

# WHERE DO THE CARIBOU ROAM?

By **Chris J. Johnson**  
and  
**Katherine L. Parker**

WOODLAND CARIBOU are an enigmatic group of ungulates that have puzzled taxonomists and naturalists since before the days of modern scientific inquiry. The Italian explorer John Cabot was probably the first European to provide written reference characterizing Newfoundland caribou as "Stagges farre greater than ours." Since that time an enormous amount of effort has been spent simply trying to classify the now recognized woodland caribou and their *Rangifer* relatives. The taxonomic record is proof of this confusion and debate; subsequent to the printing of Linnaeus's Tenth edition of *Systema Natura* in 1758, numerous authors have described and redescribed 55 species and subspecies of caribou and reindeer. It was not until 1961 that the presently accepted classification of caribou and reindeer was published. In his manuscript, Banfield provided succinct descriptions of woodland caribou biology and habitat.

**BIOLOGY.** Only moderately gregarious; live in small bands. Undertake local seasonal migrations, often altitudinal; individually more wary; polygamous. Usually one mature bull collects and serves a harem; rut commences in late September; parturition occurs in late May.

**HABITAT.** Bogs, swales, and alpine tundra in boreal coniferous forested regions. Depend upon ar-

Photograph by Chris Johnson

boreal lichens for winter food to a large extent.

Those descriptions suggest that we have a good understanding of where to find woodland caribou and how they make a living. Surprisingly, 37 years later, much of the basic life history and ecology of the animals is still unclear. This is a consequence of the incredible diversity of habitats that the animals occupy and strategies that they employ to meet the universal requirements of survival and reproduction. Woodland caribou range across an extremely large area: east to west from Newfoundland to British Columbia and north to south from Yukon to Washington and Idaho. It is this diversity of place and resulting behavior that makes understanding and characterizing the animals both difficult and intriguing.

## CARIBOU IN BRITISH COLUMBIA

Three distinct types of woodland caribou are found across British Columbia. Once separate subspecies, the mountain, northern, and boreal ecotypes are now considered *Rangifer tarandus caribou* by the taxonomists, but are distinguished by managers and biologists based on their unique life history strategies. The mountain caribou occur in the lowest numbers and range over a relatively small area. Those caribou are found in the south central to south eastern portions of the province and are of the same ecotype as those in northern Idaho and northeastern Washington. As the name implies, mountain caribou inhabit rugged mountain ranges during the winter, foraging almost exclusively on arboreal lichens at mid to high elevations where deep snow depths prevent access to terrestrial forage types.

The northern woodland caribou occur in the central to northern portions of the province where topography and snow depths are more variable. Those animals illustrate a variety of winter foraging strategies. They are found cratering for terrestrial lichens on windswept alpine ridges and in valley bottoms.

Like their mountain caribou cousins, the northern caribou also take advantage of arboreal lichens when snow limits access to ground lichens. The boreal ecotype, sometimes lumped with the northern caribou, occurs in the boreal forests of the northeastern portion of the province. They are unique in that



they do not occur in large discrete herds, but are found in small, dispersed bands.

## A LONG HISTORY OF DECLINE

Beginning in the late 1800s, the distribution of woodland caribou across North America began to recede northward. Before this time, woodland caribou were reported as far south as northeastern Vermont, northern New Hampshire, and across northern Michigan, Wisconsin, Minnesota, Montana, Idaho, and northeastern Washington. Caribou were also more abundant and widespread in Canada, being found in the southern portions of all of the provinces. Today, however, woodland caribou are just footnotes in the historical faunal accounts of Nova Scotia, Prince Edward Island, New Brunswick, and, except for remnant populations that enter Washington and Idaho, the previously listed states. Causes for the reduction in distri-

