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BROCHURE NO. 3

NCASI Caribou Nutrition Research: Phase II

For the first time, captive, trained woodland caribou are being used to study the relationships among caribou habitat conditions, the nutrition they receive, and how well caribou reproduce and survive in Canada. These relationships will be measured by undertaking research using the tamed caribou as living, scientific "instruments" that will be used across Canadian forested landscapes, starting in British Columbia, by scientists from NCASI and UNBC. The results of this project will improve the ability for biologists to design effective caribou conservation programs, particularly in light of future threats from changes in climate, ecosystems, and landscape disturbance.

FIVE YEARS OF FOUNDATION RESEARCH

Between 2009 and 2013, two dozen female caribou were raised as a tame herd at the University of Fairbanks Alaska Robert G. White Large Animal Research Station (LARS), making it possible for the scientists to closely monitor their nutrition and growth characteristics and prepare them for subsequent field work in Canada. Nutritional needs of caribou and their growing calves in summer are very high, but very little work has been conducted to understand specifically how high the requirements are, the effects of nutritional deficiencies on body fat levels of mothers and growth of their calves, and how these deficiencies might influence their survival and reproduction the subsequent winter and spring. The studies at LARS were designed to quantify the influences of nutrition on performance

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) 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 how well the forages they use satisfy these needs. 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, to acquire protein, energy, and other essential nutrients that are used to build body reserves and raise calves that will survive the next winter. One key to the productivity 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.

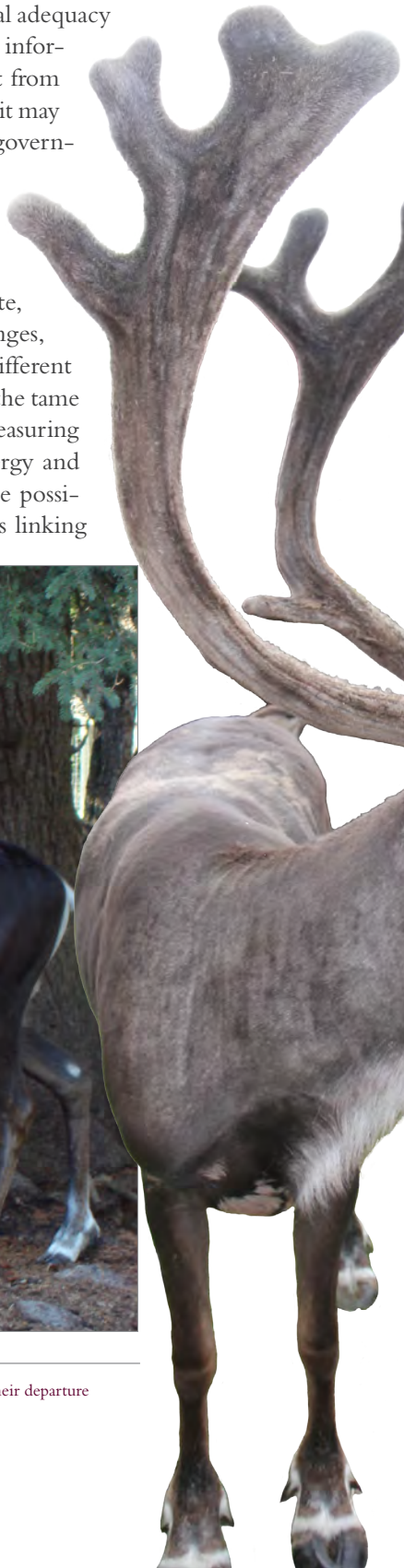
of caribou cows and calves, and these mathematical relations will underpin upcoming habitat/nutrition studies in Canada, enhancing the value and interpretation of the Canadian data.

CROSS-CANADA FIELD WORK

The current phase of the project (between 2013 and 2016) will consider site-specific conditions that caribou face in the wild. The work will largely focus on nutritional adequacy of caribou summer ranges, because nutrition of lactating females and growth of calves during late spring through autumn is critical for successful reproduction and survival in winter. The emphasis on nutrition on caribou summer ranges reflects a growing body of research for caribou in Alaska and eastern Canada and world-wide for other ungulate species (hooved animals) that shows the importance of summer nutrition and the often serious consequences (e.g., low body fat levels; small, weak calves; reduced pregnancy rates; delayed sexual maturity) when summer nutrition is deficient.

The study will involve taking the tamed caribou to a selection of landscapes across Canada to gather information on which these landscapes provide poor, moderate, or good nutrition. When coupled with body condition and pregnancy data from nearby wild populations, conservation teams will have significant new knowledge regarding the nutritional adequacy of various habitats in their region. This information has, to date, been largely absent from caribou conservation planning, and thus it may also lead to more advanced tools for government to monitor status of nutrition and health of caribou populations, and for industry to improve vegetation conditions for caribou conservation.

Due to differences in soils, climate, past disturbance, and successional changes, 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



ABOVE Dr. Kathy Parker (UNBC), Dr. John Cook (NCASI) and NCASI member company representatives visit with the tame caribou prior to their departure from Alaska. *Source: K.M. Vice, unpublished*

the kinds and abundance of plants that are present to the nutrition caribou receive from the habitat. By linking the nutrition data to climate, disturbance, and forest succession, scientists will have a basis to predict how nutritional value of habitats will likely change over time in response to land-use, natural disturbances such as wildfire, and climate change. Such ability does not exist in Canada, particularly for caribou summer ranges. Using the UAF baseline relationships linking nutrition and caribou performance, it will be possible to estimate how well these different habitats contribute to caribou reproduction and survival.

Up to four significantly-sized areas 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 in each of these areas, and various forest management patterns will be examined to identify negative and positive influences from each.

NORTH AMERICA'S TOP UNGULATE NUTRITION BIOLOGISTS

Combining the skill sets of the scientists on the NCASI and UNBC team provides a unique strength in quantifying the extent to which nutrition can influence woodland caribou population sustainability. 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 in British Columbia. Drs. John Cook and Rachel Cook of NCASI have spent the past 15 years conducting large ungulate 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.

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 University of Alaska Fairbanks – Large Animal Research Station.
Source: K.M. Vice, unpublished

TOOLS FOR MANAGEMENT

Data and individual model components from this project 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 minimizing land-use patterns that lead to heightened predation

of caribou, and will become a useful component in designing effective caribou conservation plans on a region-specific basis.

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 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 Canada[1] 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 are providing significant financial support to the project: the **Alberta Forest Products Association**, **Canfor**, **Domtar**, the **Forest Resource Improvement Association of Alberta (FRIAA)**, **LP-Canada**, **Resolute Forest Products**, and **Tolko**. These additional contributions have been instrumental in providing the financial foundation that has 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: Canfor, Cariboo Pulp and Paper, Columbia Forest Products, Daishowa-Marubeni, Domtar, Flakeboard, G-P Canada, LP-Canada, Millar Western, Norbord, Panolam, Port Hawkesbury Paper, Resolute Forest Products, RockTenn Canada, Stadacona Papers, Tolko, Twin Rivers Paper, Western Forest Products and Weyerhaeuser.

COVER IMAGE (TOP) Map of British Columbia, indicating study area for first two years of Canadian field work.

COVER IMAGE (BOTTOM) *Source: K.M. Vice, unpublished*

BOTTOM *Source: K.M. Vice, unpublished*