University of Victoria | Graduate Studies

Notice of the Final Oral Examination
for the Degree of Master of Science

of

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BSc (Dalhousie University, 2014)

"Cumulative effects of human landscape change, predators, and natural habitat drive distributions of an invasive ungulate"

School of Environmental Studies

Thursday, November 1, 2018
11:00 A.M.
David Turpin Building
Room A140

Supervisory Committee:
Dr. John Volpe, School of Environmental Studies, University of Victoria (Co-Supervisor)
Dr. Jason Fisher, School of Environmental Studies, University of Victoria (Co-Supervisor)
Dr. A. Cole Burton, Department of Forest Resources Management, University of British Columbia (Outside Member)

External Examiner:
Dr. Chris Pasztor, Resource Development, BC Ministry of Energy, Mines, and Petroleum Resources

Chair of Oral Examination:
Dr. Dante Canil, School of Earth and Ocean Sciences, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

Human footprint – in which land is converted for human use – is a leading contributor to global habitat and biodiversity loss. The accelerated rate of human landscape change to meet our growing needs has led to the direct loss of critical habitat and shifts in species distributions, interactions, and behaviour. These altered conditions affect species' ability to adapt to environmental stressors, while some species thrive and others decline. In North America, one ungulate has successfully invaded new habitat in conjunction with human land use – the white-tailed deer. Across the continent, the invasion of whitetails has led to increased competition with other ungulate species including mule deer, moose, and woodland caribou. In regions with abundant apex predators, whitetails have become a source of primary prey as their populations continue to thrive. The mechanisms by which deer occupy landscapes in the northern extents of their geographic range are not well studied outside of the winter months, or how deer respond behaviourally to various types of human disturbance in a predator-rich environment.

To address these knowledge gaps, I examined population scale resource selection across seasons and individual movement behaviour in white-tailed deer in northeastern Alberta's intensively developed oil and gas hub. I used existing predator frequency models to spatially extrapolate wolf and black bear occurrence across my study region as indicators of indirect predation risk. I used two approaches to habitat modeling to uncover how deer respond to various modes of human landscape change, including roads, seismic lines, and cut blocks in addition to predators and natural habitat. Deer distributions were best described by cumulative effects – or the combination of all of these factors – across all seasons with proximity to linear features explaining the most variation of the parameters tested. Most prominently in winter, deer strongly selected for natural sources of forage and linear features despite the increased risk of predation by wolves – suggesting that deer make energetic trade-offs with predation risk. At the behavioural level, deer significantly increased their rate of movement when occupying habitat associated with risk. I suggest that deer make greater trade-offs in winter when mobility is limited to evade predators and energetic costs are higher.

The continued use of anthropogenic features post-winter, increased rate of movement and spread of landscape occupancy by deer may allude to the importance of human disturbance in maintaining deer in northern climates. That human landscape change may be the mechanism by which deer are able to successfully colonize new areas at the northern extents of their range by linear corridors that offer an abundance of forage subsidies and a healthy dose of fear. My results shed light on the drivers of deer distributions in human altered landscapes that are critical for managing populations where the invasion of deer is complicit in the decline of other ungulate species such as woodland caribou in Alberta's boreal forest.