

Integrating woodland caribou needs and forestry: perspectives of Alberta's forest industry

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Abstract: Much of Alberta's woodland caribou (*Rangifer tarandus caribou*) range outside protected areas is subject to commercial forest management. In this paper, I discuss some perspectives of the forest industry regarding caribou-related issues. Six forest companies holding Forest Management Agreements (FMAs) in Alberta were polled. Forest managers were most concerned about 2 aspects of caribou management: reductions of annual allowable cut (AAC) that may be necessary to provide for caribou habitat needs; and management of public access. Perceived information gaps fell into 3 categories: caribou demographics (population size, trends and densities); primary limiting factors of caribou populations (including the influence of human activity); and caribou habitat requirements (including the effects of timber harvest on caribou habitat). Increased costs associated with consideration of caribou have been incurred at the planning and operational levels. However, those costs have been low, primarily because much proposed harvest in caribou ranges has been deferred. Costs are expected to increase substantially in the future as timber from caribou ranges is required to meet harvest objectives. Other issues identified included: the desire for an adaptive management approach to caribou-forestry interactions; the need to incorporate natural-disturbance-regime models into forest planning; consideration of the cumulative effects on caribou of all industrial and recreational activities; and unmanaged harvest by First Nations people. A list of caribou-related projects conducted or supported by forest companies in Alberta during the past 5 years is provided.

Key words: woodland caribou, *Rangifer tarandus*, forestry, forest management.

Rangifer, Special Issue No. 10, 213–219

Introduction

The woodland caribou (*Rangifer tarandus caribou*) was designated as an endangered species in Alberta in 1985. Since then, extensive natural resource development (forestry, oil and gas, mining, recreation, peat harvesting) has caused managers to become increasingly concerned about caribou populations throughout the province.

Much of Alberta's woodland caribou range outside protected areas is subject to commercial forest management (Fig. 1). Forestry has the potential to alter large areas of caribou habitat through timber harvest and the creation of access routes. To limit potential impacts, the provincial government has required forest companies to implement measures designed to reduce potential impacts to caribou and caribou range. Companies also have recognized the importance of maintaining caribou as a component

of the province's ecosystem, and have started programs to learn more about caribou and their habitat.

The forest industry is an important sector that will help to determine the direction of woodland caribou research and management in Alberta. In this paper, I discuss the perspective of forest companies holding Forest Management Agreements (FMAs) regarding caribou-related issues, including perceived knowledge gaps, studies done to fill those gaps, the operational and financial costs of integrating caribou needs into forest practices, and other management-related concerns.

An FMA allows a company to harvest timber on a sustainable basis on a designated portion of public forest land (Alberta Environmental Protection, 1996). As part of the agreement, the company must consider the impact of logging on other forest

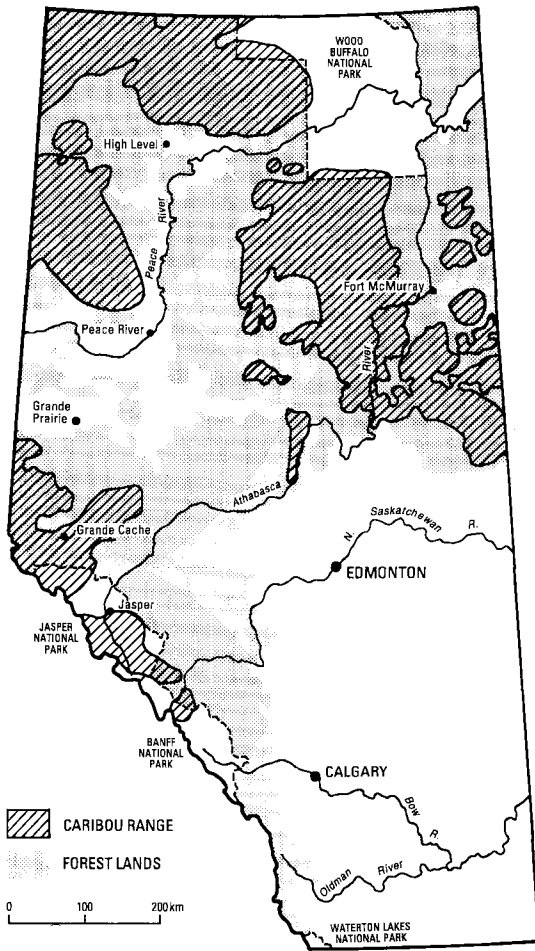


Fig. 1. Caribou distribution and forest lands in Alberta.

values such as fisheries, wildlife, and environmental quality. Maintaining adequate quality and quantity of caribou habitat is one component of that responsibility.

