AWARE Quarterly Progress Report

Project ID: Theme 1, Focus Area 1
Core Site: Boreal-wide lidar transects
Title: Combining airborne lidar transects and satellite imagery to assess spatial and temporal variability in forest structure

Institution: University of British Columbia
Project Supervisor: Dr. Nicholas Coops
HQP Name: Dr. Douglas Kane Bolton

Committee Members

- ☐ See Progress Report Year:_____ Q____
- ☐ Names:_____

Report Period

Year: ☐ S1 Jan-Apr X S2 May-Aug ☐ S3 Sep-Dec

Number of Courses Left to Complete

Research Progress During this Reporting Period

I have finished the analysis on the treeline project (i.e., characterizing Canada's alpine treelines and how they are changing through time) and written and submitted a manuscript for the project. After developing an approach to locate alpine treelines using ALS data, I investigated changes through time at each treeline using 30 years of Landsat data (74 treelines in total). I also classified areas into treed, shrub, and non-treed structural classes using ALS data to investigate which structural classes were experiencing the most change. I found that shrub and non-treed classes experienced the most greening during the Landsat record (1985 – 2015), suggesting an increase in shrub cover and herbaceous biomass. The approach I developed sets the foundation for future analyses to assess changes across the taiga/tundra ecotone using a combination of ALS and Landsat data. The manuscript for this project was submitted to Environmental Research Letters.

In addition to the treeline manuscript, I also completed a project in which I investigated what spectral and temporal information from Landsat is most important for extrapolating ALS structural attributes in areas where ALS data has not yet been collected or is out of date. For this project, I utilized ALS data from eight sites across the country, from British Columbia to Newfoundland. I found that the accuracy of predicting forest attributes with Landsat data continually increased as the length of the time-series increased across all eight sites. Additionally, Landsat spectral indices that relied on the mid-infrared portion of the spectrum were consistently the most important predictors of forest structure. My findings suggest that in areas containing spatially-limited ALS data acquisitions, Landsat time series can be effectively used to produce wall-to-wall estimates of key inventory attributes, providing an opportunity to update estimates of forest attributes in areas where inventory information is either out of date or non-existent. I have started writing a manuscript to summarize these findings, which I will complete with the help of Piotr Tompalski.

Papers Submitted

Bolton, D.K., Coops, N.C., Hermosilla, T., Wulder, M.A., and White, J.C. Evidence of vegetation greening at alpine treelines: Three decades of Landsat spectral trends informed by lidar-derived vertical structure. Submitted to Environmental Research Letters.

Annual General Meetings		
AGM1	AGM2	AGM3
☐ Attended	X Attended	☐ Attended
☐ Reported results	X Reported results	☐ Reported results

Research Targets for next Reporting Period

I have resigned my postdoc position with AWARE to take a research position at Boston University. I will stay involved with the AWARE project from Boston until both the treeline and Landsat extrapolation projects are seen through to publication.

HQP Signature: Douglas Bolton
Date: 31-05-2018

Project Supervisor Signature:
Date: