

Improving Small-Plantation and Woodlot Inventory

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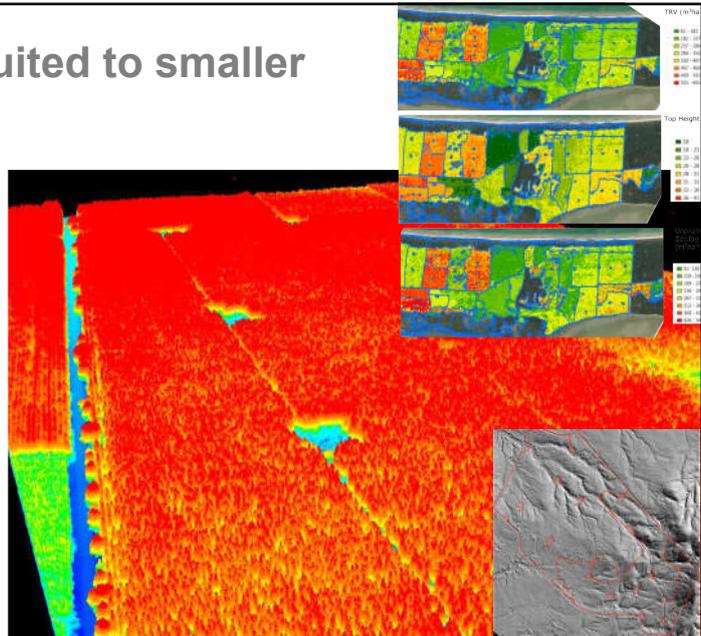


Contents

- 1. Project background**
- 2. Theme 1: UAV for Woodlot Inventory**
- 3. Theme 2: A Community Approach**
- 4. Conclusions**

RS solutions are not well suited to smaller forests

- Due to the requirements for large sample size.
- Lack of access to economies of scale for remote sensing data for smaller areas.
- Complexities in data processing may require engaging consultants at some expense.



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Woodlots are an awkward size to measure efficiently...

- How many plots can I afford to measure?
- One field crew day = 8 plots... is this enough?
- Can I rely on the estimate from a small sample size?
- Can you even calculate PLE from 8 plots?

Project Background and Overview

Goal: Carry out research that improves small-plantation and woodlot inventory

- To investigate approaches that make measurement more cost effective and / or better.
- To make the benefits of existing remotely sensed data and new statistical methods available.
- This includes use of existing data in new ways that can be useful for estimation in small-plantations and woodlots.
- To disseminate the findings to small-plantation and woodlot growers.

Project outputs

1. Summary of findings to an industry journal (either Tree Grower or NZJF).
2. Seminar presentation of findings to industry groups and funders.
3. Peer reviewed research output.



Progress
update: 1. UAVs
for Forest
Inventory

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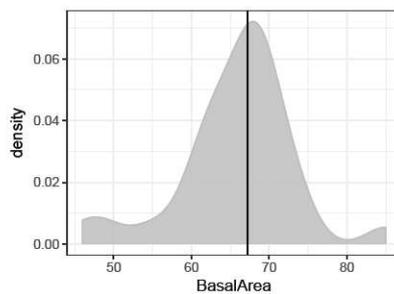
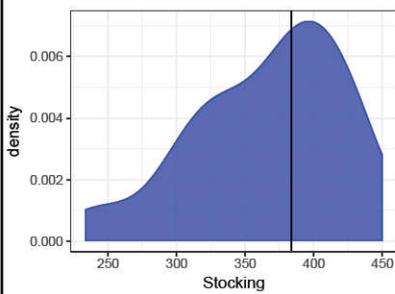
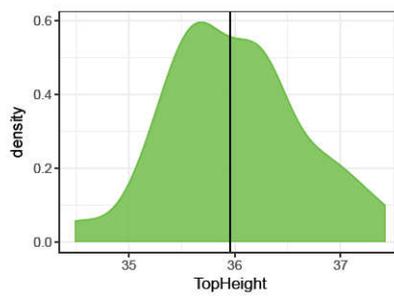
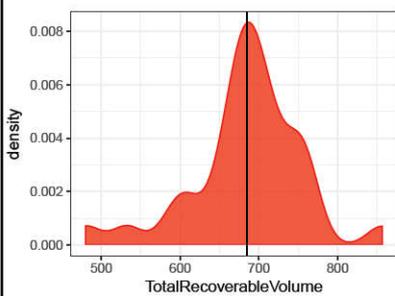
**FIRST
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Horohoro Forest - A fairly typical woodlot

- Located in the Central North Island
- ~40 ha
- Planted 1993
- *Pinus radiata*
- Current stocking ~ 350 sph



