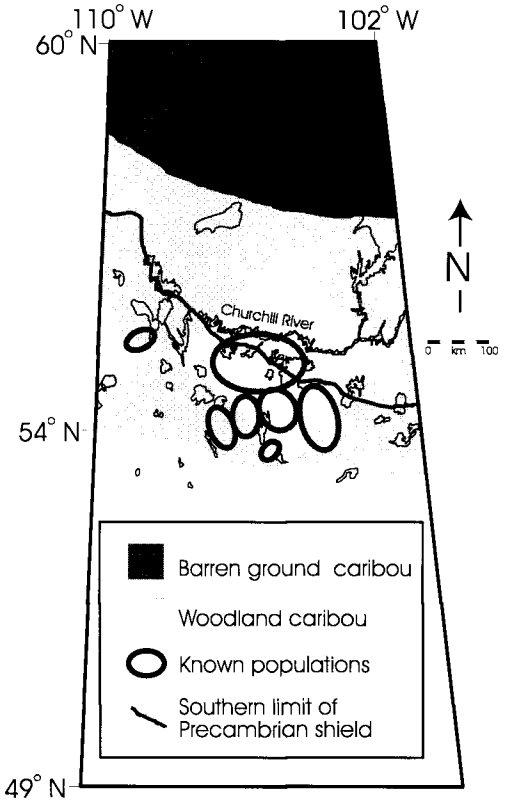

Fig. 1. Distribution of caribou in Saskatchewan showing location of identified woodland caribou populations.

hunter success rates prior to a moratorium being put in place in 1987 (Rock, 1992). Hunter success rates declined by an order of magnitude during this period. Though the use of population trend data has been characterized as unreliable in recent literature (e.g., Bradshaw & Hebert, 1996), the data used by Rock (1992) were collected in the same area by the same method over a 20 year period and they show a clear trend of decline. Rock (1992) reported that hunting was the likely proximate cause for the observed decline. Local reports indicated that increased hunting followed the increase in logging activity and road construction, and resulted in the decline or disappearance of many local caribou populations (Trottier, 1988). The pattern of decline or extirpation of woodland caribou populations following human activity has occurred across North America (Bergerud, 1974).

From the limited data available, Rock (1992) concluded that the birth rate of caribou in the region was high, but that both calf and adult survival rates were low. Minimal levels of subsistence hunting (Trottier, 1986) and the end of sport hunting should have produced an increase in the caribou population in the absence of major limiting effects of food shortage, disease, or predation. Rock (1992) speculated that the northern portion of the region was likely to contain the best remaining caribou range based on a history of limited logging activity and his assessment of the quality of the available habitat types in the area. Edmonds (1991) suggested that the required information on caribou in Saskatchewan should include a provincial caribou inventory and the acquisition of data on the size and status of various herds, as well as the delineation of caribou range.

Recent research

The first major study of woodland caribou in Saskatchewan was conducted between 1992 and 1996 with the objectives of assessing habitat selection and demographic performance of caribou south of the Churchill River (Fig. 1).

Demography

Caribou in central Saskatchewan are segregated into several populations with few interactions among individuals from differenr populations (Rettie & Messier, in press). This finding supports the observations reported in Ruttan's (1960) work, as well as more recent results in Alberta (Stuart-Smith *et al.*, 1997).

Rettie & Messier (in press) discussed demography of the woodland caribou metapopulation in central Saskatchewan and their findings are summarised in Table 1. Adult mortality of caribou in the region was similar to that reported for other populations thought to be in decline (e.g., Fuller & Keith, 1981; Stuart-Smith *et al.*, 1997). Rettie & Messier (in press) suggested that the metapopulation was not food limited based on their observations of early reproductive maturity, a high pregnancy rate, and a high parturition rate. They calculated the rate of increase from 1993-1996 survival and recruitment data and attributed the low rate of increase to high rates of predation on neonates and adult animals. Although Rock (1992) speculated that the more northerly portions of the study area would contain the best caribou habitat owing to lower levels of human disturbance, Rettie & Messier (in press) found the poorest demographic performance ($r = -0.16$) among animals in this region. The metapopulation does not appear to be increasing despite

Table 1. Demographic performance of woodland caribou in central Saskatchewan based on data from 1993-1996 (from Rettie & Messier (in press)).

