treetools

# Update on use of LiDAR ALS, ULS, MLS Single Tree LiDAR Imputation

Hurdles for Implementation - Nov 2023

David Herries

Interpine Remote Sensing Team:
Susana Gonzalez, Aki Yang, Joo-Hynn Ahn, Athul Wilson, Caleb Strickland, Chris Scoggins, Murray Walker, Perry Han, Sam West

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So Why LiDAR Recap ?
What's Been Happening ?
The Challenges
Where to Next ?
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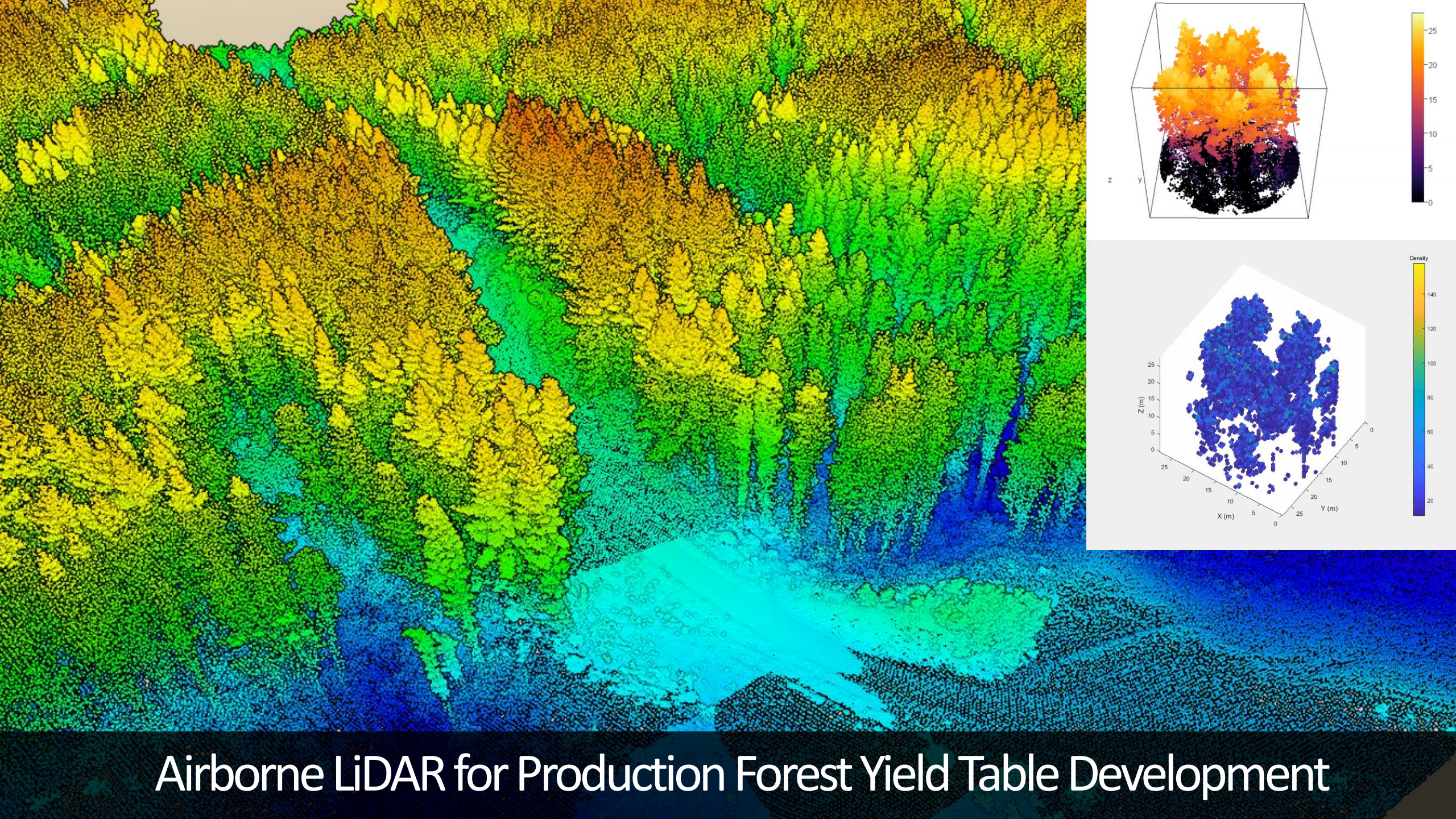
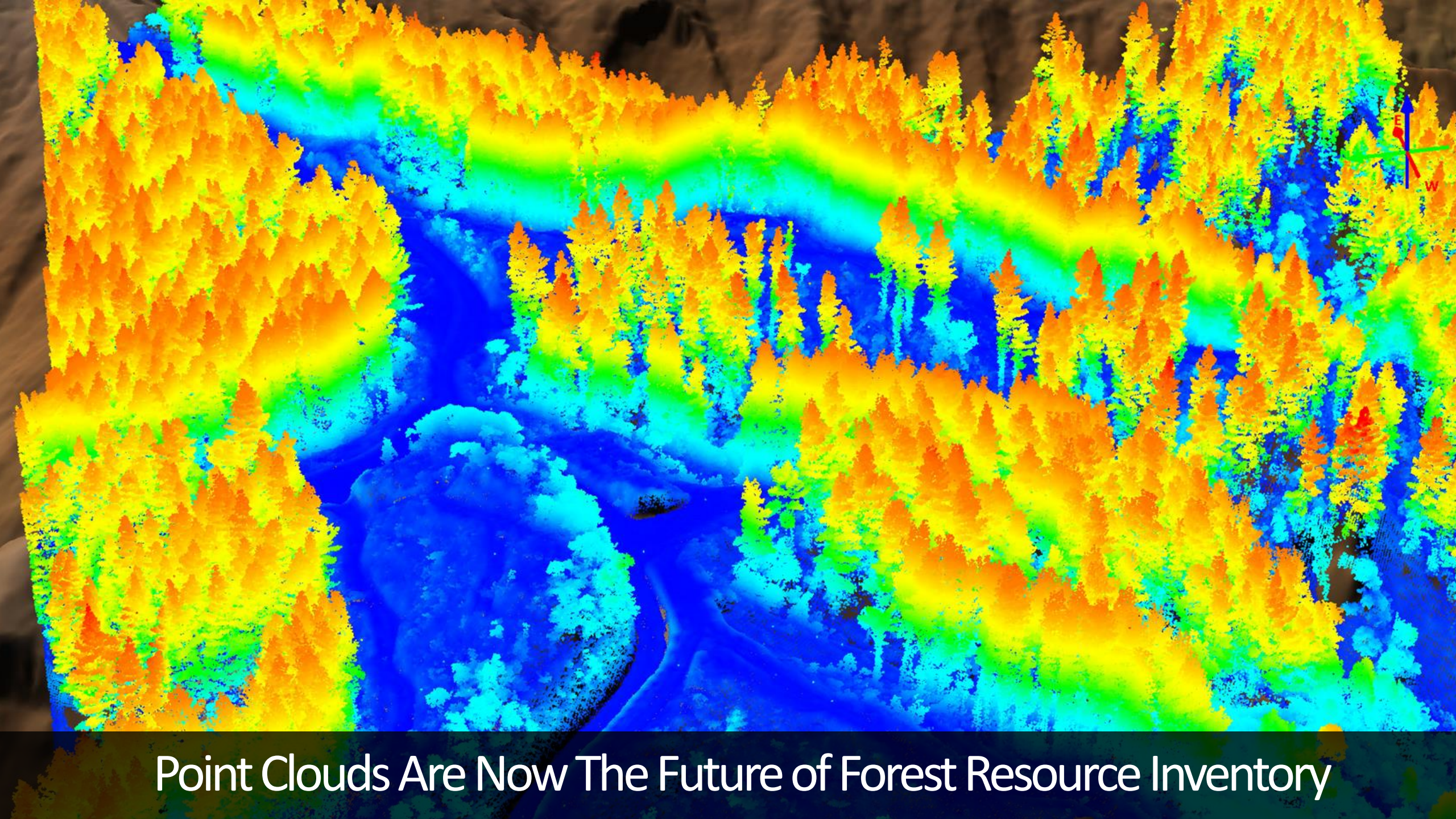



# Airborne LiDAR for Production Forest Yield Table Development




# Point Clouds Are Now The Future of Forest Resource Inventory

# Waterway and Riparian Management

## using deep learning for detection of cutover residue

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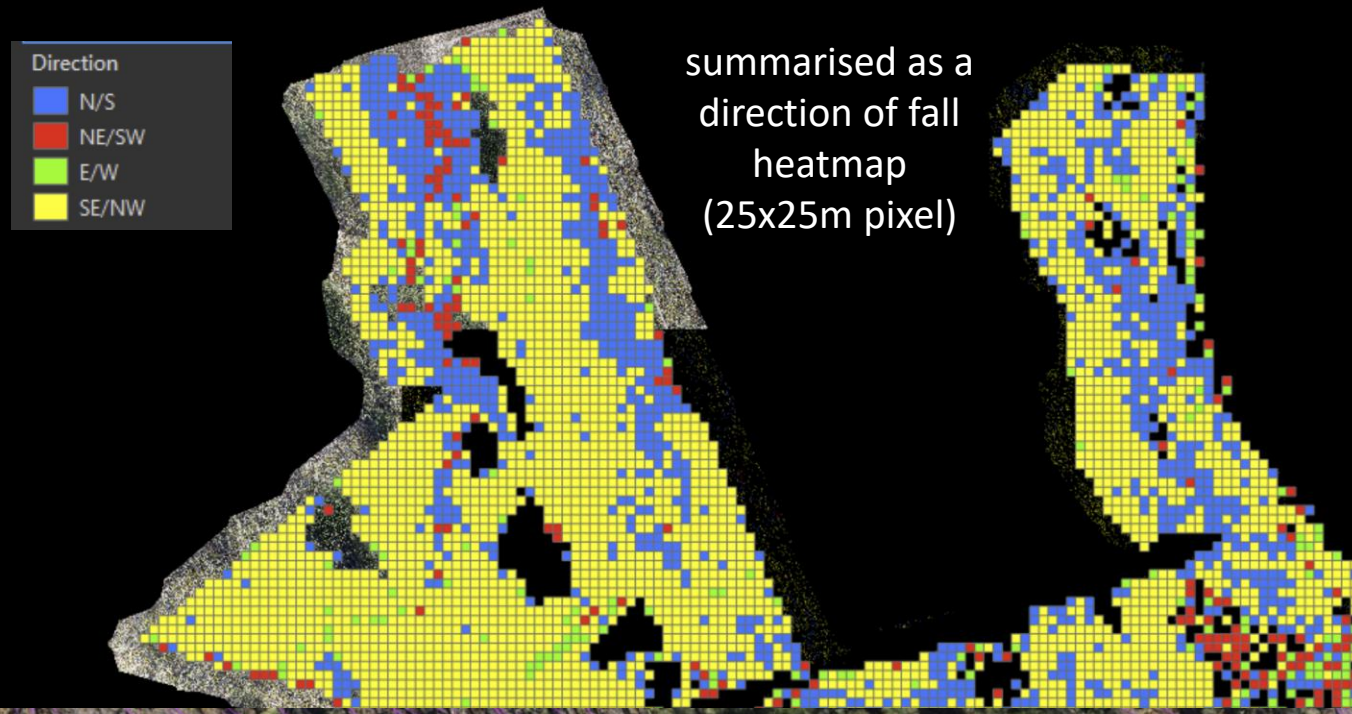
# windthrow stems detected using AI




summarised as a direction of fall heatmap (25x25m pixel)

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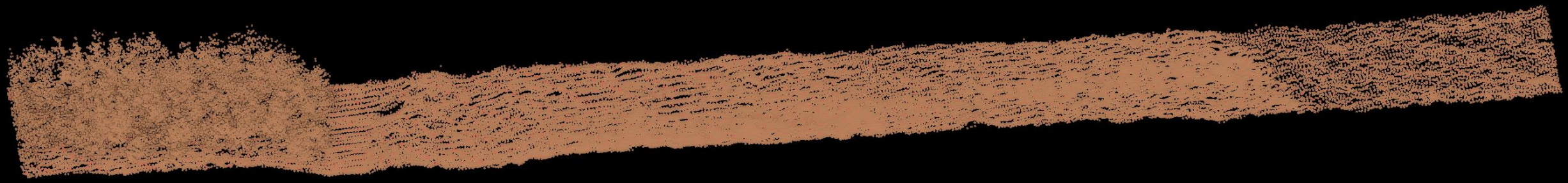
# Watching a forest grow with LiDAR