Design based baseline PLE on TRV = 4.8 %



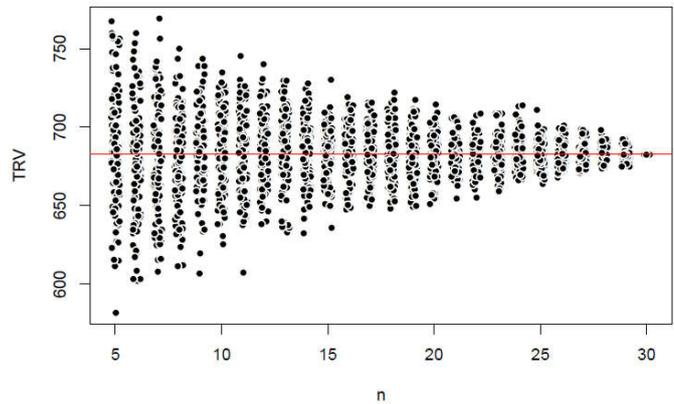
These data form the basis of subsequent analysis

Can we incorporate UAV data into this inventory so that we achieve acceptable precision and accuracy from a small sample size?

Field Sampling Simulations

Smaller samples may lead to reduced accuracy

8 plots the deviation ranges by more the $100 \text{ m}^3 \text{ ha}^{-1}$



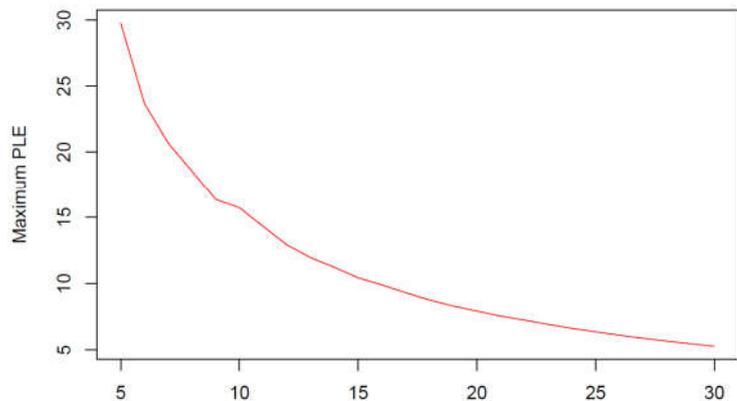
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Field Sampling Simulations

A smaller sample will lead to lower precision

However the precision estimates may be misleading



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UAV Sampling

Area: 55.34 hect
Distance: 15.34 km
Max speed: 8.1 m/s
Duration: 36m 18s
Batteries: 1
Images: 734
Points: 1761
Storage: 3.66 GB

Altitude: 280 m
Resolution: 12:1 cm/px

ha km

Simulator: Off Terrain Aware Active Connect Grid Mission User Guide

Overlap 95/... Camera Control Max: 8.1 m/s Battery Limited Offset: 0.0 m

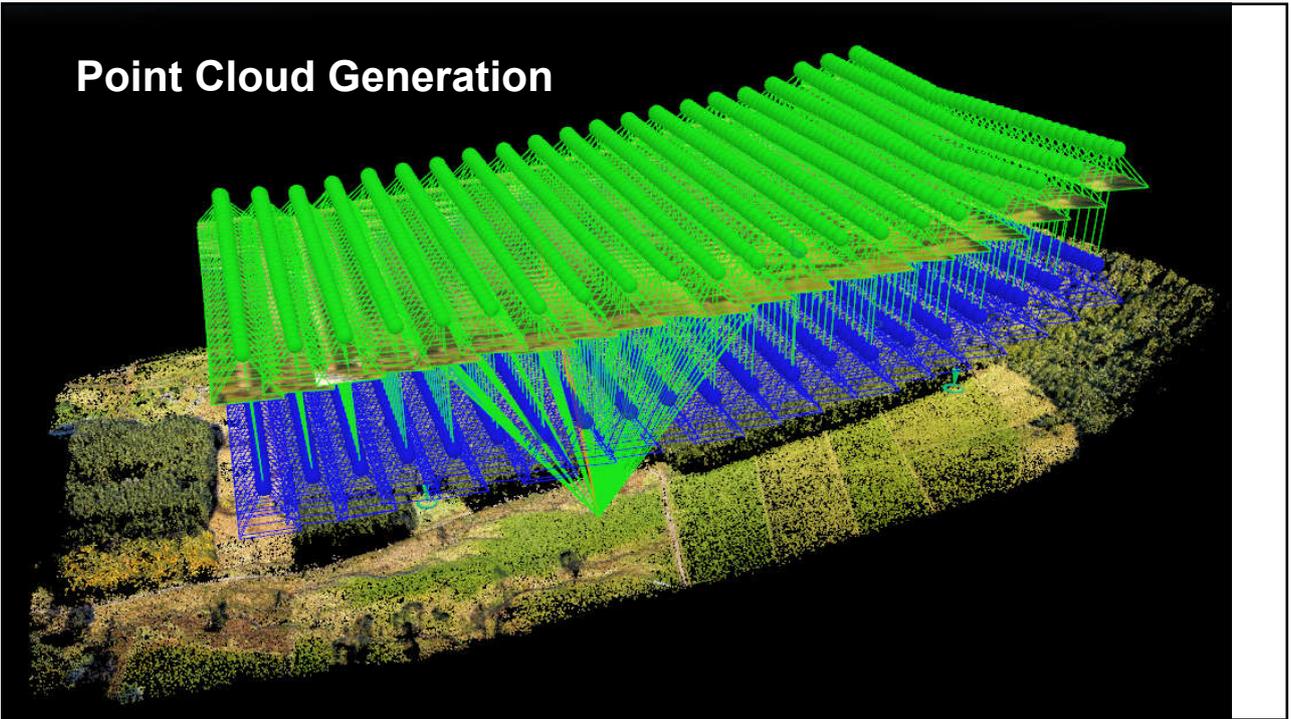
Not Connected Range: 0m @ 0° 33% 40% 100% 100% 16%

