Boreal Ecosystem Recovery & Assessment
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REMOTE SENSING TEAM FALL 2017: *A DATASET TO ASSESS DIGITAL PHOTOGRAMMETRY FOR REMOTE SURVEYS OF CONIFER STOCKING ON TREATED SEISMIC LINES*

Man Fai Wu, PhD student
University of Calgary
mfwu@ucalgary.ca

Research Team:
Greg McDermid[1], Julia Linke[1], and Guillermo Castilla[2]
[1]University of Calgary; [2]Canadian Forest Service, Edmonton

Project summary

The goal of this project is to test the capacity of digital photogrammetry to perform surveys of conifer stocking (i.e. location, distribution, and height of conifer seedlings) along linear features. In 2017, we collected a large amount of field and remote-sensing data necessary answer a specific research question:

- *What is the impact of environmental conditions (phenology, site type, seedling size) and data characteristics (ground-sample distance, point density, spectral resolution) on the accuracy and consistency of stocking surveys?*

We also set the stage for future work aimed at developing the workflows and processing strategies necessary to scale experimental procedures up to operational workflows, should these trials be successful.

Progress to date

A total of 59 experimental sites were established along 150-m segments of seismic lines, distributed across gradients of moisture regime, line orientations, line types, and restoration treatment regimes. Within each site we used a line-intercept sampling strategy to measure the location, height and species of individual tree seedlings. We also established two 100m^2 belt-plots at each site, where seedling stocking and density were recorded. In order to support remote-sensing activities and the integration of data sets, each site was also equipped with nine ground-control targets in locations that were visible from the sky. The sites were flown by Orthoshop Geomatics Ltd using a Leica RCD30 digital camera mounted on a piloted aircraft (Cessna 210T) at ~850m altitude. Imagery were acquired during both leaf-off (early May) and leaf-on (early August) conditions, and are being processed into photogrammetric point clouds (>200 points/m^2) and four-band (RGB+NIR) orthomosaics. Orthoshop has also generously donated LiDAR data acquired during the flights, which will enable us to perform additional experiments comparing photogrammetry and spatio-temporally coincident LiDAR. The vegetation data has been pre-processed, and reveals the substantial range of regeneration (nearly 1800 conifer seedlings between 2 and 435 cm in height) and environmental conditions we have documented.

Management implications

Our work will test the capacity of digital photogrammetry for performing stocking surveys along seismic lines in the Boreal forest, as specified in the forthcoming provincial restoration criteria. We intend to identify *if* and *under what conditions* this new technology can perform. The project has also laid the foundation for follow-up experiments looking at other targets (coarse woody debris, trails), and testing innovative procedures (machine learning, semi-automated workflows) for scaling up.

Geographic location

The study areas are located in LIDEA 1, LIDEA 2, and Kirby.