Abstract template for the conference "A century of national forest inventories – informing past, present and future decisions"

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On page two, you are asked to fill in your abstract in the format and font size indicated. Please remember to include authors affiliation information in the footer section of page two. The length of the abstract may not be more than one page including references.

Abstract title:		Is There A Role for Terrestrial Laser Scanning in National Forest Inventories?
Take-home message:		*Terrestrial laser scanning is an exciting new technology with the potential to revolutionize some types of forest measurements. However, that potential has yet to become fully operational. We suggest alternatives for including terrestrial laser scanning as a supplement to existing designs.*
Presenter name:		Mark J. Ducey
Presenter contact info:		Department of Natural Resources and the Environment, University of New Hampshire, Durham, NH 03824 USA; mark.ducey@unh.edu
General topic, see website: (please double click on the check box and activate the relevant one)	☐	Improving future NFIs by learning from the past
	☐	NFIs today and in the future
	☒	Cutting edge and futuristic inventory techniques and technologies
Preferred presentation form:	☒	Oral presentation
	☐	Poster
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Is There A Role for Terrestrial Laser Scanning in National Forest Inventories?

Mark J. Ducey[1] and Rasmus Astrup[2]

Introduction: Many of the tools used by national forest inventory field crews would be recognizable to their counterparts from a century ago. However, emerging technologies are creating new options for field measurements of both traditional and non-traditional variables. Terrestrial laser scanning (TLS) has promise for mapping and measuring tree boles on inventory plots, and it can help characterize crown and understory attributes that pose challenges for traditional techniques. Should we expect to assume an important role, or replace existing measurement techniques, in the short- to mid-term?

Materials and methods: We review the recent literature on terrestrial laser scanning to identify strengths, weaknesses, and areas requiring further development. We also consider the capabilities of TLS within design- and model-based frameworks for inference from NFI data.

Results: TLS shows promising advances in terms of hardware cost and capability, as well as algorithms. However, results have been inconsistent for the accuracy of diameter and volume measurements, and for omission and commission errors in the identification of individual trees. Although the high cost of field data collection is often cited as a motivation for the adoption of TLS, at current hardware and postprocessing costs full-scale adoption of TLS could have significant and undesirable impacts on the cost of associated field campaigns. The potential for TLS to quantify crown and understory structure, biomass, and dynamics is exciting but the pathway to address mandated NFI target variables requires clarification. Although model-based techniques for sampling inference, such as distance sampling, can help correct nondetection errors, such corrections are not a panacea and corrected TLS data are probably best viewed as an adjunct to, not a replacement for, conventional field plots. Perhaps the most immediate applications for TLS could involve the improved characterization of individual tree volume, biomass, or other attributes, couched within a design-based approach to inference.

Conclusion: We suggest that at in the near term, the promise of a "non-contact" forest inventory will remain elusive. However, we propose several alternatives for incorporating terrestrial laser scanning within a model-based or more conventional design-based approach to estimation within an NFI framework. Future refinements of TLS technology, and improvements in algorithms and associated post-processing costs, could lead to its wider adoption for some NFI needs.

1. Department of Natural Resources and the Environment, University of New Hampshire, Durham, NH 03824, USA.
2. Norwegian Institute of Bioeconomy Research NIBIO, 1431 Ås, Norway.
Corresponding author: mark.ducey@unh.edu