2014

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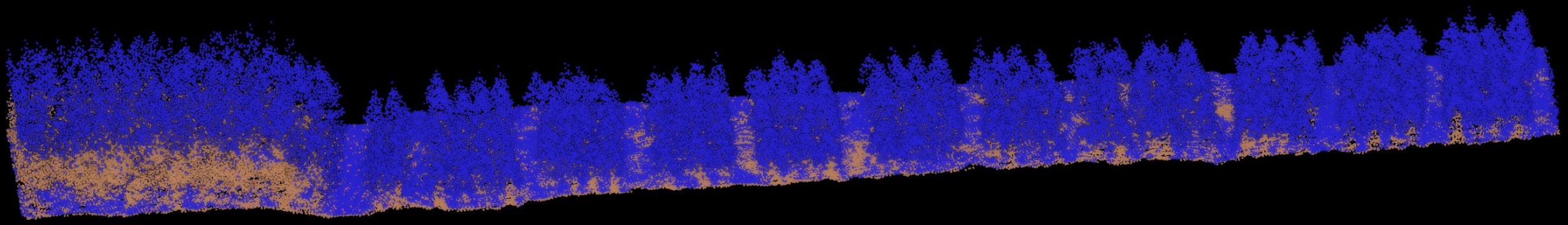
# Watching a forest grow with LiDAR



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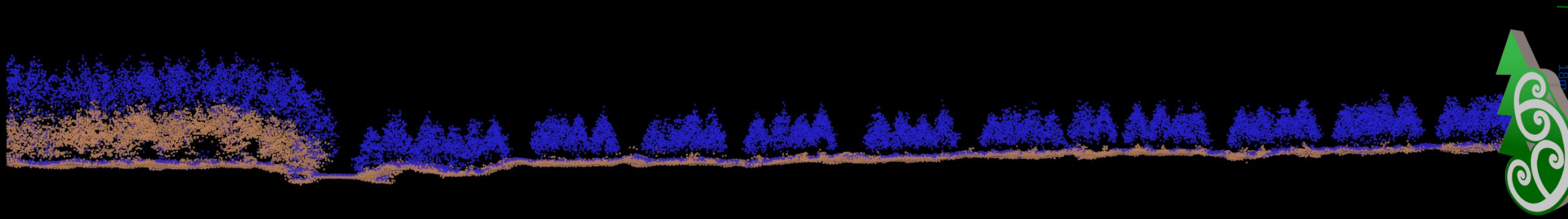


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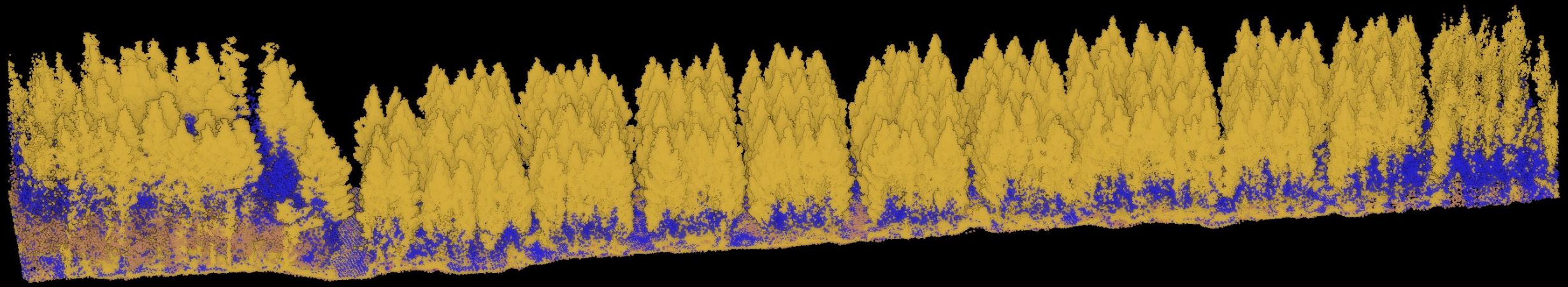
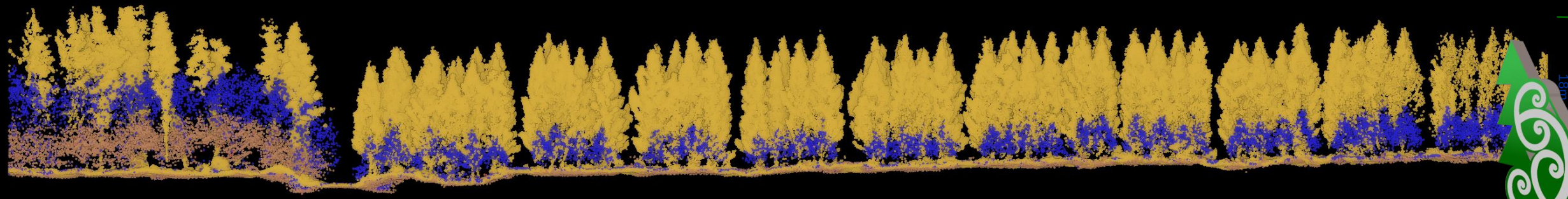


2022



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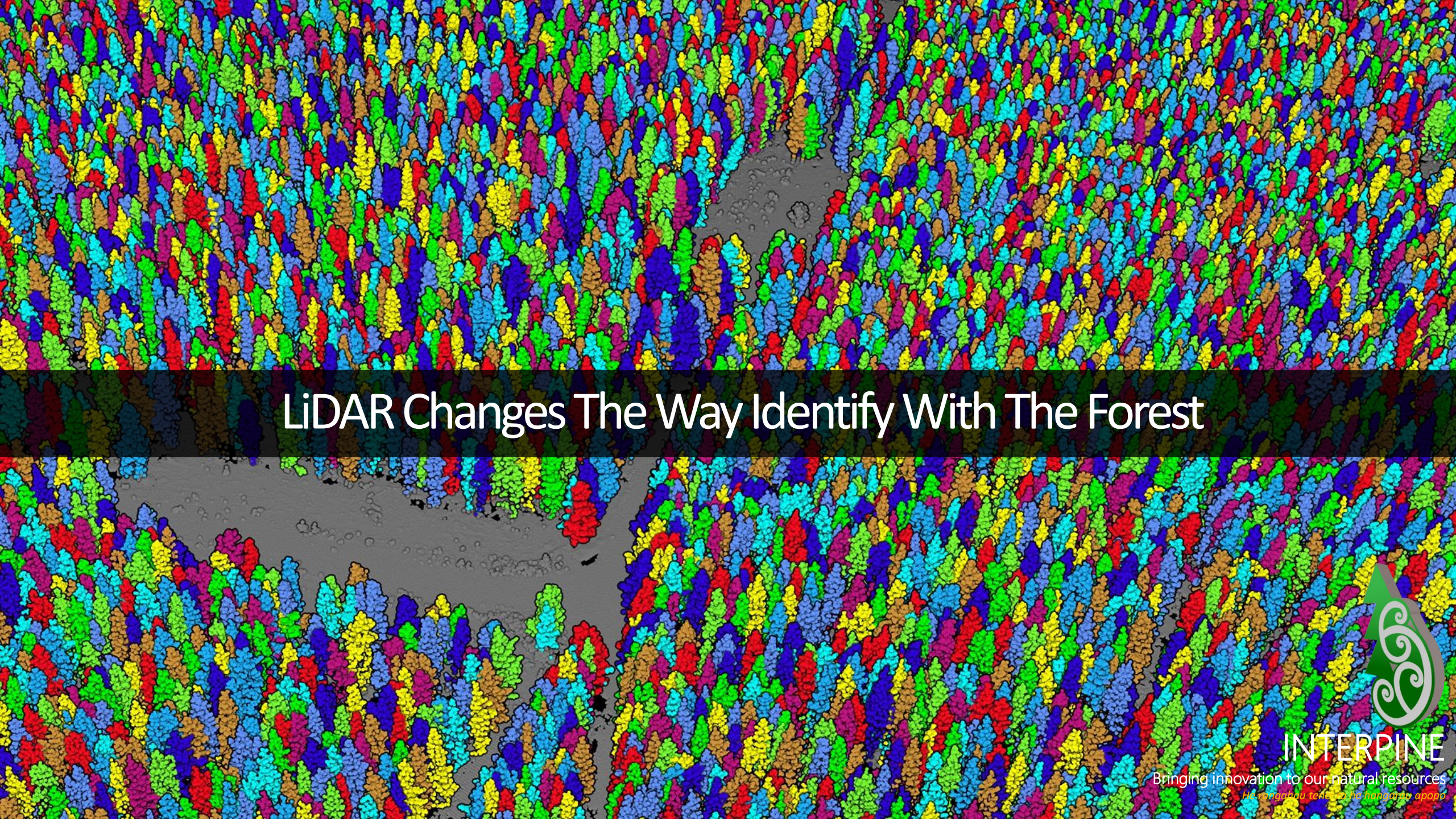
LiDAR Changes The Way Identify With The Forest
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# Single Tree LiDAR Data Combined with Hovermap Ground Based Inventory Data

Results from Recent in Forest Trials

Perry Han

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# Real-time Thinning Assessment

Sept 2023

David Herries

Susana Gonzalez, Aki Yang, Aglika Gyaourova, Athul Wilson, Caleb Strickland, Chris Scoggins, Murray Walker, Perry Han, Sam West

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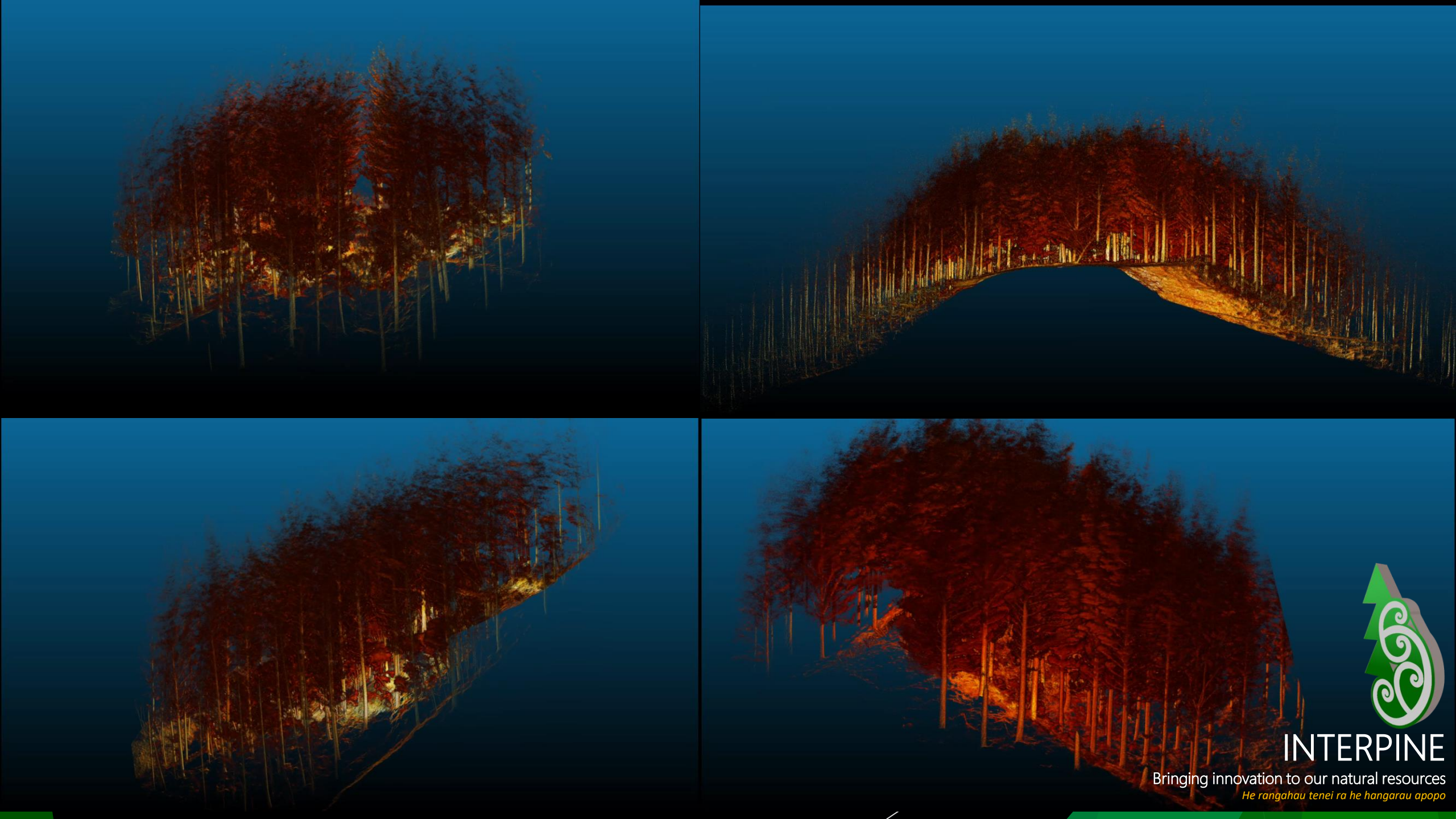

