

BROCHURE NO. 2**NCASI Caribou Nutrition Research: Phase I**

For the first time, tamed woodland caribou are being studied to explicitly quantify the relationship between caribou habitat, the nutrition they receive, and how well caribou reproduce and survive. Scientists from UAF, NCASI and UNBC are collaborating to undertake this research with a new caribou herd located at the University of Alaska Fairbanks. The results of this project will improve the ability for Canada to design effective caribou conservation programs, particularly in light of future threats from changes in climate, ecosystems, and landscape disturbance.

A WORLD-CLASS CARIBOU RESEARCH STATION

The facility selected to house the herd of forest-dwelling woodland caribou (mountain ecotype) for this project is the only facility of its kind in North America. With tightly controlled operations that comply with state (Alaska) and federal (USDA) regulations for disease surveillance and treatment of captive wildlife, the Robert G. White Large Animal Research Station (LARS) is uniquely qualified to ensure the safety and health of this caribou herd. LARS is managed by the Institute of Arctic Biology at the University of Alaska Fairbanks, and is recognized for undertaking high-quality research and education that focuses on ungulates from the subarctic and arctic.

This 134-acre research station includes both pasture land and boreal forest, which enables a cross-section of habitats in which to raise and house the caribou herd. For over 30 years, researchers at LARS have undertaken a breadth of research and education in

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.



high-latitude biology, in areas such as nutritional, physiological, and behavioural science. The station includes a centralized animal handling facility, equipment to manage and weigh large animals, storage units for feed and bedding, a laboratory, metabolic research building, and offices.

NORTH AMERICA'S TOP UNGULATE NUTRITION BIOLOGISTS

Combining the skill sets of the scientists on the UAF, NCASI, and UNBC team provides a unique strength in quantifying the extent to which nutrition can influence woodland caribou population sustainability. Dr. Perry Barboza is the principal investigator for the project at LARS, which will quantify the connection between the amount and quality of food and the body condition and reproduction of caribou. 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.

Dr. Kathy Parker of UNBC has focused on bioenergetics and nutrition since the 1980s, conducting research on plant-animal and predator-prey interactions, including studies on woodland caribou. Dr. John Cook and Rachel Cook of NCASI have spent the past 15 years conducting large ungulate (hooved animal) energetics and nutritional research in the Pacific Northwest, with specific focus on applied nutrition in the context of habitat evaluation, forest succession, and population dynamics in managed forest ecosystems. All four scientists are collaborating to ensure that an objective, scientifically-robust approach is used for this project.

HANDS-ON KNOWLEDGE FROM TAME CARIBOU

With the establishment of a tame herd of woodland caribou, researchers can get close enough to the animals to enable accurate measurement of the food they eat and various performance responses, such as growth rate of calves and yearlings, body fat and weight changes, pregnancy status, and size and viability of newborn calves. This in turn will enable the development of more meaningful quantitative relationships between the nutritional content of the food consumed by the caribou, and the rate at which key performance benchmarks can be achieved.



ABOVE Caribou calves feeding on formulated milk at three months of age.

P.S. Barboza

START PHASE 1 Set up new herd of forest-dwelling caribou calves to be raised as tamed animals.

2009

These caribou calves have been hand-raised using established protocols¹, and are maintained in large outdoor enclosures on a ration specifically developed for caribou herds at UAF².

A series of diets, representing shifts in seasonally available forage (food) and a spectrum of nutritional contents that simulate the range of nutrition potentially encountered in the field, will be provided to the caribou herd. Over the years that the caribou are monitored, data will be gathered to produce the first comprehensive mathematical relationships between nutritional content, body condition, and reproduction. To date these data have been unavailable for woodland caribou. The results of the NCASI, UAF, UNBC collaborative project will fill this important data gap, and add to the ongoing research across Canada that seeks to identify ways in which to sustain caribou populations.

¹ Parker, K.L. 1989. Growth rates and morphological measurements of Porcupine caribou calves. *Rangifer* 9:9-13.

² Barboza, P.S. and K.L. Parker. 2006. Body protein stores and isotopic indicators of N balance in female reindeer (*Rangifer tarandus*) during winter. *Physiological and Biochemical Zoology* 79:628-644.



TRAINING CARIBOU FOR CROSS-CANADA STUDIES

The trained woodland caribou from the UAF LARS work will have a benefit to future studies being planned by the NCASI, UAF and UNBC collaborative team, and will ultimately help caribou recovery teams identify current, and future, best habitats for caribou. Different habitats potentially provide different nutritional value to caribou. By placing the tame caribou in these different habitats and measuring their nutritional responses, such as energy and protein intake while foraging, it will be possible to develop quantitative relationships linking the kinds and abundance of plants that are present to the nutrition caribou receive from the habitat. Using the UAF baseline relationships linking nutrition and their performance, it will be possible to estimate how well these different habitats contribute to caribou reproduction and survival.

Once the project at UAF LARS is nearly complete, it is the intent that the tame caribou involved

Data gathered at UAF LARS and during the subsequent cross-Canada field projects will be used to build a computer-based model to help researchers, industry, and governments better estimate how nutrition for caribou can be enhanced. This information will allow for better identification of specific habitat

BELOW K. Barboza



Continue feeding experiment.

Launch field work in Canada. Introduce new caribou calves into ongoing feeding trials.

2010 2011 2012 2013 2014 2015

Training and growth on high-protein diet.

Undertake winter & summer nutrition experiment. First calves from the forest-dwelling caribou.

Complete nutrition experiment.

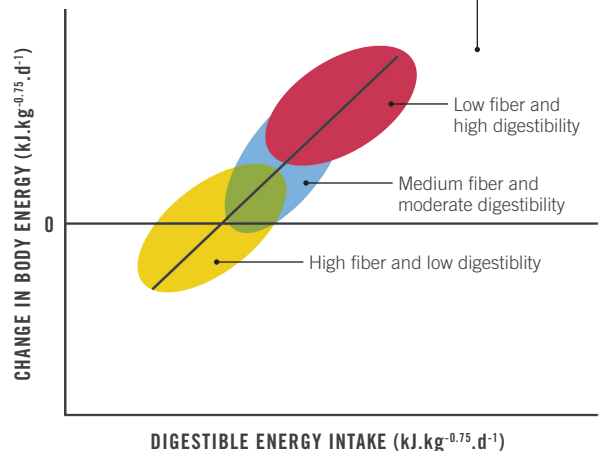
Synthesize data from LARS research.

in this study will be taken to a selection of landscapes across Canada, to provide information on the degree to which these landscapes provide poor,

moderate, or good nutrition for woodland caribou. When coupled with similar data from nearby wild populations, it will be possible for conservation teams to have significant additional knowledge regarding the habitat status in their region. This information has, to date, been largely absent from caribou conservation planning, and thus it will also lead to more advanced tools for government to monitor the relative improvement in the health and stability of caribou populations.



ABOVE Caribou calves at six weeks of age following handlers to outdoor pens.
P.S. Barboza



ABOVE Predicted relationship between food quality and the gain of caribou as energy in fat and protein. Source: P.S. Barboza, unpublished

that positively contributes to their nutritional well-being, reproduction and survival, and those habitats that fail to provide these kinds of benefits. In turn, this will aid in designing future land-based activities that will enhance protection of superior habitats and help improve habitats for caribou across Canada.

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 Canada³ 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 companies 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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³ 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 LARS facility. Source: based on Googlemap satellite view

COVER IMAGE (BOTTOM) P.S. Barboza

ABOVE P.S. Barboza