

BROCHURE NO. 1**NCASI Caribou Nutrition Research: Overall Program**

Complex interactions among human-caused and natural disturbances, habitat change, and predators have led to declines in woodland caribou in Canada. In the future, woodland caribou may face increased challenges from growing human populations and potential changes in climate. NCASI, UAF and UNBC have joined together to develop a series of projects that will increase the scientific information on the role of habitat in sustaining caribou populations, for use in enhancing caribou conservation programs.

HOW CAN CARIBOU NUTRITION BE MEASURED?

Increasing the very limited scientific information on the role of nutrition in sustaining woodland caribou populations will improve the ability to design conservation programs, particularly in light of future threats from changes in climate, ecosystems, and landscape disturbance. But how do we actually measure levels

of nutrition (rather than simply how much food) that caribou can acquire from different types of habitat?

Non-invasive measurement techniques make it possible to quantitatively link nutrition to body condition indicators, such as body fat and protein, and link these aspects to animal performance. Many of

NUTRITION AS PART OF CONSERVATION OF WOODLAND CARIBOU

Conservation of woodland caribou populations in Canada relies on specific knowledge about the habitats they use throughout the year for shelter, for raising their young, and for food. The Canadian Operations of the National Council for Air and Stream Improvement (NCASI), the Institute of Arctic Biology at the University of Alaska Fairbanks (UAF), and the University of Northern British Columbia (UNBC) are collaborating to develop a deeper understanding of nutrition needed by caribou to enhance their ability to reproduce successfully, withstand predation, and maintain healthy populations.

Relatively little is known about the relationship between the nutritional needs of woodland caribou in summer and winter, and the forages they use in their habitats. In the winter, woodland caribou use stored body reserves and consume lichens that grow on the ground and trees in the boreal forest. During other times of the year, woodland caribou eat green, leafy plants, rich in protein and essential nutrients that are used to build body reserves and raise calves that will survive the next winter. One key to the survival and resilience of caribou populations may include the nutrition available in these vascular plants, and the distribution and growth of these types of plants on the landscape. Exploring these topics is the foundation of this significant joint research program.





ABOVE Aerial view of UAF LARS in the fall. *T. Paris*

these animal performance measures may also influence how well caribou survive in winter and their ability to avoid predators.

While there have been studies regarding the types of vegetation available in the areas in which caribou live, there is relatively little information on the nutritional value of these vegetation types – particularly in the spring, summer and fall. Quantifying the connection between the nutritional value of various vegetation types and the performance of caribou is part of the first project being undertaken by NCASI, UAF and UNBC.

Mathematical relationships linking nutrition and performance are better developed for animals like deer and elk than for woodland caribou. The development of this knowledge specifically for woodland caribou is being undertaken in a scientifically controlled setting at UAF in Alaska. It will greatly enhance the value and relevance of subsequent research undertaken in Canada.

A WORLD-CLASS CARIBOU RESEARCH STATION

The Robert G. White Large Animal Research Station (LARS) is managed by UAF to provide a unique facility for research and education that focuses on ungulates from the subarctic and arctic. This 134-acre facility, comprising both pasture land and boreal forest, is stocked with Greenlandic muskoxen from Nunivak Island in western Alaska, Siberian reindeer from western Alaska, barren ground caribou from Alaska, and a new herd of forest-dwelling woodland caribou (mountain ecotype) that are being raised for this collaborative project with NCASI and UNBC.

State-of-the-art nutrition and body condition techniques will be applied in the secure, controlled facility

at UAF LARS. These techniques will increase the understanding of woodland caribou nutritional requirements, as well as the quantitative implications of nutritional deficiencies on reproductive performance and survival. While these quantitative relationships are developed, the herd of caribou is being raised as a tame herd, to make it possible for the scientists to closely monitor their growth characteristics and prepare them for subsequent field work. “Thresholds” of animal performance will be identified during the UAF LARS work, to enable accurate assessment of the nutritional status of wild caribou and the nutritional adequacy of their forage.

