Characterizing precision benchmarks for stand height and cover estimates derived from existing, conventional, stand-level, photo-based forest inventories

Piotr Tompalski[1,2], Joanne C. White[2], Nicholas C. Coops[1], Michael A. Wulder[2], Antoine Leboeuf[3], Ian Sinclair[4], Chris Butson[5], Marc-Olivier Lemonde[3]

[1]*Faculty of Forestry, University of British Columbia, 2424 Main Mall, Vancouver, BC, V6T 1Z4, Canada.*

[2]*Canadian Forest Service, (Pacific Forestry Centre), Natural Resources Canada, 506 West Burnside Road, Victoria, BC, V8Z 1M5, Canada*

[3]*Direction des Inventaires Forestiers, Ministère des Forêts, de la Faune et des Parcs du Québec, Quebec City, QC G1H 6R1, Canada*

[4]*Natural Resources Information Section, Science and Research Branch, Ontario Ministry of Natural Resources and Forestry, Ontario Forest Research Institute, 1235 Queen Street, Sault Ste Marie, Ontario, P6A 2E5, Canada*

[5]*Forest Analysis and Inventory Branch, Forest Stewardship Division, Ministry of Forests, Lands, Natural Resource Operations and Rural Development, PO Box 9512, Station Provincial Government, Victoria, BC, V8W 9C2, Canada*

Accurate information on forest resources is fundamental for sustainable forest management. Manual aerial photointerpretation is used as a cost-effective source of data for forest inventories; however, the process of photointerpretation is inherently subjective and is often undertaken by multiple photointerpreters for a given forest management area. In contrast, airborne laser scanning (ALS) data enable characterization of forest structure in a systematic fashion with quantifiable levels of accuracy and precision that often exceed required targets and standards. However, the gains associated with the use of new technologies for forest inventory are difficult to measure because the quality of existing photointepreted inventories have rarely been quantified.

In this study we characterized the uncertainty of the photo-based measures of stand height and canopy cover, using airborne laser scanning (ALS) data as reference. By incorporating three study sites located in three Canadian jurisdictions we explored the existing photointerpretation standards and then used the ALS data to mimic the specific guidelines for determining canopy height and cover.

The results showed that the agreement between the ALS-based reference values and the photointerpreted attributes was not consistent across the jurisdictions. Results indicated that precision was greater for photointerpreted estimates of height, with a relative standard deviation ranging from 22–29% among our three sites, compared to estimates for canopy cover, with precision ranging from 28%–59%. In addition, the relationship between the estimates of height was linear, and non-linear for canopy cover. Several factors influenced the precision, including dominant species, stand structure, age, and canopy complexity. Most importantly results were not consistent among our three study sites indicating that site-specific forest conditions and photointerpretation procedures influence the precision of photointerpreted estimates.

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