University of Victoria | Graduate Studies

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

of

ROBIN KITE

BSc (University of Alberta, 2006)
BSc (University of Victoria, 2013)

"Movement analytics: A data-driven approach to quantifying space-time variation in grizzly bear (*Ursus arctos L.*) near-road movement patterns"

Department of Geography

Monday, August 31, 2015
10:30 AM
David Turpin Building
Room B215

Supervisory Committee:
Dr. Trisalyn Nelson, Department of Geography, University of Victoria (Supervisor)
Dr. Christopher Darimont, Department of Geography, UVic (Member)
Dr. Gordon Stenhouse, Foothills Research Institute (Additional Member)

External Examiner:
Dr. Stephanie Hazlitt, Government of BC, UVic

Chair of Oral Examination:
Dr. Lisa Gould, Department of Anthropology, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

Improvements in GPS tracking technologies have resulted in the collection of high resolution movement datasets for a range of wildlife species. In combination with new high resolution remote sensing products, researchers now have the ability to ask complex questions regarding animal movement in heterogeneous landscapes. However, there currently exists a dearth of analytical approaches to combine movement data with environmental variables. Developing methods to examine wildlife movement-environment interactions are particularly relevant given our unprecedented access to high resolution data; however, the analytical and technical challenges of integrating two disparate data types have yet to be effectively overcome. In the analyses presented in this thesis, I examine current approaches for linking wildlife movement to the physical environment, and introduce a data-driven method for examining wildlife movement-environment interactions. The first analysis consists of a review of existing tools in wildlife movement analysis, specifically tools supported within R statistical software, to highlight any existing methodological opportunities and limitations associated with relating movement to landscape features. The review highlights R's strengths as an integrated toolbox for exploratory analyses, and the current lack of applications for linking high density telemetry datasets with environmental variables. *AdehabitatLT* was the most functional package available, offering the greatest variety of analysis options. Due to the comprehensive nature of *adehabitatLT*, I recommend that future method development be implemented through its package specific framework. Extending the first analysis, the second portion of this research introduces a data-driven method, based in semivariogram modelling, for quantifying wildlife movement patterns relative to linear features. The semivariogram-based method is applied to grizzly bear telemetry data to quantify how grizzly bear movement patterns change in relation to roads. The semivariogram-based method demonstrated that the bears' spatial scale of response ranged from 35 m- 90 m from roads but varied by age, sex, and season. Applying the scales of response to link near-road movement patterns to survival and mortality, revealed that bears that were killed displayed less-risk adverse movements near roads than bears that survived (i.e., longer step lengths and more day light movements around roads). Given this pattern, our data suggest a minimum vegetation buffer of 90 m to serve as screening cover along roadsides to help mitigate the effects of roads on grizzly bear populations in west-central Alberta, Canada. Through the development of data-driven methods in wildlife movement analysis, we can realize the full potential of high resolution telemetry datasets. Data-driven methods reduce the subjectivity within movement analyses, providing more relevant measures of wildlife response to environment. The semivariogram-based method can identify definitive zones of influence around linear disturbance features in any wildlife system, thereby, providing managers with spatially explicit, data-driven insights to reduce impacts on wildlife in multi-use landscapes.