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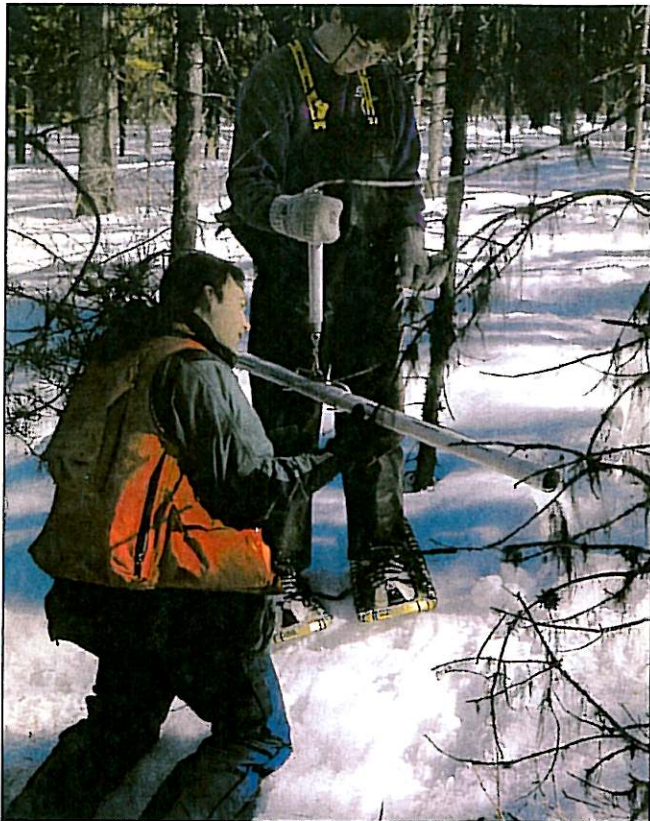
bution and abundance are still debated. Explanations include habitat alteration and loss, increased predation, uncontrolled hunting, disturbance, and parasites, or some combination of these factors. Although there have been proposals to reintroduce caribou to extirpated portions of their historic range, the cost and limited success of translocation projects suggest that we need to conserve and manage current woodland caribou populations to maintain or expand existing ranges. This is a tall order considering our lack of understanding of their basic ecology.

## THE PRESSURES INTENSIFY

Over the past 15 years, woodland caribou in British Columbia have become a species of special concern for wildlife managers and conservationists. With the increasing demand for timber, much of the interest has focused on how forest harvesting affects

**RESTRAINING A GPS COLLARED FEMALE CARIBOU PRIOR TO RELEASE.**

*Photograph by Doug Heard*



**MEASURING SNOW DEPTH AND DENSITY AT A LOCATION WHERE A CARIBOU HAS CRATERED FOR TERRESTRIAL LICHENS.**

*Photograph by Glen Keddie*

these nomadic cervids. Initially, mountain caribou - occurring in small isolated populations, being reliant on arboreal lichens found in timber-rich old forests, and in some locations having a history of shrinking ranges - were the center of research efforts and management plans. However, as logging progresses northward into previously undisturbed watersheds, there is concern that the northern caribou may be susceptible to the adverse effects of forestry activities. The most frequently reported direct impact is the destruction

**SCALE IS A CONCEPT THAT ALLOWS US TO CONSIDER AN ANIMAL'S OR SPECIES' UNIQUE PERCEPTION OF TIME AND SPACE.**

of winter forage: the slow growing and easily disturbed terrestrial and arboreal lichens.

There are also indirect impacts. One of the most serious is the conversion of coniferous forests to young stands with abundant deciduous vegetation that serve as excellent moose winter range. Although this may be good for hunters, it can upset the delicately balanced wolf-caribou predator-prey relationship. In essence, more moose attract and support more wolves,

and more wolves cause fewer caribou. Caribou, with a relatively low and inflexible reproductive potential, can not match wolf populations that increase rapidly in response to abundant moose. A reduction in the total amount of suitable caribou habitat also reduces the area available for caribou to space out across the landscape, a strategy that they use to avoid contact with wolves. Further tipping the scale in favor of wolves are logging roads that increase hunting efficiency by allowing for easier four legged travel across deep-snow terrain. Studies have implicated predation as the major limiting factor for woodland caribou populations in Yukon, western Alberta, and southeastern British Columbia, and have suggested that maintaining a natural balance between caribou and wolves is an essential component of any strategy designed to conserve woodland caribou. Considering the suite of impacts listed above, it is easy to appreciate why the woodland caribou is one of the most disturbance-sensitive ungulates in North America.

