

## 3<sup>rd</sup> International Conference on **Biodiversity & Sustainable Energy Development**

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#### **Scenario modeling to support the protection of a threatened species (*Rangifertarandus caribou*) in a highly industrialized landscape in Alberta, Canada**

Woodland caribou (*Rangifertarandus caribou*) in Alberta, Canada, are designated as threatened due to their reduced distribution, a decrease in the number and size of populations, and threats of continued declines associated with oil and gas extraction and forestry industries. Assessing and managing cumulative effects of human activities on caribou and providing adequate habitat to allow for its persistence is of critical importance. In this study, a scenario modeling approach that combines movement ecology with behavioral ecology within an agent-based framework is presented to achieve three objectives: (i) recreate the movement behaviors of caribou to understand how they select and use their winter habitat, (ii) determine the relative impact of different industrial features on caribou habitat selection strategies, and (iii) assess how caribou adapt to their changing environment. The study was conducted in the Little Smoky region, covering an area of 3100 km<sup>2</sup> located in the foothills of west-central Alberta, which has the highest level of industrial development of any caribou herd in Canada. Based on caribou bio-energetics, the agent-based model (ABM) simulates caribou as individual agents that make trade-off decisions to maximize their survival and reproductive success while avoiding predators and habitat disturbance. Using a validated optimal foraging strategy, caribou habitat-selection responses under five scenarios of future land development plans were simulated. It was found that herd spatial extent progressively contracted with increasing industry intensity; caribou lost most reproductive energy when forestry only was developed. Despite increased use of area set aside as critical habitat, females still failed reproduction when oil and gas continued to develop within.

#### **Biography**

Danielle Marceau is Professor in the Department of Geomatics Engineering at the University of Calgary and holds a Schulich Research Chair in GIS and Environmental Modelling. Her research program focuses on developing spatial simulation models, namely cellular automata (CA) and agent-based models (ABMs) to study the dynamics and interactions of natural and human systems and guide decision making in environmental resource management. She applies her research in domains that are of particular relevance in Alberta and elsewhere in Canada: water and energy, land use and spatial planning, and wildlife responses to human activities. She is the main editor of a book on *Advanced Geosimulation Models* published in 2011 and is the member of the scientific board of several Journals including *Ecosystem and Ecography*.

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