Methods

I sent a questionnaire to individuals responsible for caribou management for 6 forest companies holding FMAs in Alberta. The questionnaire was intended to provide information on the perceptions of forest managers about caribou management and its effects on forest planning and operations. Results were not analysed statistically. All information provided is included. Some answers were edited for brevity or combined with others that were similar, while attempting to retain the substance of the response.

Responses under each heading are not necessarily ranked by importance, although those given more than once are listed initially in each category. In some cases, I have added annotation to summarize remarks and to contribute an additional perspective.

Results

Replies to the questionnaire were received from all 6 companies (Appendix 1). Responses are presented below by individual question.

1. *Approximately what proportion of your FMA is considered caribou range?*

There was a wide range among FMAs in the proportion considered as caribou range:

- 5-10% ($n = 2$ FMAs);
- 30% ($n = 3$ FMAs); and
- 75% ($n = 1$ FMAs).

The proportion of the annual allowable cut (AAC) contained within caribou range may be greater than the proportion of the FMA considered as caribou range because of the reliance of caribou on older-aged stands which have greater timber volumes per area of land than younger-aged stands. Companies with 30% or more of their FMA within caribou range have committed more resources to studies of caribou, but all acknowledge the importance of caribou issues and related investigations.

2. *What are the 3 most important issues regarding caribou and forestry in your FMA?*

Of the issues identified, the 3 most commonly cited were:

- Potential reductions of AAC ($n = 3$ responses);
- Finding ways to maintain long-term habitat supply ($n = 4$ responses);
- Access management ($n = 4$ responses).

Timber harvest has been deferred in known caribou range by most companies in an attempt to limit potential impacts. Deferrals reduce the effective land base for harvest and may require reductions in the AAC in both the short (annual) and long (rotational) terms. As an alternative strategy, harvest has been reduced in some parts of caribou range to limit habitat change. The reliance of caribou on older-aged stands has the potential to intensify the effects of deferrals or reduced harvest. Reductions in AAC represent additional planning costs, a loss of logs to the mill, and reduced capacity.

Finding ways to maintain long-term habitat supply for caribou included developing a better understanding of: caribou habitat needs; caribou use of merchantable timber stands; and the effects of timber harvest on habitat. Related operational questions included "what harvest patterns are most appropriate?" and "when is it appropriate to apply summer vs. winter logging?"

Roads and associated access generally are recognized as an important impact of natural resource development. For caribou, the intrusion of roads can mean increased hunting, both legal (by First Nations people) and illegal, and habitat fragmentation. There also is concern that compacted snow on trails or plowed roads can make caribou wintering areas more accessible to wolves. How roads are used once they are developed is crucial in determining their impact. Managing access is difficult and can be expensive.

Other important issues included the following points:

- The effects of forestry on large-mammal predator-prey relationships (in Alberta these systems may be complicated, involving up to 7 ungulate species and 6 potential predators);
- The effects on caribou of disturbance associated with development, including logging, oil and gas, mining, and recreational use; and
- Public perception regarding stewardship of caribou and caribou habitat.

In general, there is a concern by forest managers about the level of scientific knowledge available regarding caribou/forestry relationships. Important information gaps are considered below under question 3. Studies are underway to answer some questions (see question 4); however, results and conclusions are slow to be realized.

3. What are the 3 most important information gaps regarding caribou in your FMA?

The answers to this question fell into only 3 categories, including:

- Caribou population size, trends and densities ($n = 6$ responses);
- Primary limiting factors and how those interact to influence caribou populations ($n = 4$ responses);
- Caribou habitat requirements ($n = 6$ responses), including the effects of timber harvest on caribou habitat ($n = 2$ responses).

There was a consensus that a better understanding of caribou population sizes and trends is crucial. This requirement creates an important dilemma. The success of management efforts ultimately will be judged by the presence or absence of viable caribou populations. However, biologists have been attempting for years, with limited success, to devise adequate techniques for surveying caribou populations under dense forest cover. Population numbers or trends are difficult or impossible to discern (Thomas, 1998). Even the natural variability in caribou population sizes is difficult to determine in many instances. The management goal of maintaining viable populations will be difficult to realize if we cannot understand how management measures affect population change.