Although there are 39 discrete herds and approximately 16,000 northern and boreal caribou in British Columbia, there have been only three comprehensive studies of these animals. In the meantime, the timber and fiber needs of the forest industry are met, regardless of whether we have definitively characterized the habitat needs, or the impacts of harvesting on these animals. This is not to say that steps haven't been taken to find a place for northern caribou within the subboreal and boreal forests and hilltops of British Columbia. Land use plans, forest harvesting strategies, and silvicultural prescriptions are being developed and implemented to try to accommodate the needs of these animals, while still allowing for timber harvesting. To meet both objectives, managers, foresters, and biologists require detailed information on the foraging habits, habitat requirements, population dynamics, and predator relationships of the northern woodland caribou.

**QUESTIONS OF SCALE**

In the past most of our efforts to understand and mitigate the effects of disturbance were focused on the small-scale direct impacts, such as reduced availability of lichens or increases in predation. We now accept that disturbance can affect ecological processes that occur at larger spatial and temporal scales. Landscape configuration, fragmentation, connectivity, and metapopulation dynamics are likely meaningful in the context of caribou management, but we have no empirical evidence that documents how these processes influence the distribution and abundance of these animals.

To provide some of these answers we initiated a 4-year study to explore the processes that influence the distribution and movements of northern caribou across the landscape. Initial financial assistance for this project was provided by a Boone and Crockett Club Grant-In-Aid. Our study caribou are known as the Wolverine Herd and consist of 250-400 individuals. The herd ranges throughout a 3,500 km<sup>2</sup> area, approximately 250 km northwest of Prince George, British Columbia. We chose this area because there has been relatively little forestry activity, and we have some previous information on the large-scale movements of the animals.

Our project is designed to answer both applied and theoretical questions. We will provide information on how the Wolverine Herd, and northern caribou in general, respond to their environment, as well as explore the ways in which we study and describe the distribution and movements of animals. We address both types of questions by structuring our research around the ecological concept of scale.

Scale is a concept that allows us to consider an animal's or species' unique perception of time and space. By measuring the responses of caribou to their environment at several spatial and temporal scales, we will be able to better understand a variety of scale dependent behaviors. For example, a caribou that chooses a

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Photograph by Chris Johnson

location for cratering (digging in the snow for food) bases its decisions on different environmental features than a caribou migrating across the landscape might recognize. Trying to understand animal behavior by using one arbitrarily defined scale, such as

a forest patch, could result in other scale-specific decisions going unnoticed. Adopting a scale-explicit approach allows us to move away from simply describing patterns and to begin exploring ecological processes.

### GPS AS A RESEARCH TOOL

To collect the data necessary to reconstruct movements and determine scale specific choices, each sample animal was collared with a Global Positioning System (GPS) collar. These collars are similar to a hand held GPS receiver, except that they are packaged to fit around a caribou's neck and to withstand extremes of heat, cold, and moisture. The collars also have a small computer that allows them to automatically collect a location, accurate to 3-8 meters, at predetermined times. This means that we are able to track accurately and precisely the fine-scale movements of our collared caribou day or night, rain or shine; when compared to aircraft dependent conventional radiotelemetry, the benefits are obvious. The movements and hunting activities of wolves in 4 different packs are also being monitored using both conventional radio and GPS collars.

The GPS animal data will be used within a Geographical Information System (GIS) to look at movement patterns and habitat se-

lection at the patch and landscape scales. Ecological variables that we have identified as potentially important include predation risk, the spatial orientation of habitat patches, vegetation, snow depth, and movement corridors. To understand the choices caribou make at scales smaller than the GIS can discriminate, we tracked caribou in the snow in both alpine and forested habitats over the past two winters. Feeding sites, and larger patches where feeding had occurred, were measured for snow conditions, forage species and abundance, and patch characteristics. We are now analyzing the data from this component of the study. Preliminary results suggest that caribou select specific terrestrial lichen species, crater at locations with the shallowest snow, and begin feeding on arboreal lichens as the winter advances and the snow becomes deeper.

