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

REMOTE SENSING TEAM FALL 2017: *DETECTING AND MEASURING CONIFER SEEDLINGS FROM A DRONE: CAN IT BE DONE, AND AT WHAT ALTITUDES?*

Guillermo Castilla, PhD, BERA PI
Canadian Forest Service, Edmonton
guillermo.castilla@canada.ca
Research Team:
Michelle Filiatrault and Michael Gartrell
Canadian Forest Service, Edmonton

Project summary
Recent advances in computer science have given a renewed impetus to Digital Aerial Photogrammetry (DAP) applications in forestry. The research question is part of the efforts by the BERA project to develop cost-effective methods to monitor seismic line vegetation recovery using UAVs. Seismic lines have a prominent indirect role in the decline of threatened woodland caribou. If this decline persists, Canadian federal law contemplates temporary prohibitions of industrial activity in the affected ranges. Hence seismic line restoration is a top priority for industry and governments alike, who need information on the number and condition of conifer seedlings growing on them. In my talk, I will show visualizations of DAP point clouds in a 1 m2 circular quadrat containing conifer seedlings in a seismic line near CNRL Kirby south, where we flew two drones in October 20 this year at 2.5 m, 5m, 30 m and 90m altitude above ground level. The 2.5 and 5 m point clouds were respectively derived from motion video and photographs taken with a 28 mm (79° FOV) lens, 12.3 megapixels camera, and the rest with a 24 mm (84° FOV) lens, 20 megapixel camera. I will also show the corresponding ortho-photos derived at each altitude.

Progress to date
The point clouds described above are still being processed and should be ready by workshop time. We also have leaf-off UAV photography for four more sites in Kirby. In addition to these five sites, we have another five sites (10 in total) with leaf-on photography acquired in Aug 1-4, plus close to 30 other sites in Kirby that were flown also in August at a higher altitude (120 m) by a UAV company we hired. All these data will be processed during this fiscal year, and analyses will proceed as photogrammetric data become available and continue during next fiscal year.

Management implications
The higher you can fly, the more terrain you cover and the more efficient the operation, as exemplified by the Orthoshop MAV acquisition (850 m above ground altitude with a 80 mm, 40° FOV, 80 megapixel camera yielding 5 cm ground sampling distance -GSD). At the same time, the higher you fly, the less detail you get about the seedlings. We hope to establish guidelines and trade-offs between flight altitude/GSD and quality and amount of useful information about seedlings.

Geographic location
Selected BERA Kirby sites, located south of Conklin, treated (wet) and untreated.

Acknowledgments
This work was made possible thanks to funds leveraged from NRCan's Program for Energy Research and Development (PERD). Other BERA geospatial team members have and/or will be contributing to this research (F.M. Wu, J. Linke, S. Blackadder, J. Hird and G. McDermid).