In a related aspect, forest companies wish to know what factors are acting to limit caribou populations. Forest managers would prefer to manage those elements over which they have direct control, such as habitat change, disturbance, and access. They have no mandate to deal with factors such as predation and no ability to deal with factors such as climate. However, because most limiting factors (predation, food, climate, insects and parasites, hunting, and human development; Klein, 1991) relate to habitat in some way, it is important that forest managers understand how those factors operate and how they are interrelated. For example, at least one company has changed their cut block design to reduce enhancement of moose habitat, thereby reducing the potential of altering predator-prey relationships.

Every respondent included habitat requirements of caribou as an important knowledge gap. This information is fundamental to understanding the impacts of forestry on caribou. The habitat relationships of woodland caribou have been the subject of systematic study for less than 20 years. In Alberta, the first detailed examination of ranges on provincial lands began in 1979. Other studies have been started since (see question 4, below), but progress has been slow due to the complex nature of caribou habitat selection, the inherent low densities of the animals, and environmental variability. Studies (e.g., Brown *et al.*, 1994; Edmonds, 1988; Stuart-Smith *et al.*, 1997) have shown that due to the wide range of movement and habitat-use patterns exhibited by caribou across the province, basic habitat relationships for each herd should be determined before the results obtained in other areas are applied.

4. *What caribou-related projects have you undertaken or funded during the past 5 years to fill those, or any other, gaps?*

- Much of the recent research conducted in the province has been related to caribou habitat selection, primarily in response to the information gaps discussed in question 3.

A list of projects supported by forestry companies during the past 5 years is provided in Appendix 2. Several studies based on radio-telemetry and backtracking have been initiated recently to determine basic aspects of caribou habitat use. Many fundamental questions remain regarding caribou habitat needs at the landscape and stand levels, caribou food habits, influences of environmental variables on caribou habitat selection, and the short- and long-term effects of timber harvest on caribou habitat use.

The advent of regional standing committees has been important to caribou research programs in the province, and all of the FMA holders questioned have been supporters and active participants. The first multi-sector committee was organized in west-central Alberta in 1989 to increase knowledge and communication among industries, government managers, public interest groups and researchers, and to provide a framework for research and information gathering. Formalized standing committees then were formed across the province in the early 1990s, primarily in response to provincial government policy for oil and gas development on caribou range (Alberta Forestry, Lands and Wildlife, 1991).

The standing committees have come to coordinate much of the caribou-related research in the province. Three committees currently are active in separate regions. Recently, the research subcommittees in the northeast and northwest have cooperated to coordinate research efforts.

Participants in the standing committees include representatives of government agencies (wildlife management, forestry and mineral resources), and resource industries (forestry, oil and gas, and pipelines). Other representatives on some committees include other industries (peat extraction, mining), public interest groups, trapper and outfitter organizations, and researchers. Dissatisfaction regarding the committee process was expressed by one respondent. However, the development of a forum that involves most sectors with an interest in the land has been important in obtaining funding, sharing information, reducing unnecessarily repetitive re-

search, and reaching agreements about caribou management measures.

Although much importance was placed on gaining more information about population numbers, population trends, and limiting factors (see question 3), forest companies have undertaken only a few studies to address those issues (e.g., Stuart-Smith *et al.*, 1997). This is largely because the responsibility for population management rests with the provincial government, and forest companies have considered those investigations beyond their mandate. By participating in the standing committees, forest companies will begin to contribute to population studies.

5. *How has planning been affected by trying to incorporate caribou needs?*

Measures have included:

- Deferral of harvest on caribou range;
- Changes in cutblock sequencing;
- Changes in the timing of harvest to avoid winter ranges or condensing the harvest period to ensure logging is completed before late-winter;
- Increasing cutblock sizes to reduce their attractiveness to moose;
- Development of access management plans; and
- In one case, the development of a specific "caribou protection plan."

To date, these measures have been considered easy to incorporate into planning. Changes in cutblock locations suggested by management agencies late in the review process have caused some complications for at least one company. Harder decisions related to deferrals and reductions in AAC may be yet to come as more is learned about the woodland caribou's need for habitat and space.