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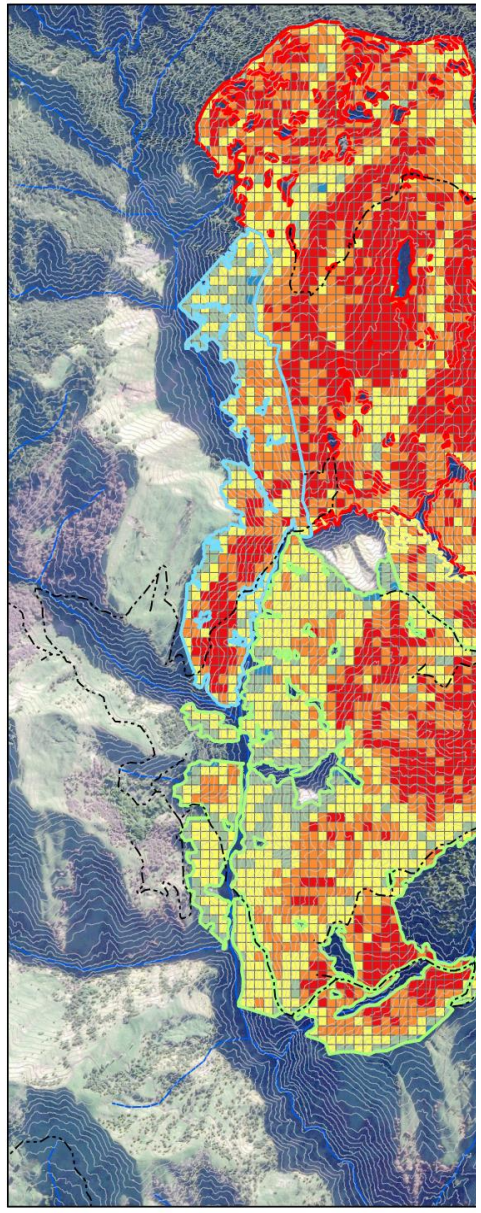
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Rivers
Lake
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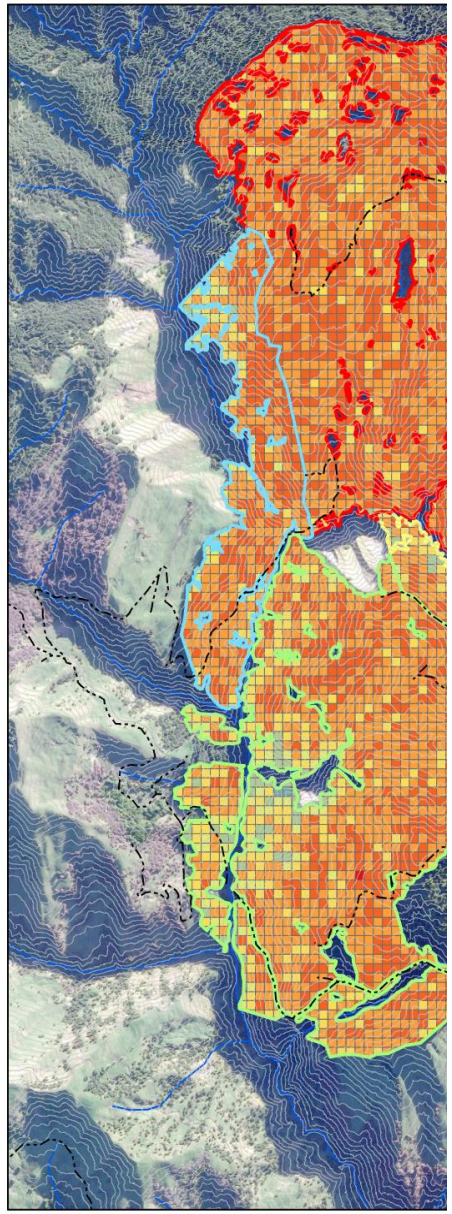
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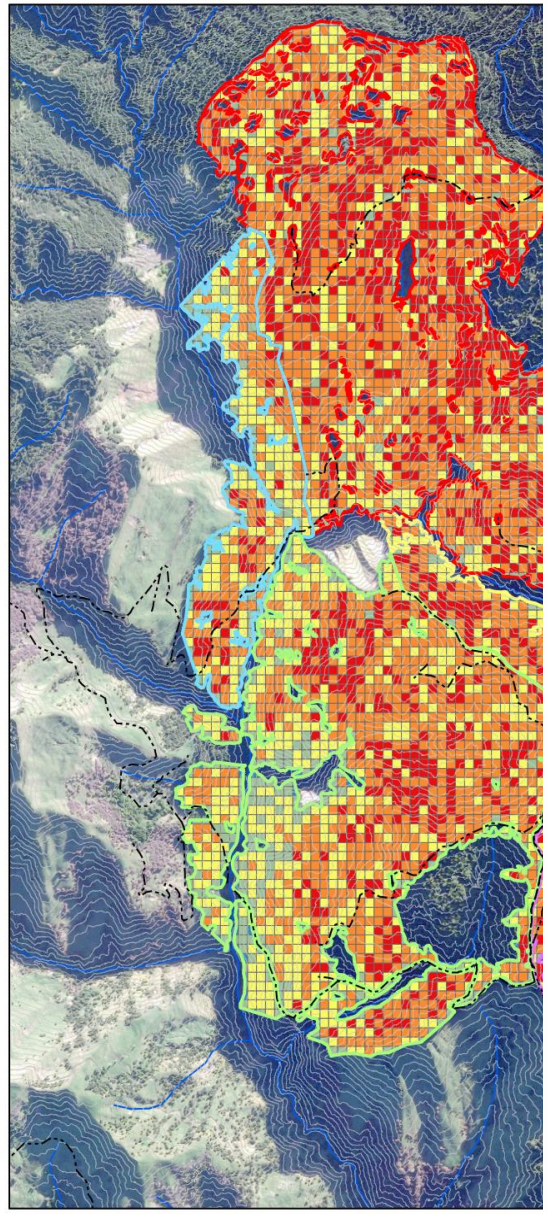
6-6.5m
6.5-7m
7m+
Rivers
Lake
0 75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Rivers
Lake
Total Rec
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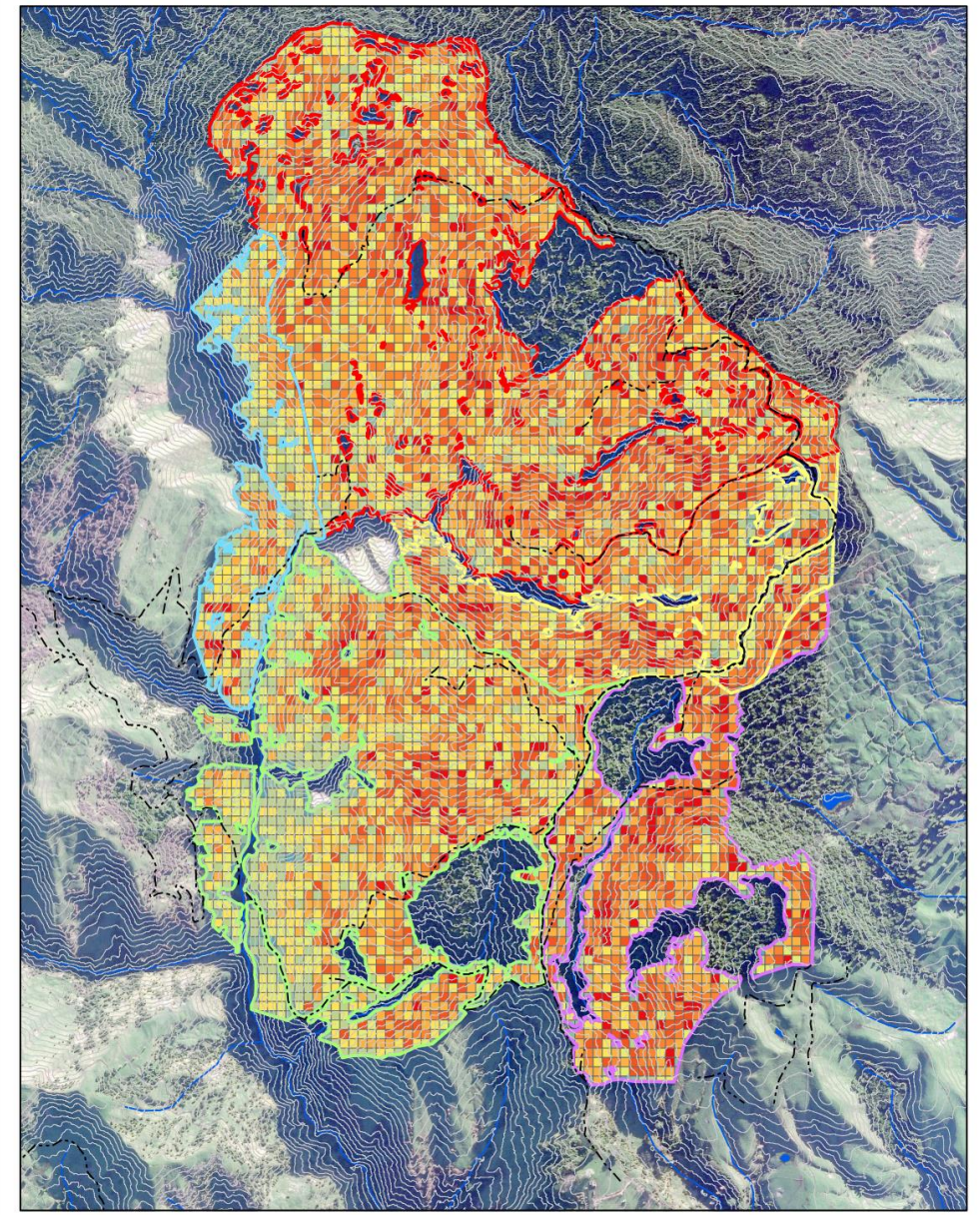
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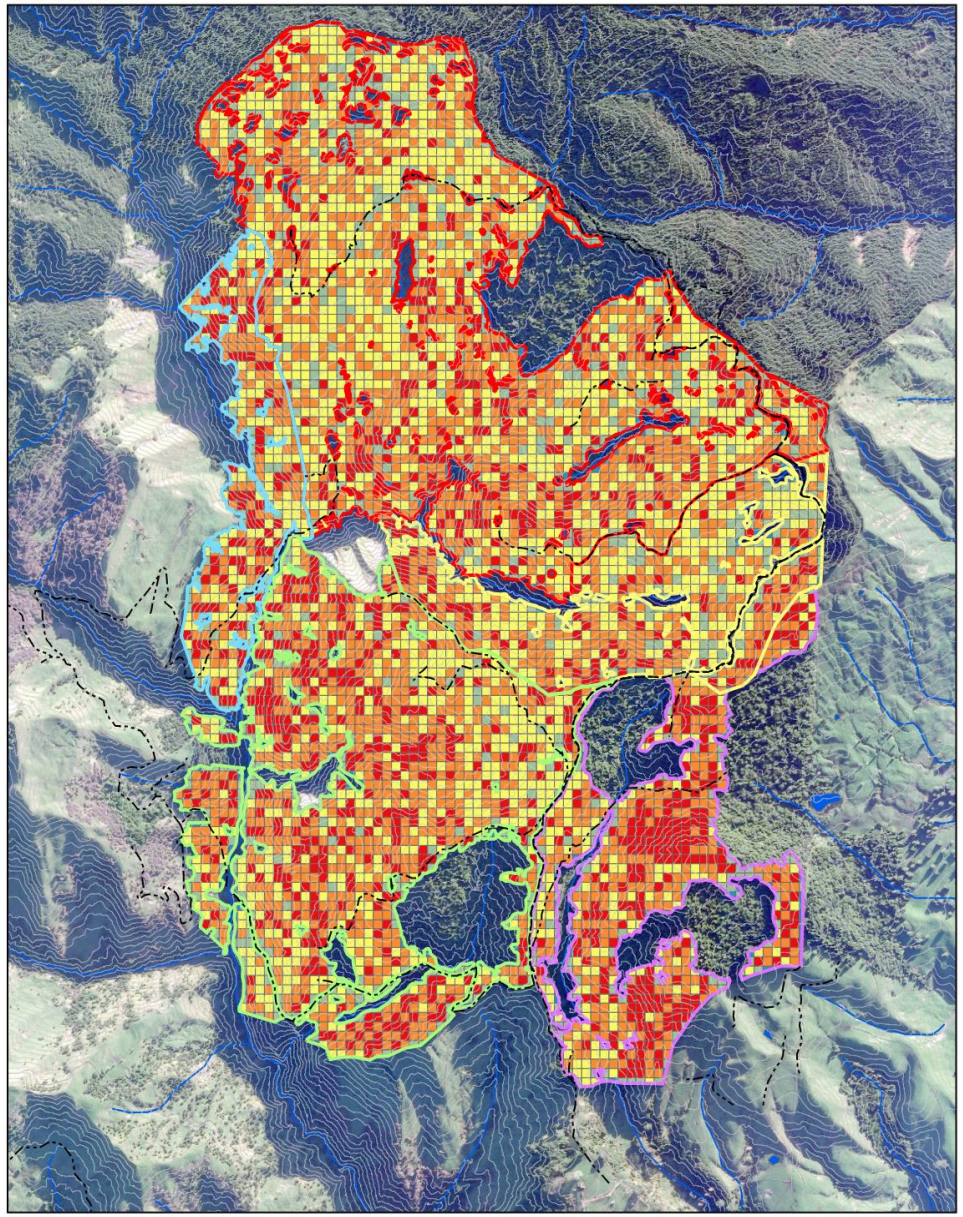
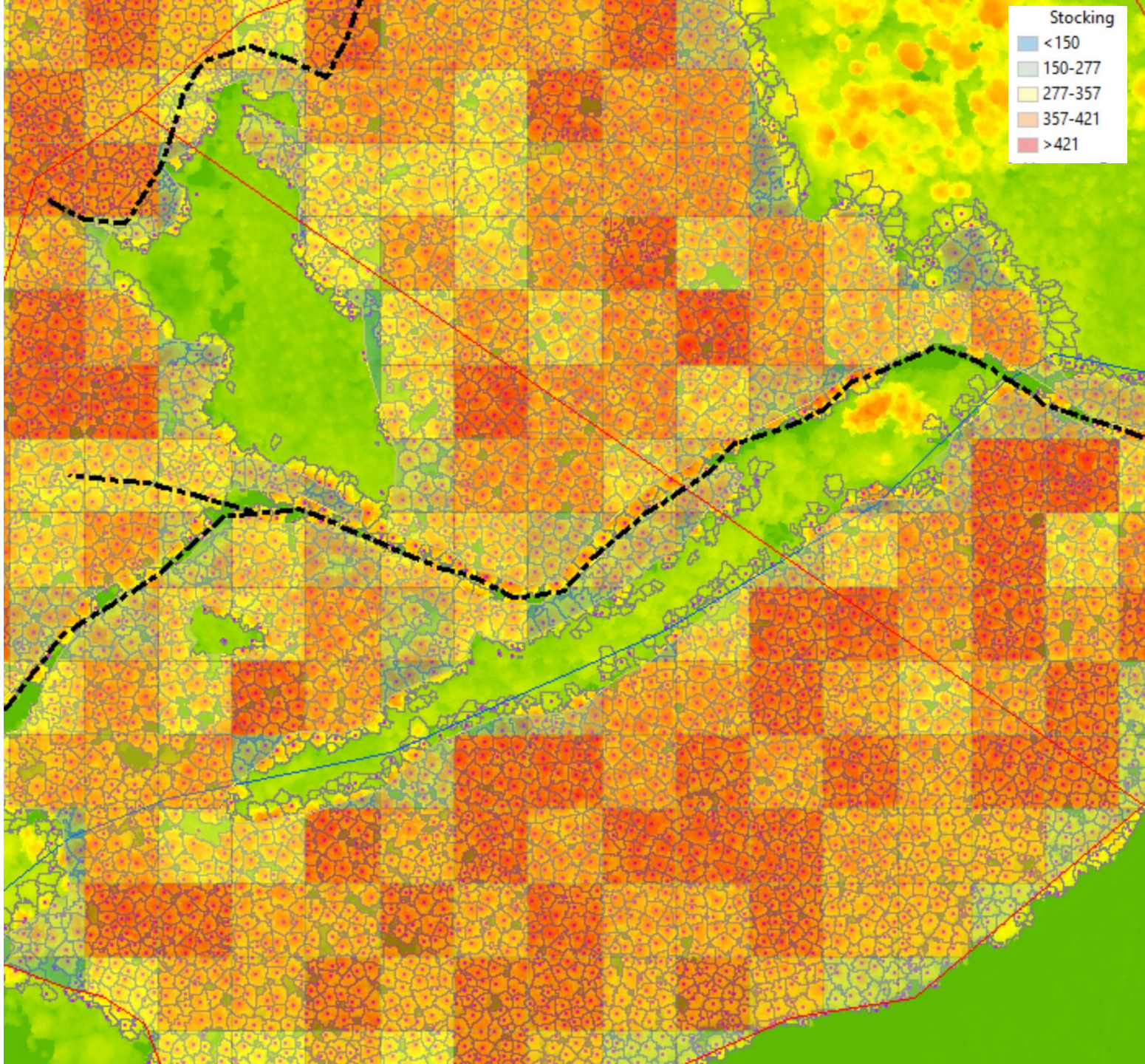
616-722
722-809
809-889
889-969
969-1066
>1066
Rivers
Lake
Total Recoverable Volume (m3/ha)
Modelled for June 2030 (Age 28)
(Export Pruned Strategy)
Date: 27/09/2022
Map Produce by
0 75 150 300
Meters
Coordinate System: NZGD 2000 New Zealand Transverse Mercator
Projection: Transverse Mercator
Datum: NZGD 2000