Dr. Perry Barboza is the principal investigator for the project at UAF LARS, which will quantify the connection between the amount and quality of food and the body condition and reproduction of woodland caribou, incorporating measurement techniques developed by scientists at NCASI. Dr. Barboza has worked on the nutrition of wild and captive herbivores for over twenty years, including projects on caribou and other northern ungulates at LARS for the last 13 years. Scientists from NCASI and UNBC are working with Dr. Barboza over the several years’ duration of this project, the results of which will become the foundation for field work in Canada.



ABOVE UAF LARS trains animals for research. *Institute of Arctic Biology UAF*

CROSS-CANADA FIELD WORK

After the quantitative correlations are developed, a second project will involve taking the tame caribou to a selection of landscapes across Canada, to gather information on the degree to which these landscapes provide poor, moderate, or good nutrition for caribou. This project will consider site-specific conditions that caribou face in the wild. Given the different vegetation and geoclimatic conditions across the nation, it is anticipated that federal and provincial governments and other stakeholders will be involved to better facilitate and disseminate knowledge gained about improving landscape conditions to sustain caribou populations.

This field work will also improve knowledge of how habitats and forest disturbance can be effectively managed to promote woodland caribou survival. Up to four sites will be selected across the nation, to represent major vegetative zones that woodland caribou occupy in Canada. The relationships between plant communities and use of the vegetation by caribou will be studied, and various forest management patterns will be examined to identify negative and positive influences from each. Both the tame caribou herd and resident wild caribou herds will be studied as part of this project.

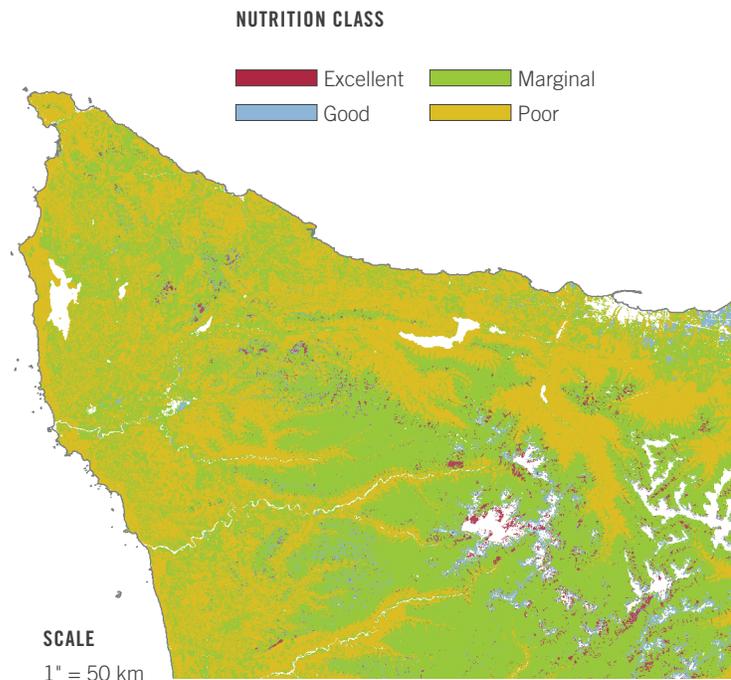
Dr. Katherine Parker, of UNBC, and Dr. John Cook and Rachel Cook, of NCASI, will be principal investigators for this multi-year study. Dr. Parker has conducted large ungulate (hooved animal) research with a focus on bioenergetics and nutrition since the 1980s, and has conducted research on woodland caribou over the past decade. NCASI's large ungulate biologists, John and Rachel Cook, have conducted large ungulate energetics and nutritional research in the Pacific Northwest for over 15 years, with specific focus on applied nutrition in the context of habitat evaluation, forest succession, and population dynamics in managed forest ecosystems.

TOOLS FOR FOREST MANAGEMENT

Data and individual model components from the work at UAF LARS and the cross-Canada field studies will be integrated into a forecasting model that can support land management planning and decisions by forest managers, planners, researchers, and others. The model will enable descriptions of current habitat

conditions with relevance to caribou, and will be able to help predict distributions and habitat use of woodland caribou based on distributions of nutritional resources and other habitat characteristics. The model will add to the tools currently under development across Canada, such as those for important aspects such as minimizing land-use conditions that lead to heightened predation of caribou, and will become a useful component in designing effective caribou conservation plans on a region-specific basis.