One company has started a relatively new approach to timber management on caribou ranges. For the purposes of planning, individual winter ranges will be treated as separate, sustained-yield units (i.e., each range will have its own AAC), with cutting sequences developed to ensure that intact "chunks" of habitat adequate in size and composition for caribou needs are maintained. The approach is in the early stages of development, and other factors such as relative geographic location, vegetation composition, and stand structure, have not yet been integrated. Until the critical characteristics of winter ranges can be defined, planners are designing harvest programs to more-closely resemble the

natural landscape patterns of forest stand size, shape, and age.

6. *What have the real effects been on operations, and how difficult have those changes been to implement?*

All but one company has, at some time, delayed harvest in caribou range on their FMA. On at least one caribou winter range, the second harvest pass has been conducted earlier than originally planned. That strategy was taken to avoid entry into the remainder of the range, and to create a large block of approximately even-aged stands that will be available to caribou as the forest matures. The modification of logging techniques by implementing measures such as selective logging is being considered, depending on the effects of those measures on lichen regeneration trials (see Appendix 2). Implementation of these measures has been considered straightforward.

7. *Please describe where additional costs have been incurred as a result of changes to planning and operations due to caribou-related concerns.*

There are direct costs associated with measures to integrate caribou needs and forestry. Some areas in which additional costs have been incurred include:

- Active harvest by 2 companies has been stopped by government order;
- Increased annual and long-term planning costs and additional time have been required to accommodate deferrals, to make changes in road and cutblock design, and to identify effective harvest alternatives;
- Movements of additional logging equipment and loaders into the caribou zone has been necessary to ensure harvest is completed during the available operating window;
- Seasonal restrictions have been placed on timber supply due to winter-only harvest;
- Caribou-related research has required direct funding;
- Access management measures have been implemented;
- Additional road access has been built into areas outside of caribou range to replace deferrals;
- Silvicultural costs have increased due to restricted access following the reclamation of roads for access-management purposes; and
- Signs have been developed and installed to inform the public about caribou and the need for road closures.

8. *Are there any other issues that you would like to have addressed or resolved with respect to caribou and timber harvest in your FMA?*

Other issues that respondents wished to raise included the following points:

- An adaptive-management approach (Walters, 1986) to caribou was considered necessary. There exist no definitive answers about the long-term impacts of timber harvesting on caribou. Therefore, impacts must be monitored and approaches modified when necessary. An important issue arising from the adoption of an adaptive approach is the question of responsibility for the required monitoring. The forest company representative who raised this issue believes that the responsibility is jointly government's and industry's.
- The use of models for forest planning based on natural-disturbance regimes (i.e., attempting to more-closely emulate the natural range of variability of the ages, shapes and sizes, composition, structure, and distribution of forest stands) is being investigated. This approach would allow positive management action before a complete understanding of caribou habitat requirements is developed, and would address forest-management issues such as the conservation of biodiversity.
- Several respondents stressed that the cumulative effects to caribou of all industrial and recreational activities should be considered when developing management plans. They considered that to focus on forestry issues in a vacuum ultimately will be detrimental to the caribou populations.
- One respondent indicated a need for more information on sensory disturbance of caribou and the ability of caribou to habituate to predictable industrial activity.
- One respondent considered access management to be a "Band-Aid" solution, and that education to ensure that the public recognizes the need and role of access management may be a better investment.
- Although recreational hunting of caribou has been prohibited since 1981, caribou still may be harvested, without limit or timing restrictions, by First Nations people. Forest companies recognize that hunting by First Nations could negate other management initiatives.
- One respondent suggested that consideration be given to allowing no further coniferous tim-

ber allocation until issues such as caribou habitat supply are resolved.

Clearly, some of these issues are controversial, but the responses reflect the wide diversity of opinion among forest managers.

Conclusions

The forest industry and provincial agencies alike are concerned about maintaining woodland caribou in Alberta. Forest companies are attempting to find means of incorporating caribou habitat needs into forestry practices without experiencing serious reductions in AAC. Planning and operational costs have been increased by implementing measures to reduce the impacts of timber harvest on caribou and by conducting biological research. Those costs are expected to increase substantially as more is learned about the population biology and habitat relationships of caribou.