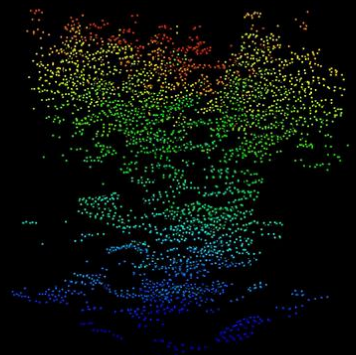



**Stocking (SPH)**
**June 2022**

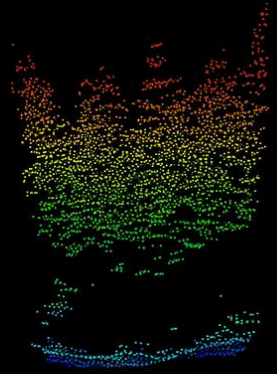
Date: 27/09/2022
Map Produce by

Coordinate System: NZGD 2000 New Zealand Transverse Mercator
Projection: Transverse Mercator
Datum: NZGD 2000

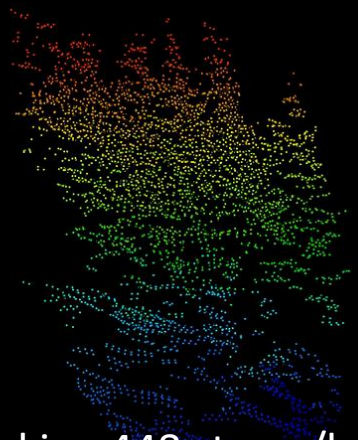




Stocking 261 stems/ha



Stocking 352 stems/ha



Stocking 448 stems/ha

ALS LiDAR Point Cloud

# Drone Based LiDAR

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# Making Digital Enabled Thinning a Reality

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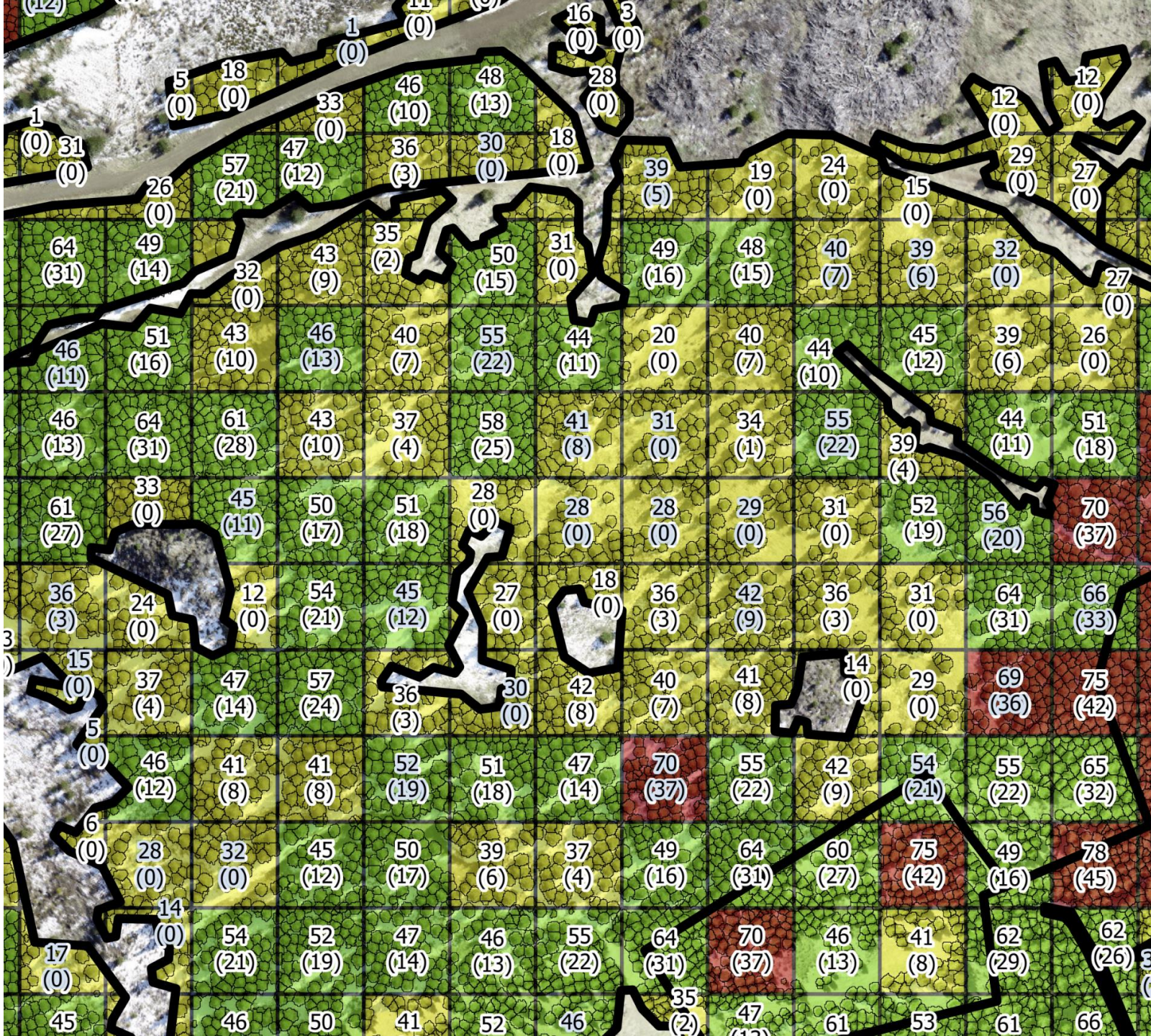
**Remove technical hurdles and roadblocks to get useful technology into the hands of forest users**

**Create a thinning pre-assessment tool to plan and assist operators and prototype a Real-time or Near Real-time in field workflow post thinning assessment of tree stocking (and related key metrics)**

- Stage 1 – pre-assessment workflow for stocking and height
- Stage 2 – post-assessment infield laptop near real-time prototype
- Focused Metrics
  - Pre-assessment
    - Tree Size > Height and Crown Area (with imputed DBH and Volume)
    - LiDAR sensor approach
  - Post-assessment
    - Tree Stocking > Gap Analysis

Tools for foresters

"Eyes in the air, reducing the boots in the blackberry"



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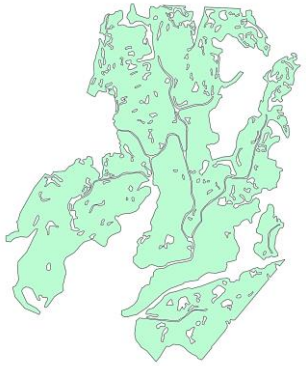
Area of Interest

…

stand shape file



LiDAR Data

…

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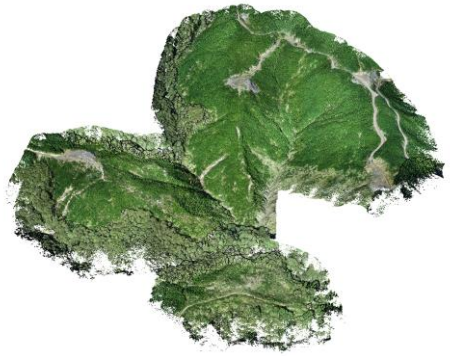

