Environnement et Changement climatique Canada / Environment and Climate Change Canada

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Canada

UNBC UNIVERSITY OF NORTHERN BRITISH COLUMBIA

UQAR Université du Québec à Rimouski

UNIVERSITÉ LAVAL

## *Opportunity for a PhD or a Postdoctoral position*

# Modeling individual variability in behaviour and demography of boreal caribou


Boreal caribou is a cultural keystone species for Indigenous peoples and an indicator of broad-scale changes in ecosystem dynamics. Despite their ecological and cultural value, boreal caribou are imperiled across much of their range, and are listed as threatened on Schedule 1 of Canada's Species At Risk Act (SARA). Accordingly they are subject to a comprehensive national recovery strategy and action plan (Environment Canada 2017, 2012). The mechanisms behind variation in the population trajectories of boreal caribou are critical to understand. Many studies suggest a high-level of adaptation to local or range-wide ecological and climatic conditions as well as individual variation in behaviour including the responses to human and natural disturbance, and ultimately survivorship and population dynamics. Such findings have relevance to our understanding of intraspecific behavioural plasticity, the species' inherent potential to adapt to rapidly changing environments and our ability to forecast population trajectories. However, there has been no work to systematically quantify this variability within and among herds across Canada.

To address this knowledge gap, we seek to quantify intraspecific variability in the habitat ecology and demographic outcomes for populations of boreal caribou that are representative of the range of variability in ecological, climatic and human factors, the range of observed behaviours being considered as analogues for future adaptive strategies. Our goal is to build agent-based models to explore the response of individual caribou to landscape change, including future changes in vegetation communities, human and natural disturbance, and climate. Reproductive and survival outcomes from simulated caribou will allow us to explore the population implications of environmental change and to evaluate management actions designed to increase the likelihood of persistence of these caribou across the boreal range.

Our team is offering a postdoctoral research opportunity or a PhD position with the following objectives:

1. Quantify the variation in habitat selection among individual caribou and relate it to individual survival, including the spatial representation of predation and disease.
2. Adapt an existing mechanistic energetics model to calculate the reproductive consequences of caribou demonstrating the range of identified distribution strategies along a disturbance gradient.
3. Develop or adapt, and apply, Agent-Based Models (ABM) to investigate the seasonal movements and distribution strategies of caribou considering internal state, motion and navigation capacities.
4. Relate the resulting movement to factors such as vegetation change, predation risk, and climate.
5. Apply the ABM to contemporary landscapes and to future landscapes under climate-driven changes in natural disturbances (e.g. fire), emergent or altered distribution of plant communities, and changes in the nature and intensity of the human footprint.

The project will **start in September 2019** or **January 2020**, with a grant for a 2-year (postdoc) or a 4-year (PhD) period. The candidate will be based at UQAR (Rimouski, QC), under the supervision of Martin-Hugues St-Laurent, and co-supervised by Chris Johnson at UNBC (Prince George, BC), where he/she will have to spend 6-12 months. Our collaborative team will count on the expertise of Cheryl Ann Johnson (ECCC, Ottawa, ON), Steve Cumming (U. Laval, Québec city, QC) and Eliot McIntire (NRCan, Victoria, BC). The candidate will interact with the other members of research team and will be invited to travel between the different research centers.

**Requirements**:

- Highly motivated and determined to complete a project and to publish the findings.
- Track-record publishing in peer-reviewed journals.
- Interest in spatial ecology and experience analysing location data.
- Advanced understanding of statistical and spatial analyses (R, SAS, STATA).
- Ability and willingness to work productively in a team environment.
- Ability to speak French is an asset, but is not essential.

**How to apply**: If interested, please send a CV with contact information (phone, email address) of at least 2 references and a cover letter **before Friday August 23rd, 2019** (to start in September 2019) or **before Monday September 30th, 2019** (to start in January 2020) to:


- **Martin-Hugues St-Laurent**, Université du Québec à Rimouski (martin-hugues_st-laurent@uqar.ca) (website)
- **Chris J. Johnson**, University of Northern British Columbia (chris.johnson@unbc.ca) (website)
- **Steve Cumming**, Université Laval (steve.cumming@sbf.ulaval.ca) (website)
- **Eliot McIntire**, Natural Resources Canada (eliot.mcintire@canada.ca) (website)
- **Cheryl Ann Johnson**, Environment and Climate Change Canada (cheryl-ann.johnson@canada.ca) (website)