The project team will be responsible for building and testing the final caribou nutrition model. In the U.S., NCASI has collaborated with federal and state governments to build nutrition-explicit models for elk. Similar models for caribou will incorporate forestry, nutrition, and human activities using a "resource selection" analytical approach to integrate land use strategies and caribou conservation needs. The model will be useful both from a planning perspective, and from the perspective of continual improvement in effective forest management and land-use strategy implementation.



ABOVE Nutritional adequacy map for elk summer ranges developed using NCASI nutrition mapping algorithms and USFS GIS forest inventory data. Source: USDA Forest Service, PNW Research Station

TEAM OF COLLABORATORS

THE NATIONAL COUNCIL FOR AIR AND STREAM IMPROVEMENT (NCASI) is an independent, non-profit, member-driven research institute that seeks to create credible scientific information required to address the environmental information needs of the forest products industry in North America. Established in 1943, NCASI is recognized as the leading source of reliable data on environmental topics affecting this industry, and has nearly 100 member companies throughout Canada and the United States. With a staff of 70 technical professionals, NCASI conducts surveys, performs field measurements, undertakes scientific research, and sponsors research by universities and others to document the environmental performance of industry facility operations and forest management, and to gain insight into opportunities for further improvement in meeting sustainability goals.

THE UNIVERSITY OF ALASKA FAIRBANKS (UAF) ROBERT G. WHITE LARGE ANIMAL RESEARCH STATION (LARS) provides a unique facility for research and education that focuses on ungulates from the subarctic and arctic. LARS is situated on 134 acres, which is equally divided between pastures and boreal forest. Since 1979, research at LARS has focused on the different ways arctic herbivores use their food and conserve their body stores, to survive, grow, and produce young despite the harsh conditions of a long winter and the brief respite of a northern summer. Living accommodations are available to visiting scientists, graduate students, visiting scholars and interns. The Station also provides a unique venue for introducing students of all ages to the biology of these animals.

THE UNIVERSITY OF NORTHERN BRITISH COLUMBIA (UNBC) is a small research-intensive university, initiated by its local communities and officially opened 'in the North for the North' in 1994. Many of the faculty members are internationally renowned and they focus on social, economic, environmental, and cultural issues of the North. World-class research is being conducted in

areas such as natural resources and the environment. Collaborative studies into natural resource systems and human uses of the environment are enabled by research partnerships with public agencies and the private sector. Addressing climate change and resource development, and the implications to community sustainability are UNBC strengths. As an example, studies are ongoing to unravel the needs of caribou using vast landscapes, the effects of warming and development on their forested habitats, and the consequences of those effects to people who rely on caribou or forests.

SPONSORS

NCASI member companies in Canada¹ are financially supporting this research, and additional funding sources will be sought as the program expands into launching the field component. In particular, the following organizations have provided significant financial support to the first phase of the project, at UAF LARS: **AbitibiBowater**, **Domtar**, the **Forest Resource Improvement Association of Alberta (FRIAA)**, **Tolko**, and **Verso Paper**. These additional contributions have been instrumental in providing the financial foundation that enabled this research program to be undertaken. As this research program proceeds, funding from additional government and conservation organization collaborators is being actively sought, to enable the field work to be executed in a manner that will meet the needs of caribou conservation planning in Canada.

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¹ NCASI Canadian member companies include: AbitibiBowater, ATC Panels, Canfor, Cariboo Pulp and Paper, Columbia Forest Products, Domtar, Flakeboard, Fraser Papers, Grant Forest Products, LP-Canada, NewPage, Norbord, Panolam, Peace Valley OSB, Smurfit-Stone, Stadacona Papers, Tolko, and Weyerhaeuser.

COVER IMAGE (TOP) Map of Canada, indicating current distribution of caribou in Canada. Source: Forest Products Association of Canada, 2007

COVER IMAGE (BOTTOM) P.S. Barboza

LEFT Darren Sleep

