Boreal Ecosystem Recovery & Assessment
An NSERC Collaborative Research & Development Program

Gustavo Lopes Queiroz, MSc student
University of Calgary, Department of Geography
glopesqu@ucalgary.ca
Research Team:
Greg McDermid[1], Mustafizur Rahman[1], Julia Linke[1], Man Fai Wu[1], Guillermo Castilla[2], and Alexandria Nicole Hamilton[1]
[1]University of Calgary; [2]Canadian Forest Service, Edmonton

Project summary

Coarse woody debris (CWD) is an important forest-restoration target on boreal seismic lines and other industrial-disturbance features. When present at optimal densities, CWD can be effective at limiting human and predator movement on the landscape, and creates valuable microsites for seedling growth. This study aims to develop a novel approach to automated CWD detection and measurement using remote sensing. Latest results have demonstrated high levels of accuracy (95% completeness and 93% correctness) when training objects are present in the application area, and good accuracy (89% completeness and 96% correctness) when the application area is geographically detached from the training dataset.

Progress to date

A field campaign was executed during the summer of 2018 in order to obtain CWD measurements at 108 sample sites distributed across the Kirby South study area: half on seismic lines and half in the surrounding forest. High-resolution (5cm pixel-size) orthophotos obtained from piloted aircraft during summer of 2017 were segmented into image-objects and classified with a random-forest machine-learning algorithm in order to detect CWD objects. The influence of different input variables and environmental conditions on classification accuracy are currently being assessed. The next big milestone is to estimate CWD volume (as opposed to basic object detection) using image-objects and 3D point clouds.

Management implications

Traditional methods for detecting and measuring CWD rely on manual field operations: an activity that is labour intensive and difficult to scale. The methods being developed in this study will allow for accurate and extensive CWD map products to be generated via a highly automated workflow. Once the location and volume of CWD objects across a landscape are known, restoration targets (e.g. seismic lines) can be readily attributed. This will provide land managers with information for identifying vulnerable areas that could benefit from CWD treatment, or assessing the effectiveness of previous treatments.

Geographic location

This study will analyze the seismic lines and surrounding forest of Kirby South near Conklin, AB. The application area extends over 30 km², while the calibration/validation sites cover about 6 km².