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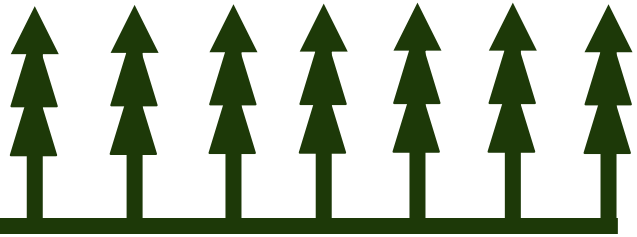
Digital Elevation Model
Canopy Height Model
Tree Peak Detection (incl. Height)
Crown Detection and Crown Metrics
Stocking / Tree Height Heat Map
ATLAS GeoMaster Summary Import
Regeneration Modelling
Tree Selection / Competition Index



products available for download
information stored for limited time
(i.e. 7 days)

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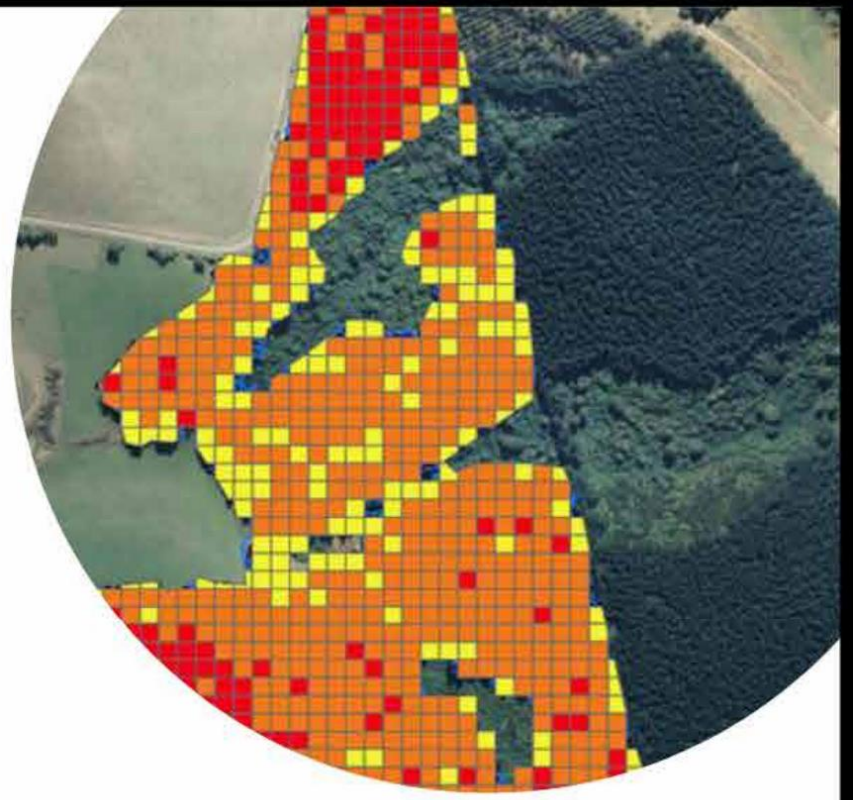
# The future of tree thinning assessment.

**Treetools offers pre and post thinning assessments to support forestry decision making.**

Now available in BETA format, Treetools has been designed to support forest managers better direct thinning crews and will advance into a real time, in forest, application in future versions.

The first iteration leverages advanced data sources such as LiDAR and RGB imagery to deliver pre and post assessment thinning maps including tree location, stocking, derived gap analysis, digital surface model, tree height and digital crown area.

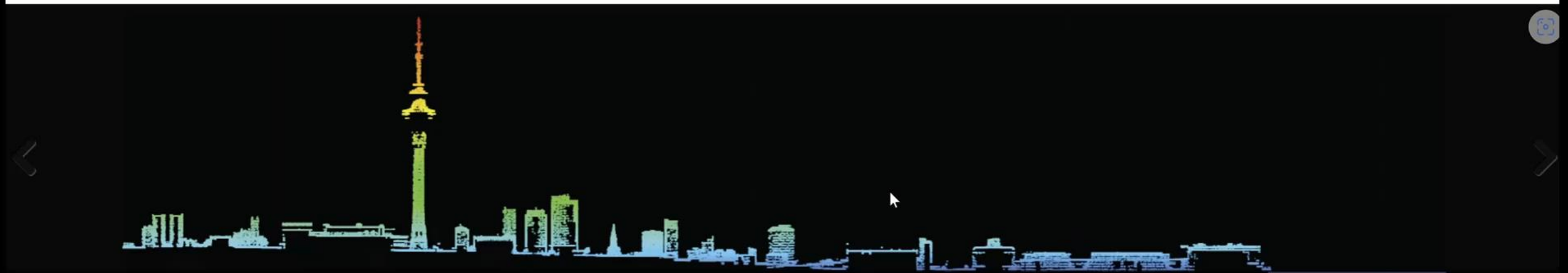


treetools

# Elevation Aotearoa

Toitū Te Whenua
Land Information
New Zealand

NZ Elevation Map - LiDAR availability and release schedule | About the elevation programme | Get started | How-to guides - open source | How-to guides - ArcGIS | Case studies



Profile through Auckland, NZ lidar point cloud data. Sky Tower at center left.

# Latest News

## Polar Geospatial Center's ArcticDEM and REMA data now accessible via OpenTopography

Sep 11, 2023

ArcticDEM and the Reference Elevation Model of Antarctica (REMA) are now accessible via OpenTopography with our value-added tools for access, processing, and visualization. The 32m and 10m resolution data products are open to all users, while...

## New SfM Dataset over Mount Rainier, Washington

Sep 5, 2023

OpenTopography has recently added a new structure from motion (SfM) dataset over Mount Rainier in Washington State. This dataset was collected by the National Park Service Mount Rainier (MORA) Geology Division in cooperation with the Alaska Region...

Request an API Key

**Latest Datasets:**

- Porirua, Wellington, New Zealand 2023
- Reference Elevation Model of Antarctica (REMA)
- Quantifying Channel Change in a Steep Coastal Stream, CA 2022

Real Time Analytics

# Point Cloud Job Results



Modify and resubmit this job
Full job metadata

Download job metadata
View job configuration

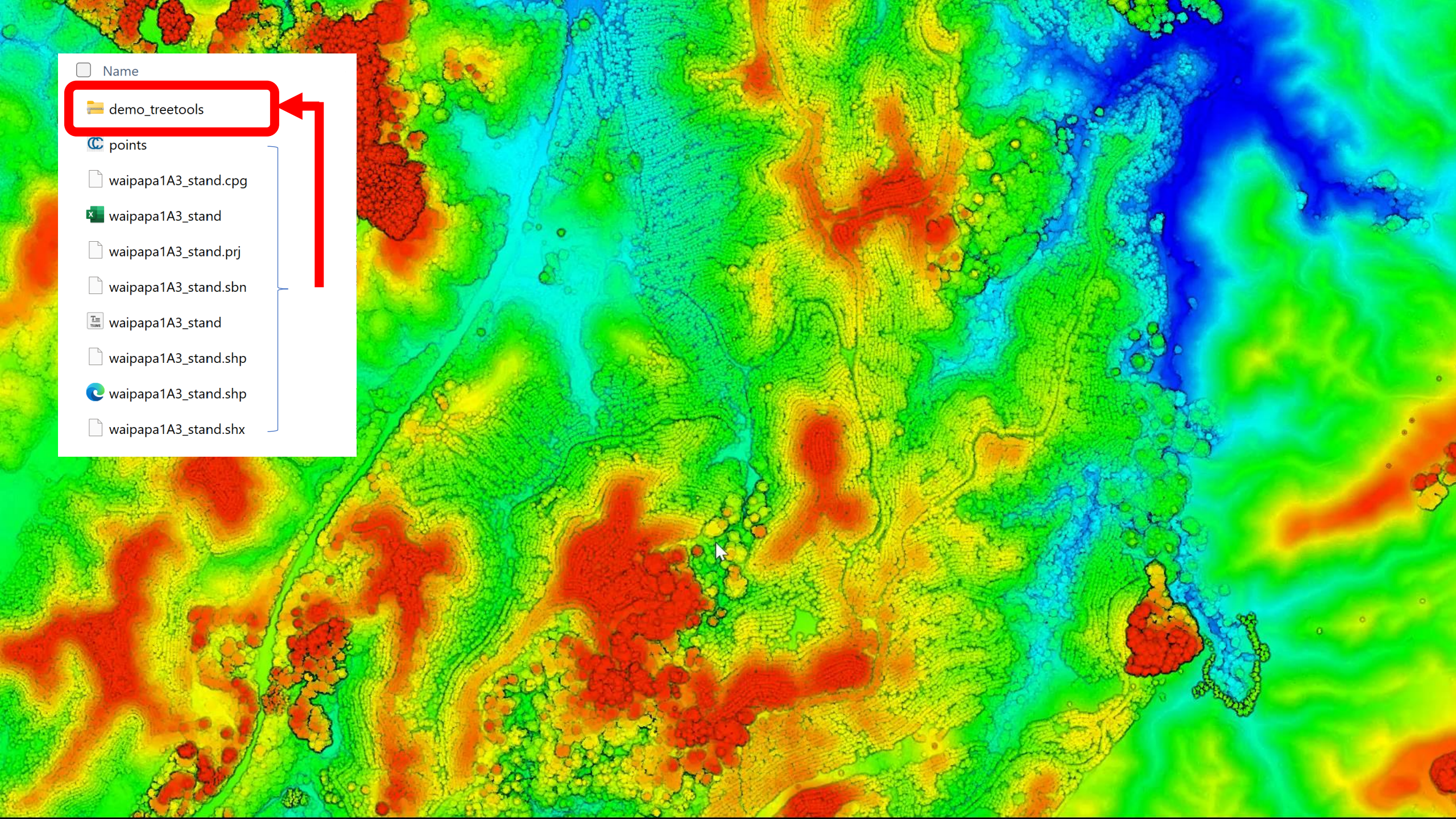
**Dataset Citation:** BOPLASS Limited, Toitū Te Whenua Land Information New Zealand (LINZ) (2023). Bay of Plenty, New Zealand 2019-2022. Collected by Aerial Surveys, distributed by OpenTopography and LINZ. https://doi.org/10.5069/G9W66J0Z. Accessed: 2023-09-12

Use License: **CC BY 4.0**

| Job Id | Dataset | Title | Submission | Completion | Duration | Num. Points | Final Status |
|---|---|---|---|---|---|---|---|
| pc1694524786016 | NZ20_BoP | Test Tree Tools | 2023-09-12 13:19:46 | 2023-09-12 13:20:56 | 70 secs | 28,592,342 | Done ✔ |