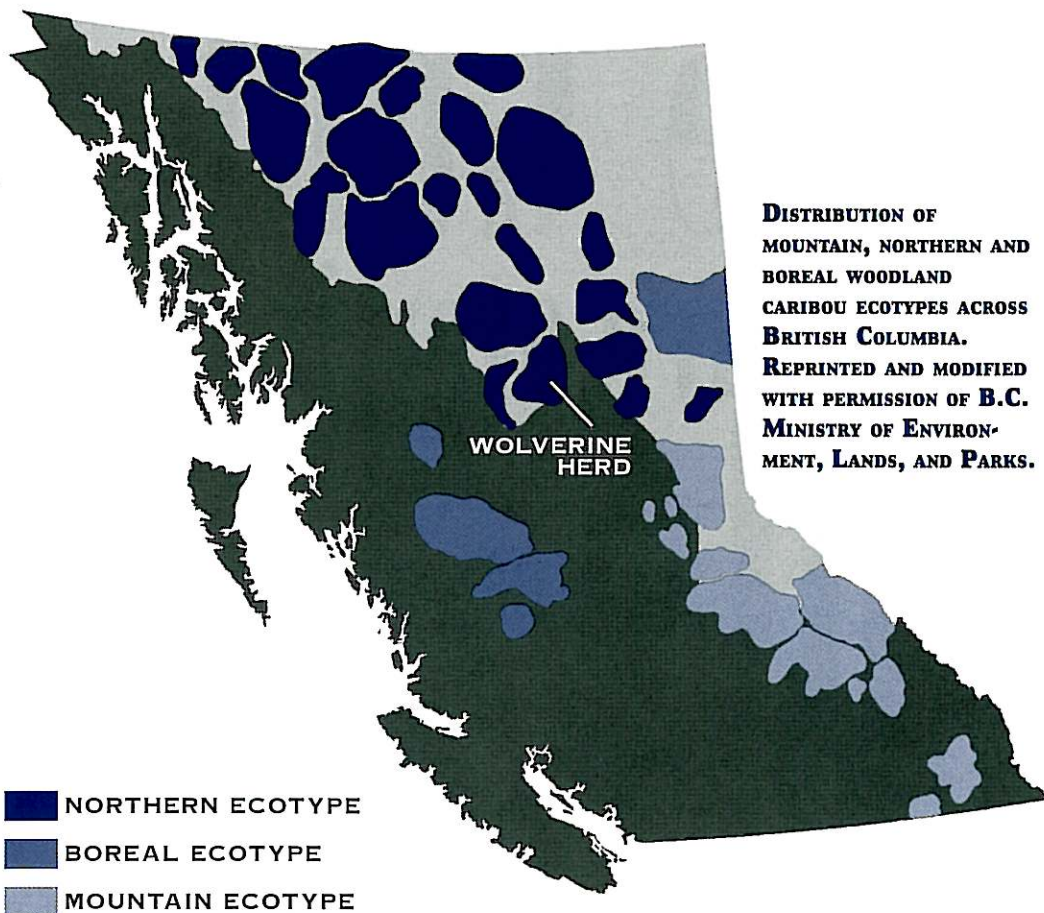
### APPLICATIONS TO CONSERVATION

After three years of research we are beginning to see concrete results from our efforts. The findings of the tracking component of this study are promising and will have direct application to conservation guidelines and planning. For example, we hope to contribute to the development of a field book that foresters can use to assess caribou winter range. By investigating fine-scale feeding



behavior, we have also defined one more part of the larger multi-scale puzzle that, when pieced together, will provide a greater understanding of the wanderings of these animals. We are confident that the larger-scale GIS analyses will be just as revealing.

When complete, this study will not only answer the question "where do the caribou roam?" but also provide some insight as to why. This knowledge can then be used by managers and biologists to make the decisions necessary to meet conservation objectives that will prevent the declines and extirpations that have characterized the northern caribou's more southerly relatives. Leopold would certainly have agreed that these animals are a truly emblematic wilderness species. Fortunately, for these mysterious beasts it is not too late; we still have the opportunity to prove to ourselves and future generations that we can maintain wild places for the ancient inhabitants of British Columbia's forests. ▲▲▲



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**CHRIS JOHNSON AND KATHERINE PARKER ARE PHD STUDENT AND ASSOCIATE PROFESSOR, RESPECTIVELY, IN THE FACULTY OF NATURAL RESOURCES AND ENVIRONMENTAL STUDIES, UNIVERSITY OF NORTHERN BRITISH COLUMBIA, PRINCE GEORGE, BRITISH COLUMBIA.**

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