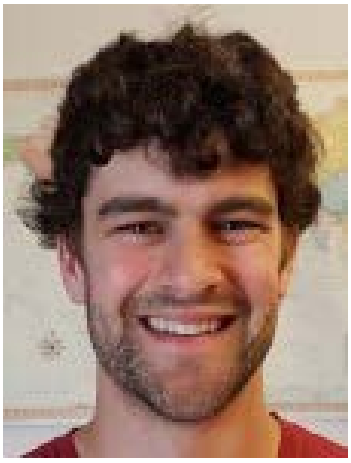
2020 Project Summaries
Boreal Ecosystem Recovery & Assessment
An NSERC Collaborative Research & Development Program

Remote Sensing Team: Satellite Time Series Can Map Regeneration on Forest-Harvest Areas



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Project Summary
Annual Landsat time-series satellite remote sensing data acquired 1984-2017 were used to identify harvest block recovery patterns as detected in the imagery compared to a field-based regeneration survey (also called a Free-to-Grow or FTG assessment). Best-Available-Pixel compositing and spectral trend analysis were implemented. The Google Earth Engine LandTrendr image analysis tool was selected following comparisons with the Canadian Forest Service C2C protocol developed for carbon budget accounting in Canada. Spectral trajectories were generated within field-surveyed harvested forest areas. Results indicate that while Free-to-Grow sites often achieve spectral recovery (>90%), many non-Free to Grow sites were classified as spectrally recovered. This was interpreted to be largely a consequence of species and stocking (density) differences.

Management Implications and Lessons Learned
Vegetation cover change mapping following disturbance using Landsat time series data is both feasible and accurate with a minimum mapping unit down to approximately 0.5 ha (represented by a single Landsat pixel). There were few errors in identifying sites that were disturbed and had subsequently recovered vegetation cover amount. A simple spectral recovery statistic was used: 80% of the pre-disturbance reflectance. However, if vegetation recovery was determined according to field-based forestry standards with requirements of a particular species, stocking and height condition, many apparently recovered sites according to the imagery did not meet that field standard. This was a 'false-positive error' – the recovered vegetation was the 'wrong' species, for example – suggesting that improved methods of Landsat time-series spectral recovery monitoring are needed if field-based forestry definitions of recovery are used. Possibly larger minimum mapping units could be used to manage cutblock spatial variability and locational errors in automated Landsat time series spectral trend analysis.

Publication(s)
Williams, G. 2019. Interpretation of forest harvest recovery using field-based and spectral metrics in a Landsat time series in Northwestern Ontario. MSc Thesis, Trent University, Ontario, Canada.

Williams, G., and S. E. Franklin. In review. Comparison of Free to Grow (FTG) Survey Field Data and a Landsat Time Series Spectral Recovery Metric. *Canadian Journal of Remote Sensing*, submitted January 2020.