Specific concerns of forest companies relate to potential loss of AAC through deferrals or changes to harvest practices within caribou range, such as the alteration of seasonal timing, cut patterns, and rotation length. Access management within operating areas is of particular concern. Applied research projects that are underway relate primarily to caribou habitat requirements. However, forest managers also have a need for information on caribou population status, dynamics and primary limiting factors, all of which are difficult and expensive to study. Limited availability of funds makes research into those aspects more difficult. The formation of regional committees that include a wide range of land users has been important in dealing with that issue by obtaining funding from a range of sources, sharing information, reducing unnecessarily repetitive research, and reaching agreements about caribou management measures.

Woodland caribou occupy a wide range of habitats across the province, leading to a diverse pattern of habitat use and movement patterns. Respondents agreed that the transfer of information directly from herd to herd should not be done uncritically. Although there may be many similarities between populations, variations in habitat types and availability, distribution of other ungulates and predators, and environmental variables such as snowfall can have substantial effects on caribou behaviour.

Forest companies accept that adaptive-management models may be useful in dealing with caribou

because many important questions remain unanswered regarding caribou-forestry relationships. If adaptive management is to be applied toward caribou in commercial forests, managers must ensure that proper experimental design and adequate monitoring are included in programs. The relative responsibility between the government and private sectors for that monitoring must be resolved. Some companies also are considering the use of natural disturbance models and cumulative effects analyses as management tools.

Acknowledgments

I am indebted to the individuals listed in Appendix 1 for taking the time to answer the questionnaire and review an earlier draft. I especially thank Randy Poole and Bob Wynes who have provided much information during hours of informal discussion about caribou and forestry. Marilyn Croot, Sun Mountain Graphics Services, prepared Fig. 1. Two anonymous reviewers and Warren Eastland provided valuable comments on an earlier draft.

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Appendix 1. Questionnaire respondents.

Greg Branton, Alberta Newsprint Company, PO Bag 9000, Whitecourt, AB, T7S 1P6.

Daniel Gilmore, Canadian Forest Products Ltd., PO Bag 100, Grande Prairie, AB, T8V 3A3.

Randy Poole, Weyerhaeuser Canada Ltd., PO Bag 1020, Grande Prairie, AB, T8V 3A9.

Gordon Stenhouse, Weldwood of Canada Ltd., 760 Switzer Drive, Hinton, AB, T7V 1V7.

Shawn Wasel, Alberta Pacific Forest Industries Inc., PO Box 8000, Boyle, AB, T0A 0M0.

Bob Wynes, Daishowa-Marubeni International Ltd., PO Bag 2200, Peace River, AB, T8S 1Y4.

Appendix 2. Caribou-forestry projects undertaken by forest companies during the past 5 years in Alberta.

Alberta Newsprint Company

- Habitat suitability index (HSI) model designed to predict the occurrence of lichen on the basis of forest cover and soils.
- Support for the West-central Alberta Caribou Standing Committee to encourage information exchange and to fund research.

Alberta Pacific Forest Industries, Inc.

- Distribution and seasonal movements, including habitat preference and use of recently disturbed sites based on an intensive radio-telemetry program.
- Caribou population dynamics.
- Response of caribou to industrial disturbance.
- Access management and caribou distribution relative to linear corridors.
- Support for the North-east Region Standing Committee on Caribou to encourage information exchange and to fund research.

Canadian Forest Products Ltd.

- Support for the West-central Alberta Caribou Standing Committee to encourage information exchange and to fund research.

Daishowa-Marubeni International Ltd.

- Radio-telemetry studies of caribou to determine caribou distribution and movements.
- Back-tracking and fecal pellet analyses on caribou winter range to assess habitat use patterns.
- Caribou habitat analysis using GIS.
- Peatland classification for caribou habitat analyses.
- Support for the Northwest Region Standing Committee for Caribou to encourage information exchange and to fund research.

Weldwood of Canada Ltd.

- Effects of forest harvesting on lichen growth to assess lichen response after various harvesting strategies.
- Review of caribou habitat supply for west-central Alberta.
- Caribou habitat selection and the effects of logging on caribou distribution as a component of the Foothills Model Forest.
- Support for the West-central Alberta Caribou Standing Committee to encourage information exchange and to fund research.

Weyerhaeuser Canada Ltd.

- Detailed habitat assessments of 3 caribou winter ranges.
- Caribou distribution surveys on 2 winter ranges.
- Caribou habitat selection and the effects of logging on caribou distribution as a component of the Foothills Model Forest.
- Support for the West-central Alberta Caribou Standing Committee to encourage information exchange and to fund research.