## Download Data

| | |
|---|---|
| Point Cloud Results | • Download point cloud data in LAZ format points.laz (116.2 MB) |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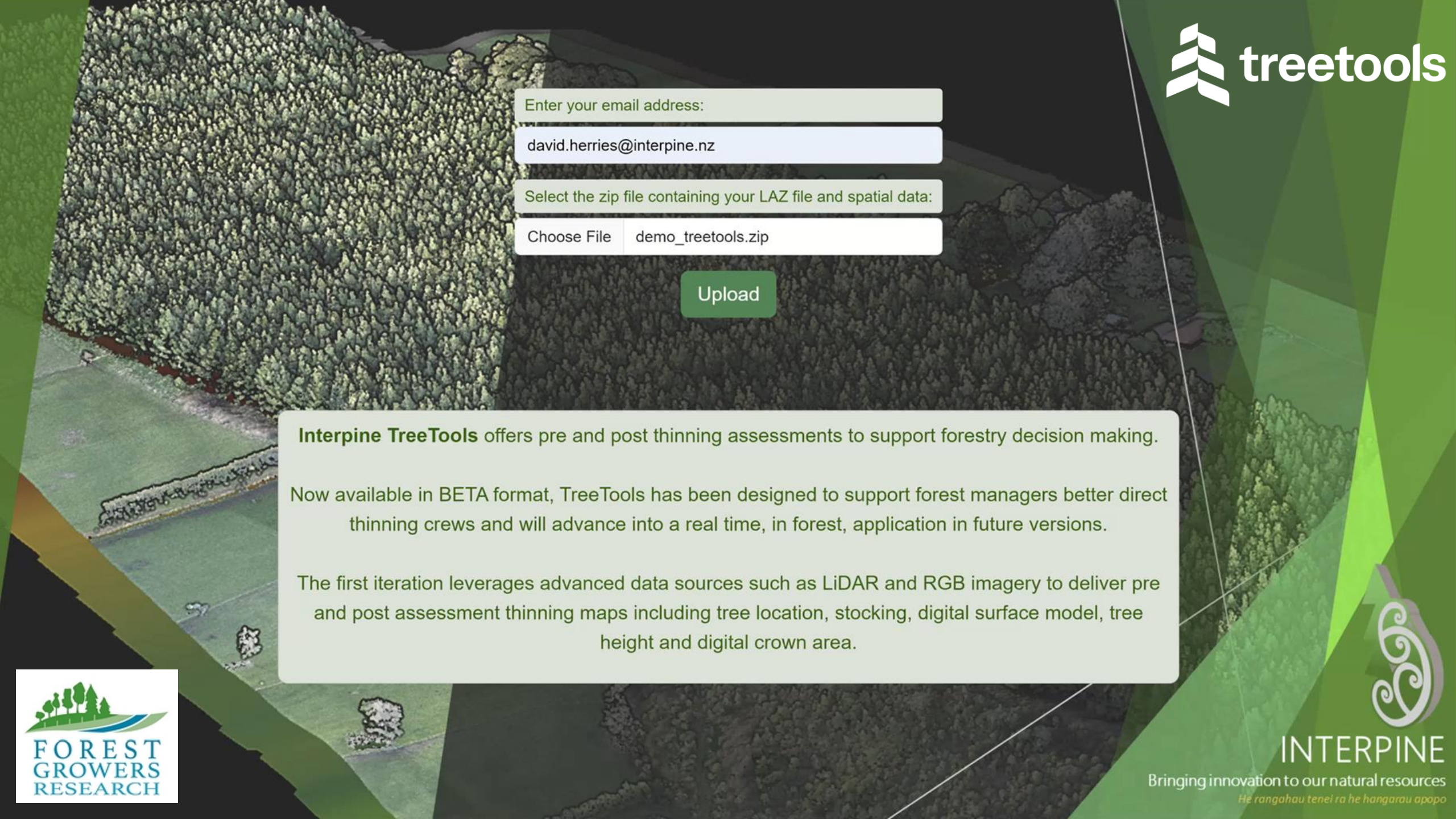
treetools
Enter your email address:
david.herries@interpine.nz
Select the zip file containing your LAZ file and spatial data:
Choose File
demo_treetools.zip
Upload
Interpine TreeTools offers pre and post thinning assessments to support forestry decision making.
Now available in BETA format, TreeTools has been designed to support forest managers better direct thinning crews and will advance into a real time, in forest, application in future versions.
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FOREST GROWERS RESEARCH
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Kia ora david.herries@interpine.nz,

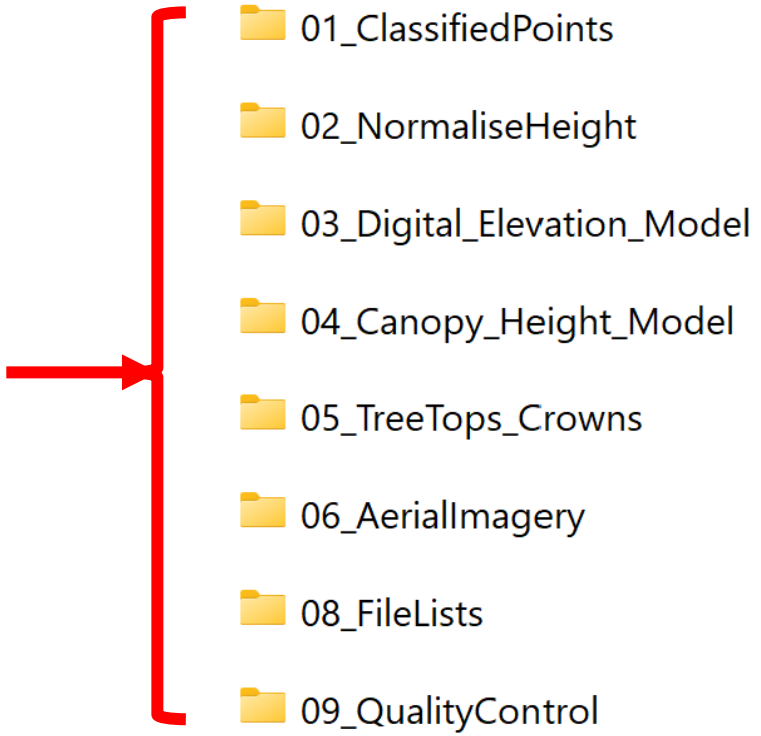
Your project data demo_treetools.zip has been processed.

Your results are available here:

https://ipgimageuploads.blob.core.windows.net/images/Results/demo_treetools_60cd57aa754d5_results.zip?se=2023-09-18T23%3A00%3A52Z&sp=rt&sv=2020-06-12&sr=b&sig=G74cEIxEXqpRN1pTEF5YNMsjqffGHw270LfL11w5pN0%3D

The results will be available for 7 days.

Nga mihi

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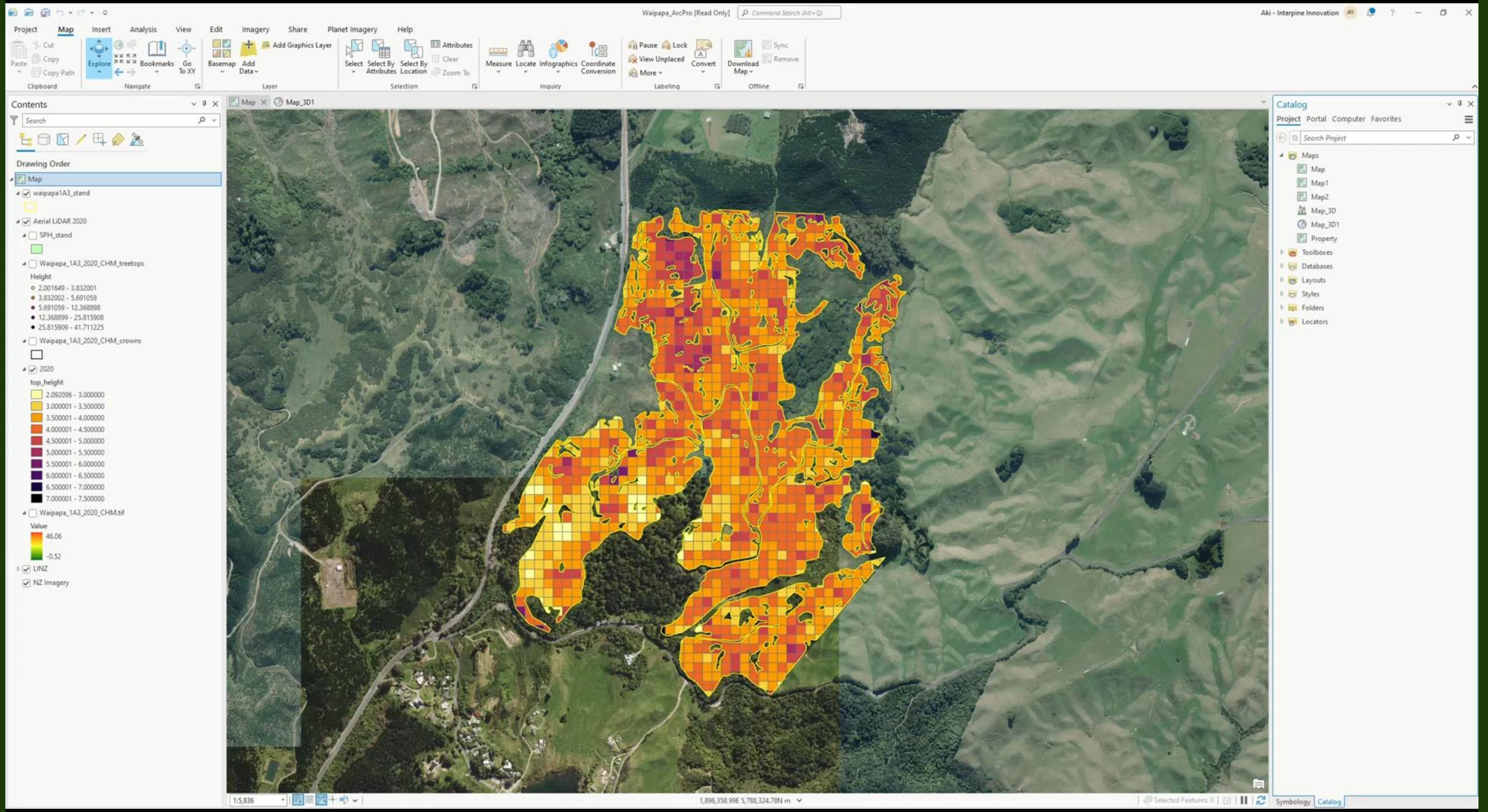
Waipapa_ArcPro [Read Only]
Command Search (Alt+Q)
Aki - Interpine Innovation
Project
Map
Insert
Analysis
View
Edit
Imagery
Share
Planet Imagery
Help
Cut
Copy
Copy Path
Paste
Clipboard
Explore
Bookmarks
Go To XY
Navigate
Basemap
Add Data
Add Graphics Layer
Layer
Select
Select By Attributes
Select By Location
Attributes
Clear
Zoom To
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Measure
Locate
Infographics
Coordinate Conversion
Inquiry
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View Unplaced
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5.500001 - 6.000000
6.000001 - 6.500000
6.500001 - 7.000000
7.000001 - 7.500000
Waipapa_1A3_2020_CHM.tif
Value
46.06
-0.52
LINZ
NZ Imagery
Map
Map_3D1
Catalog
Project
Portal
Computer
Favorites
Search Project
Maps
Map
Map1
Map2
Map_3D
Map_3D1
Property
Toolboxes
Databases
Layouts
Styles
Folders
Locators
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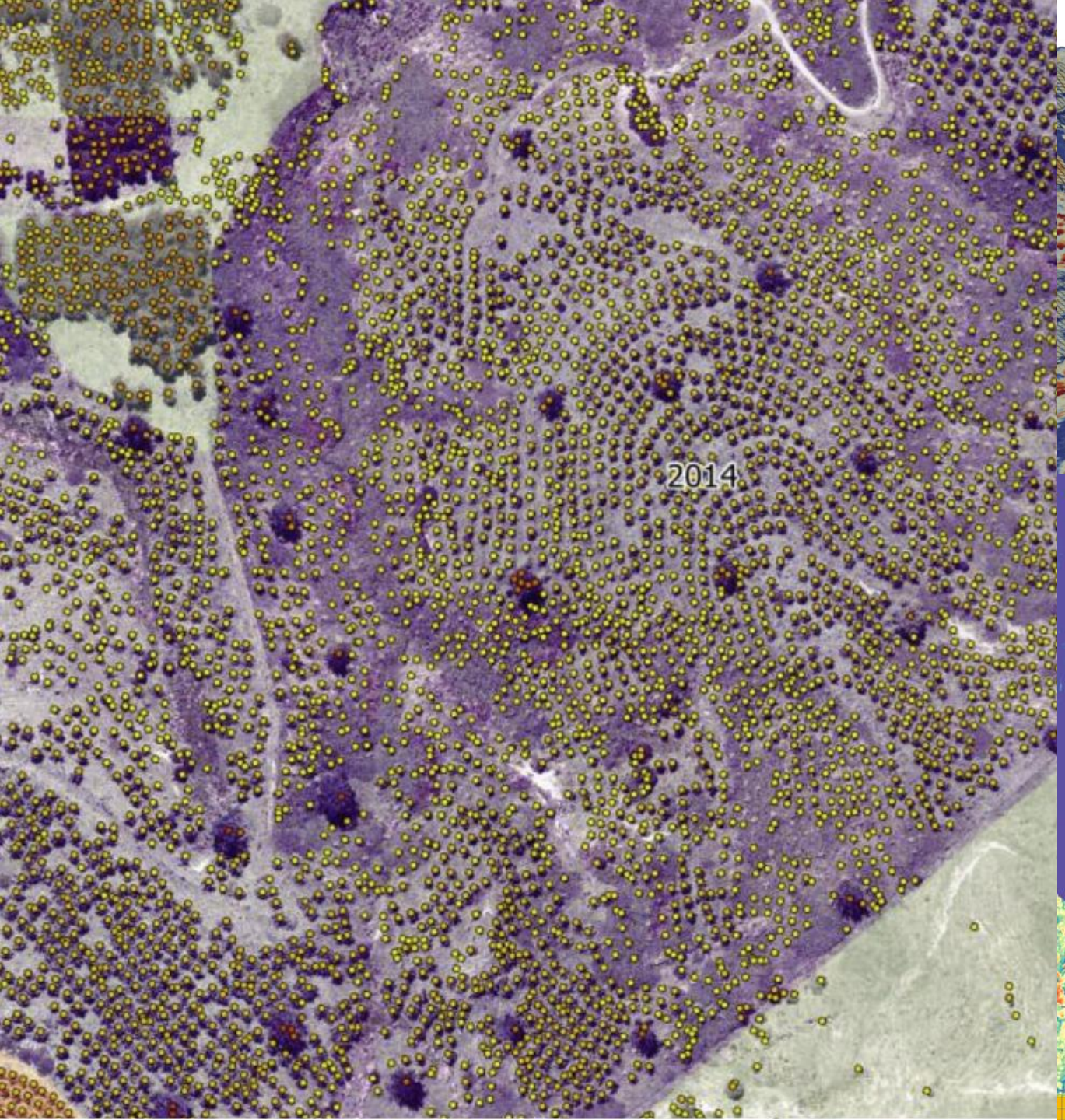
Symbology
Catalog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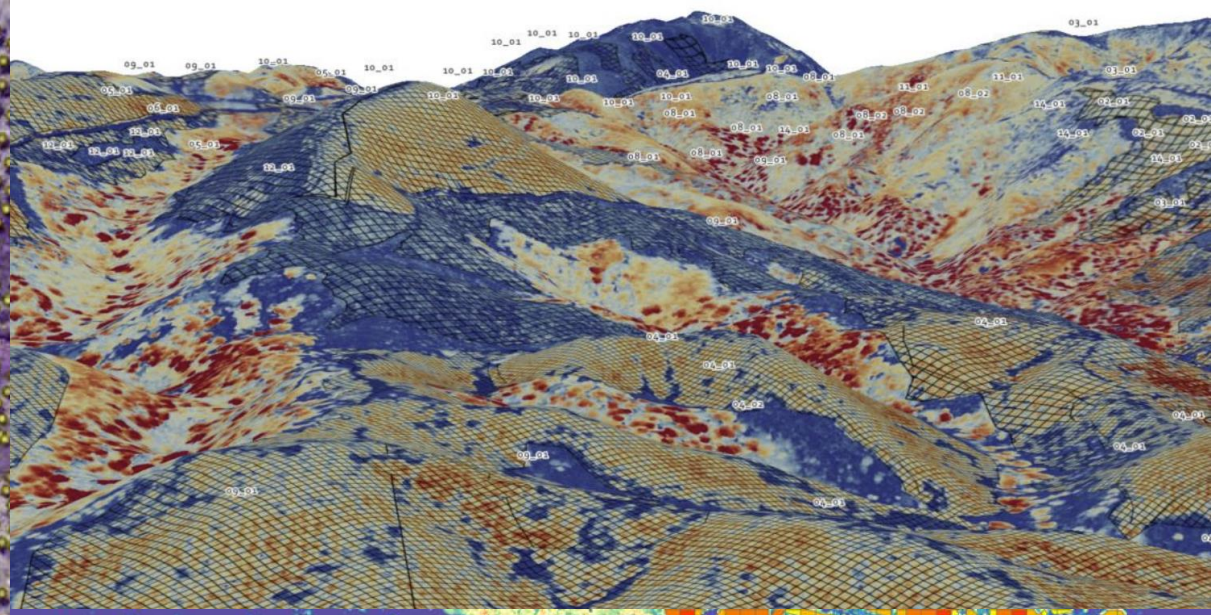

