Behaviourally-mediated interactions of landscape pattern shape predator-prey dynamics in highly altered landscapes

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Landscape structure plays a fundamental role in shaping predator-prey dynamics, often being a key determinant of predator-prey coexistence. Rapid alteration of landscape structure, however, can lead to changes in predator-prey interactions with the magnitude of such changes dependent upon the scale and intensity of alteration and animal behavioural responses to novel environmental stimuli. In the boreal forests of western Canada, linear features (e.g. roads, seismic lines and pipelines) from industrial activity are a ubiquitous form of landscape alteration and increasing evidence suggests their presence has impacted interactions between wolves (*Canis lupus*) and boreal caribou (*Rangifer tarandus caribou*), leading to caribou population declines. Using simulation analyses parameterized by empirical data, we demonstrate how linear features affect the ability of wolves to predate caribou and evaluate how the spatial configuration and density of linear features interacts with animal behaviour to influence caribou-wolf encounter rates. Model outputs yield insights into the spatial requirements of caribou for effectively reducing predation risk and further illustrate behavioural strategies that are theoretically optimal for caribou. We discuss how our spatially explicit modelling of predator-prey encounter rates can inform management actions aimed at minimizing anthropogenic impacts within caribou range as well as in other predator-prey systems.

Biographical Notes:

Craig DeMars is a post-doctoral researcher at the University of Alberta. He has a broad interest in terrestrial ecology with a particular focus on wildlife management and conservation planning in multi-use landscapes. His Ph.D. thesis focused on understanding the spatial dynamics of boreal caribou, wolves and black bears during the caribou calving season. He has also worked on developing province-wide predictive maps of boreal caribou habitat in British Columbia and Alberta.