Parameter	Value*
Adult survival rate (n = 63.6 caribou radio-tracking years)	0.84 ± 0.05
Conception rate of females at 16 months (n = 5 cows)	1.00 ± 0.00
Pregnancy rate (n = 51 cows)	0.94 ± 0.03
Minimum parturition rate (n = 28 cows)	0.86 ± 0.07
Calf:cow ratio (March) (n = 223 cows)	0.28 ± 0.03
Metapopulation rate of increase	-0.05 ± 0.06

* All rates and ratios presented as mean annual values ± 1 SD.

a ban on sport hunting and reportedly low levels of subsistence hunting. Rettie & Messier (in press) suggested that high levels of ptedation arising from (1) higher densities of black bear (*Ursus americanus*) and (2) an increase in wolf numbers in response to expanding moose and deer densities, were the proximate causes of the lack of population growth. Increased predation, especially on caribou neonates may be independent of caribou density and may ultimately be linked to habitat changes following logging.

Habitat selection

The distribution of woodland caribou populations is heterogeneous in response to habitat characteristics that may isolate them from wolves as reported by Cumming *et al.* (1996). Rettie and Messier (in press) speculated that such behaviour may place calving caribou in areas with higher densities of black bears. Preliminary analyses (Rettie - unpublished data) suggested that caribou in central Saskatchewan preferentially select peatland habitat throughout the year. Areas on the Precambrian shield may be inherently different in the quantity, quality, or distribution of peatland habitats secure from predators and may be more sensitive to human disturbance than areas further south. The provincial forest inventory maintained by the Forestry Branch of Saskatchewan Environment and Resource Management places the numerous distinct bog and fen communities into two coarse peatland (or "muskeg") categories. The lack of detailed information in the forest inventory has precluded the identification of specific bog and fen communities that woodland caribou may be selecting. Researchers at the Universiry of Alberta have recently completed a detailed classification of bogs and fens in a 5000 km^2 portion of central Saskatchewan to provide the data against which to measure selective use by woodland caribou.

Current status of woodland caribou in Saskatchewan

Information currently available does not permit a revision of Kelsall's (1984) esrimate of woodland caribou in Saskatchewan. Population trends suggest that the caribou metapopulation south of the Churchill River is fragmented and likely declining. The effect of logging activity in the area has included the production of habitat well suited to black bears, moose, elk (*Cervus elaphus*), and white-tailed deer, and hence to wolves. Viable caribou populations inhabit the remaining patches of habitat that are extensive enough to provide refuge from predators. Continued resource exploration and extraction in central Saskatchewan will further limit the amount of caribou habitat available and will result in the decline, and possibly the disappearance, of local caribou populations.

Research and management recommendations

If caribou are to remain viable in the region south of the Churchill River, the persistence of small local populations should be the key management objective as there appears to be little movement among populations. Furthermore, movements among populations are likely to become more restricted as the region becomes increasingly fragmented by roads and logged areas, an outcome that may pre-

vent recolonization following local extinctions. Providing habitat to preserve the areas with low densities of predators used by local caribou populations, as well as to preserve corridors among them, should represent a management priority. Recent research activities have identified some of the remaining caribou populations, and will ultimately provide information on selective use of various habitat types. In this regard, it is likely that more data will be required to quantify the availability of the various types of peatlands in the region. These data are required ro assess the relative preferences of caribou for different types of bogs and fens.

In contrast to the predictions of Rock (1992) we do not expect current research to support the idea that the best woodland caribou habitat in the region is in the areas on, or immediately adjacent to, the Precambrian shield. Despite higher levels of disturbance, the caribou populations which are stable or possibly even increasing are to be found further south. Though the more sourherly populations are closer to active logging operarions, they may still have access to larger or higher quality predator-free areas. The proximity of logging operations to remaining caribou popularions increases rhe need for prompt action.

In summary, we agree with Edmonds (1991) that some local caribou populations may not be viable, and support the recommendation of Rock (1992) that parts of the boreal forest will need to be managed for caribou in order to ensure their persistence. Long-term monitoring of the distribution and demography of caribou in the region will be required to assess the success of any management strategies. Effective management will require cooperation from the foresr industry, government, and aboriginal groups as suggested by Thomas & Armbruster (1996).

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