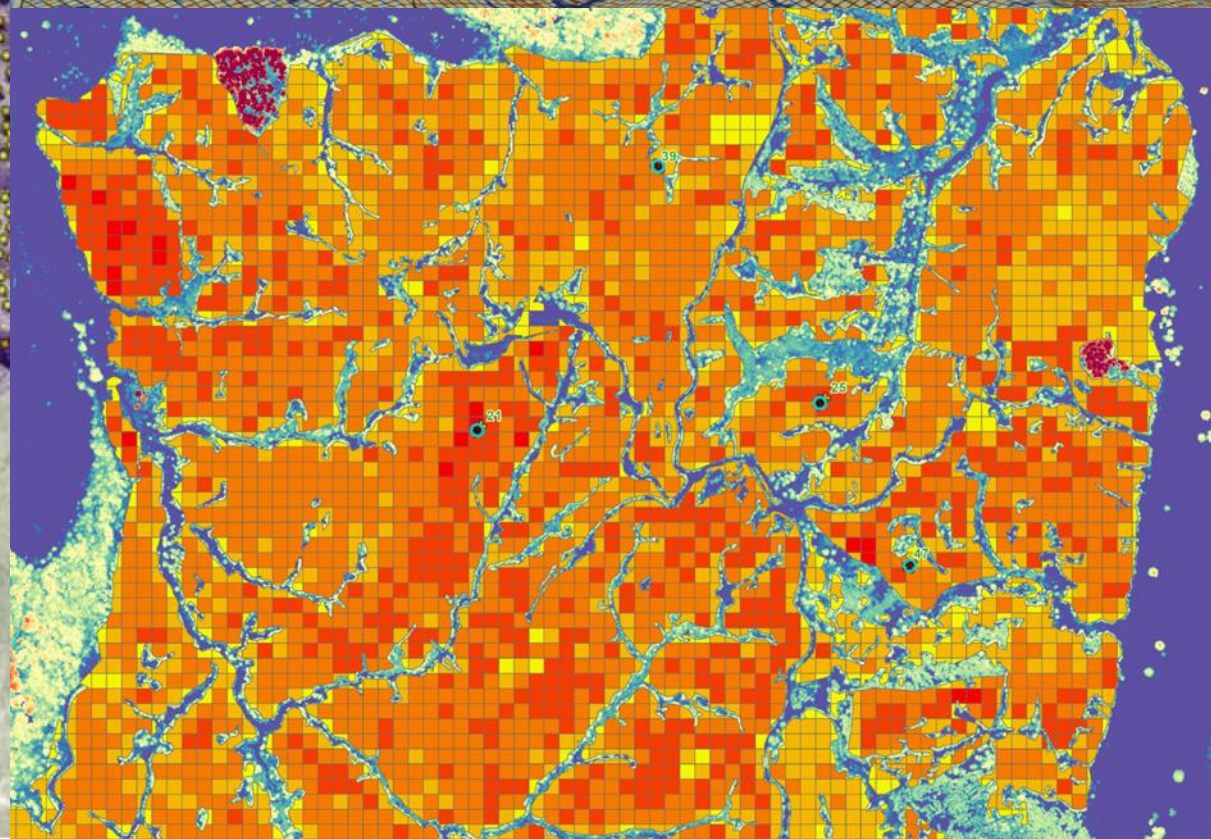

# Alpha Prototype Release End Sept

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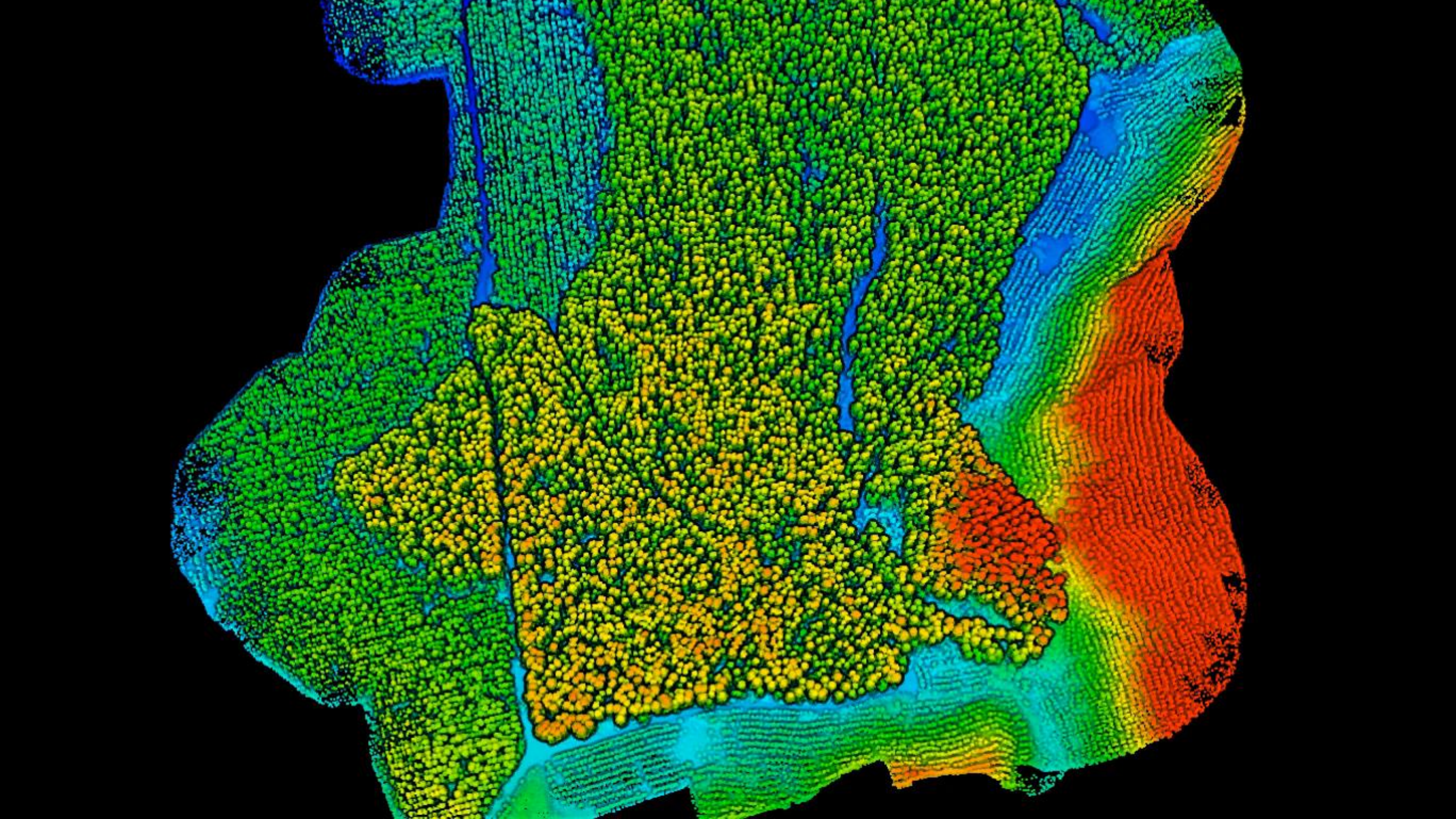