vers
by levy

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Point Cloud Generation



Analysis phase

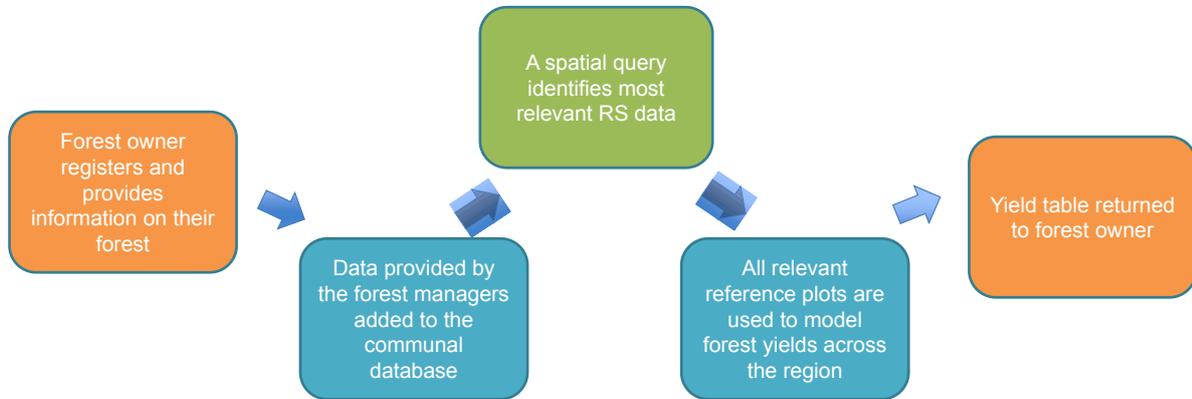
- What is the most appropriate form of statistical inference for this scenario?
- How low can we reduce the field plot sample size and get similar precision and accuracy?
- What are the most practical data collection procedures?
- What are the implications for sampling design?

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2. A Community Approach

Community data sharing approach



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We need to engage with a community of users for this approach to be successful

2 articles on the project published in the NZ Tree Grower

Some response but more needed

Where to from here?

- Direct contacts through NZFFA or NZIF?
- Contact through consultants or managers
- Any other ideas?

Eyes in the sky
Michelle Harsett and Jonathan Dash

Improving small plantation and woodlot inventory using remote sensing
How you can help
Jonathan Dash and Michael Watt

Using LiDAR for small forests

Using remote sensing

Forest Growers Research

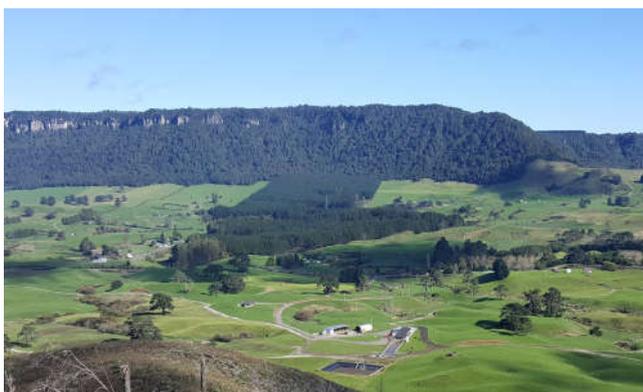
Concluding comments

This project is uniquely positioned to deliver new solutions using emerging technology in a manner that is suitable for small growers.

We have developed methods for generating 3D information on the forest canopy from UAV imagery

We are developing new methods for statistical inference suitable for small forests

We are developing methods for plot sharing approach for a community of small-forest growers.



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