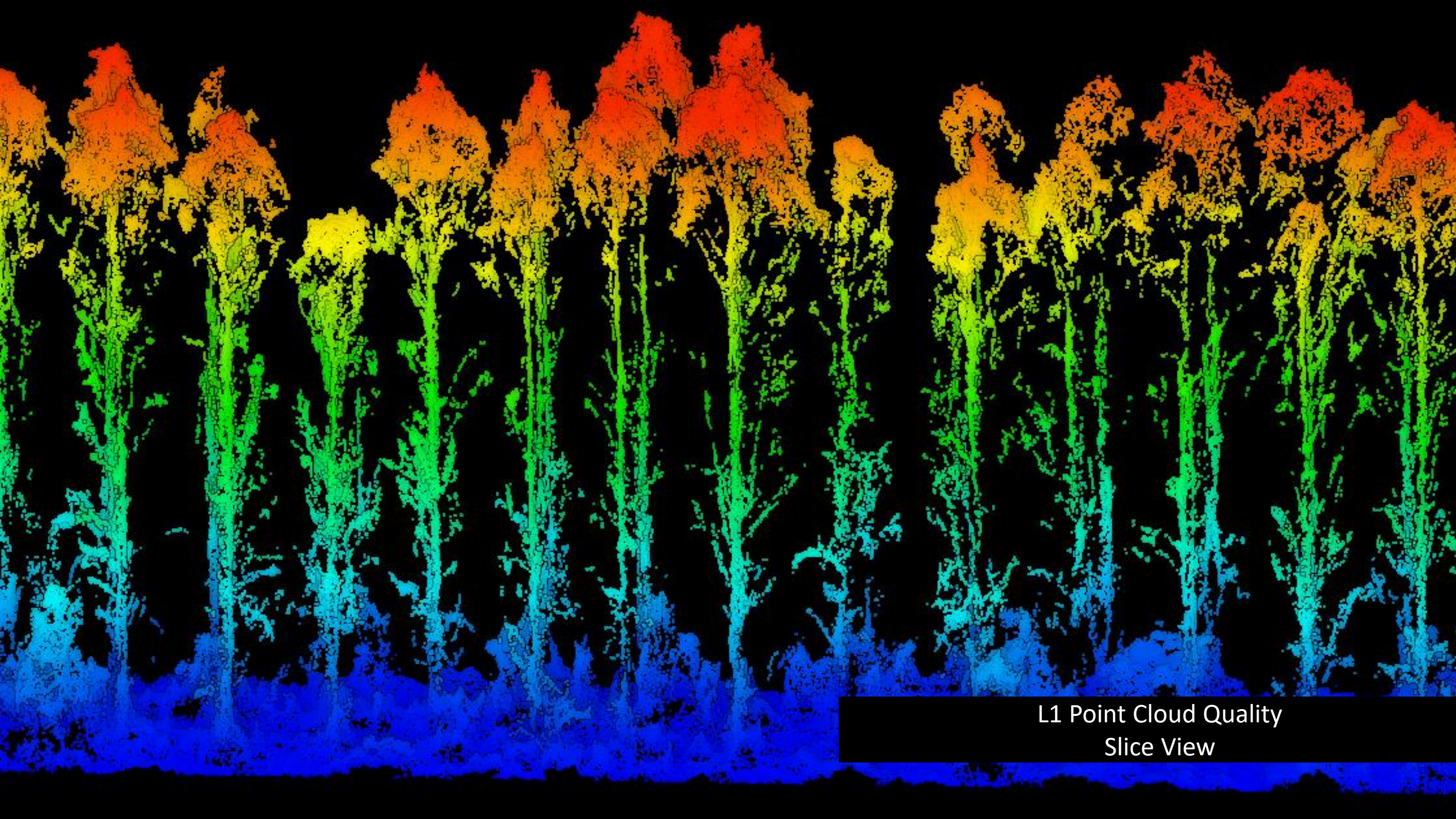
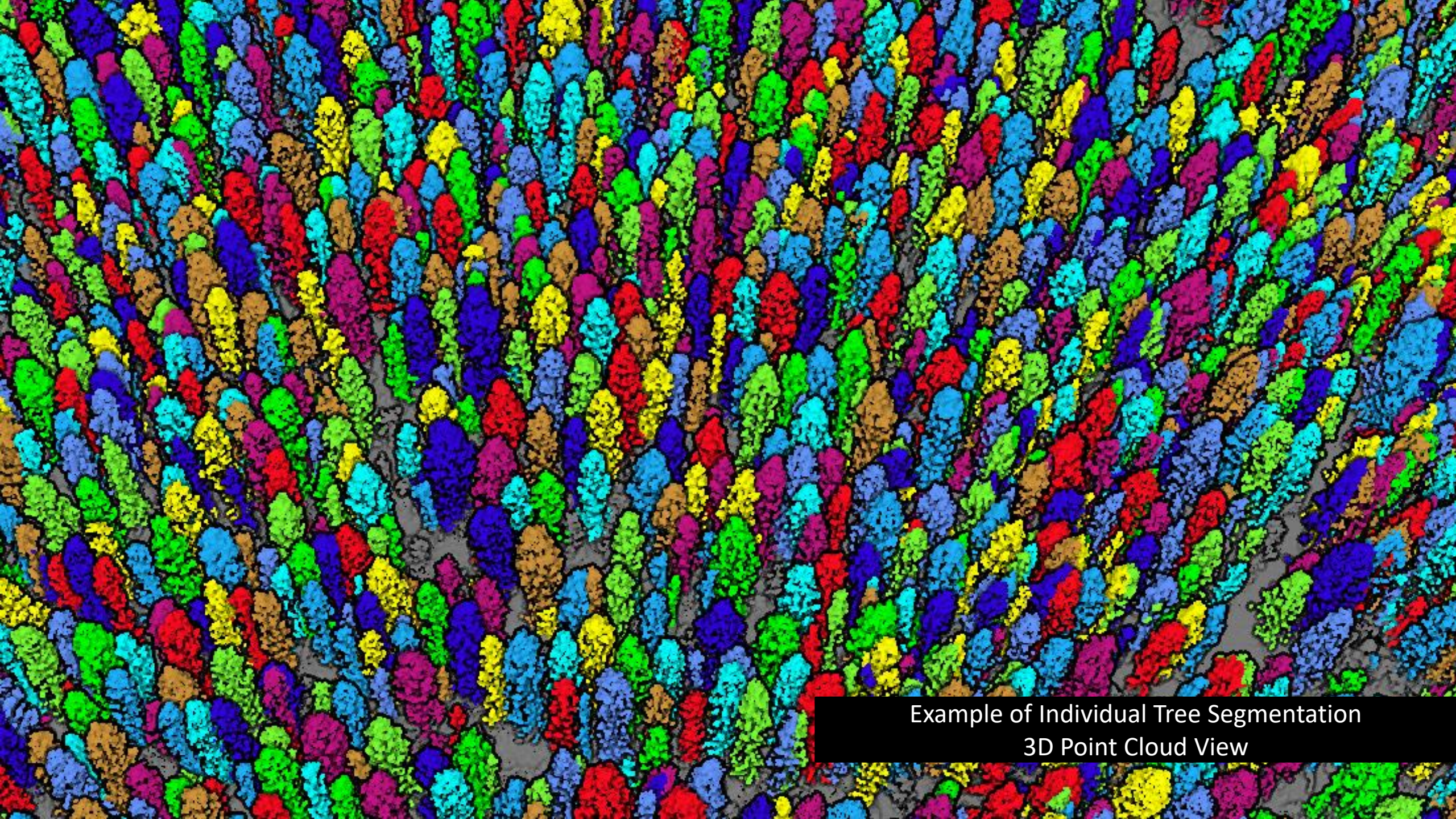
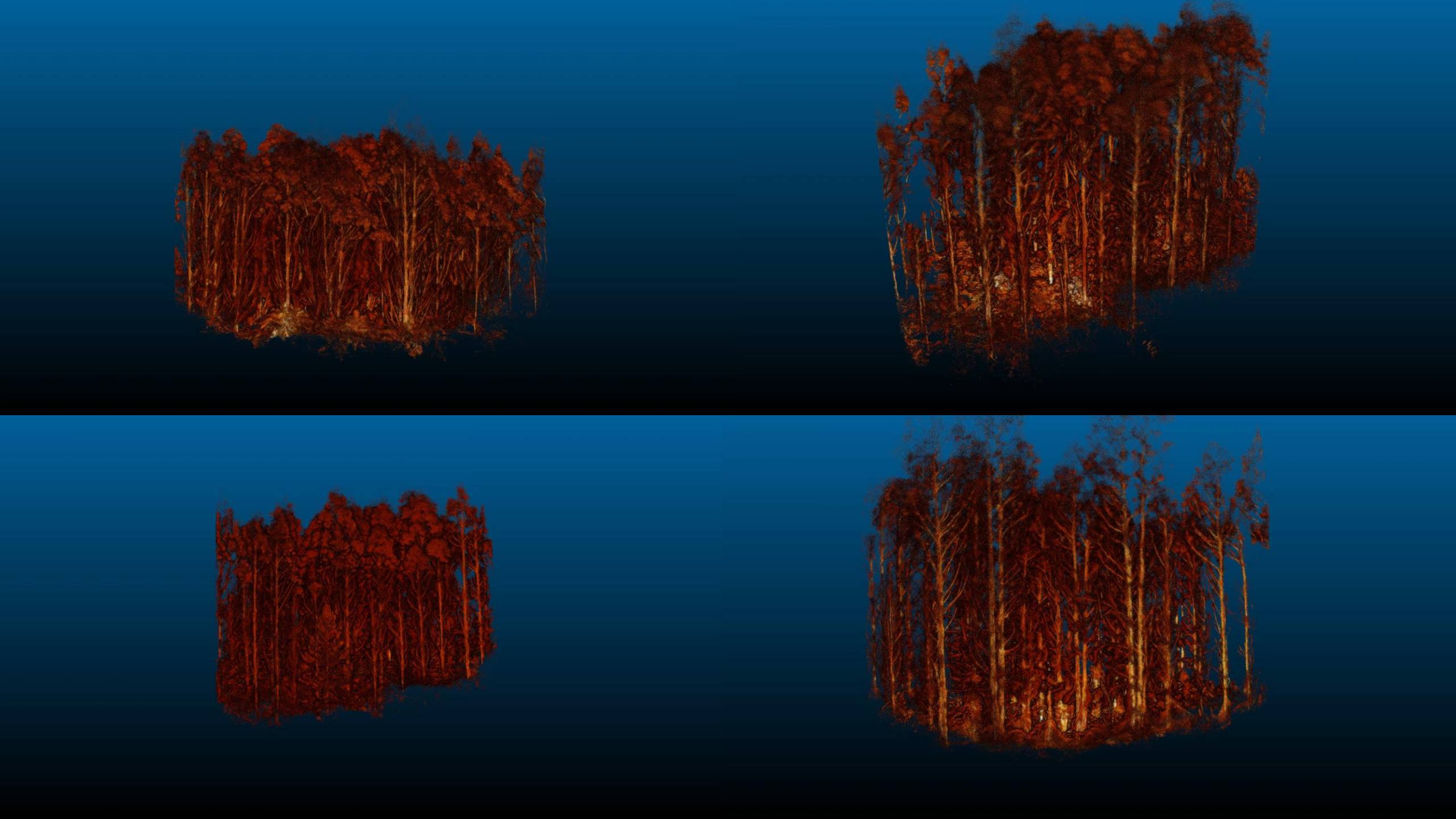
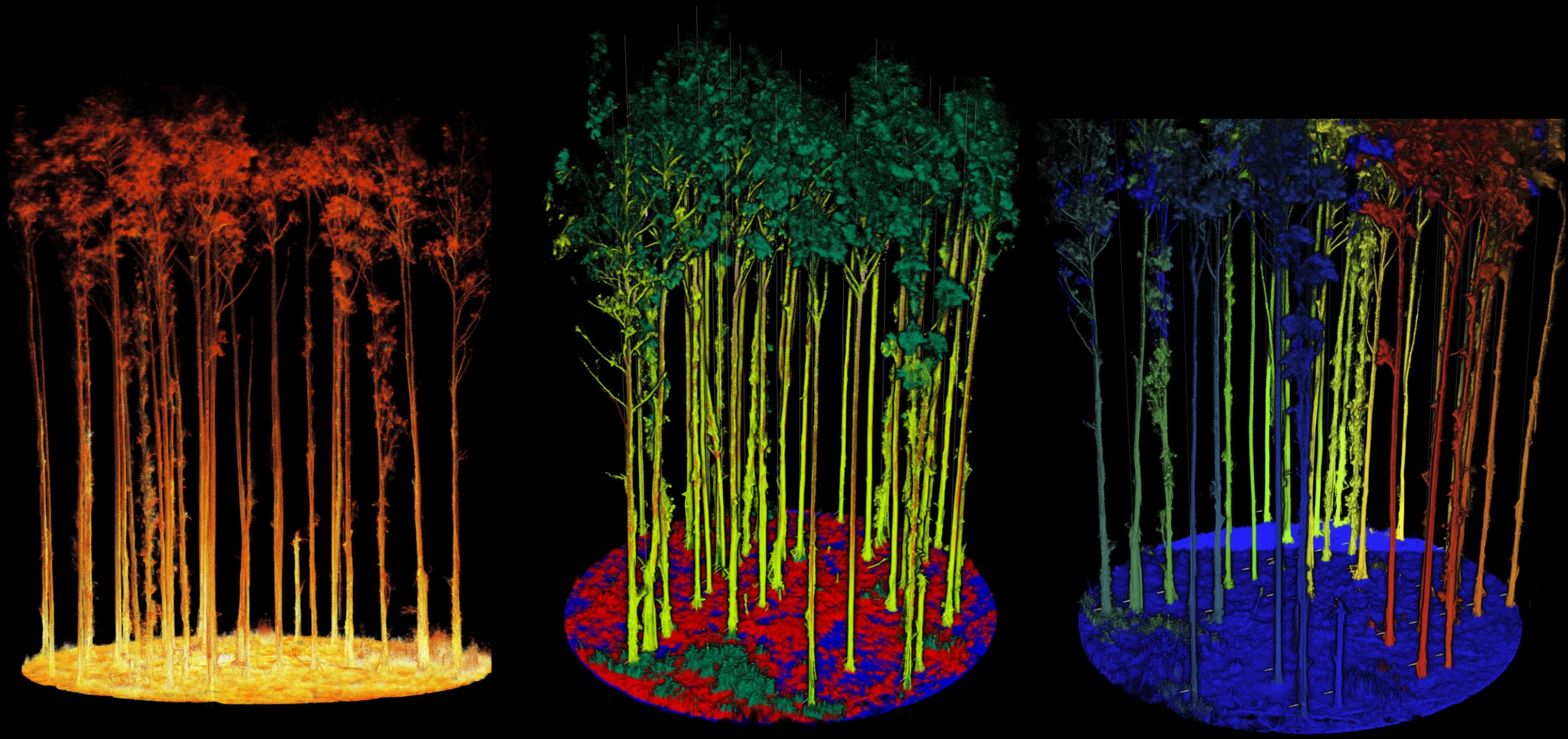
Trimble

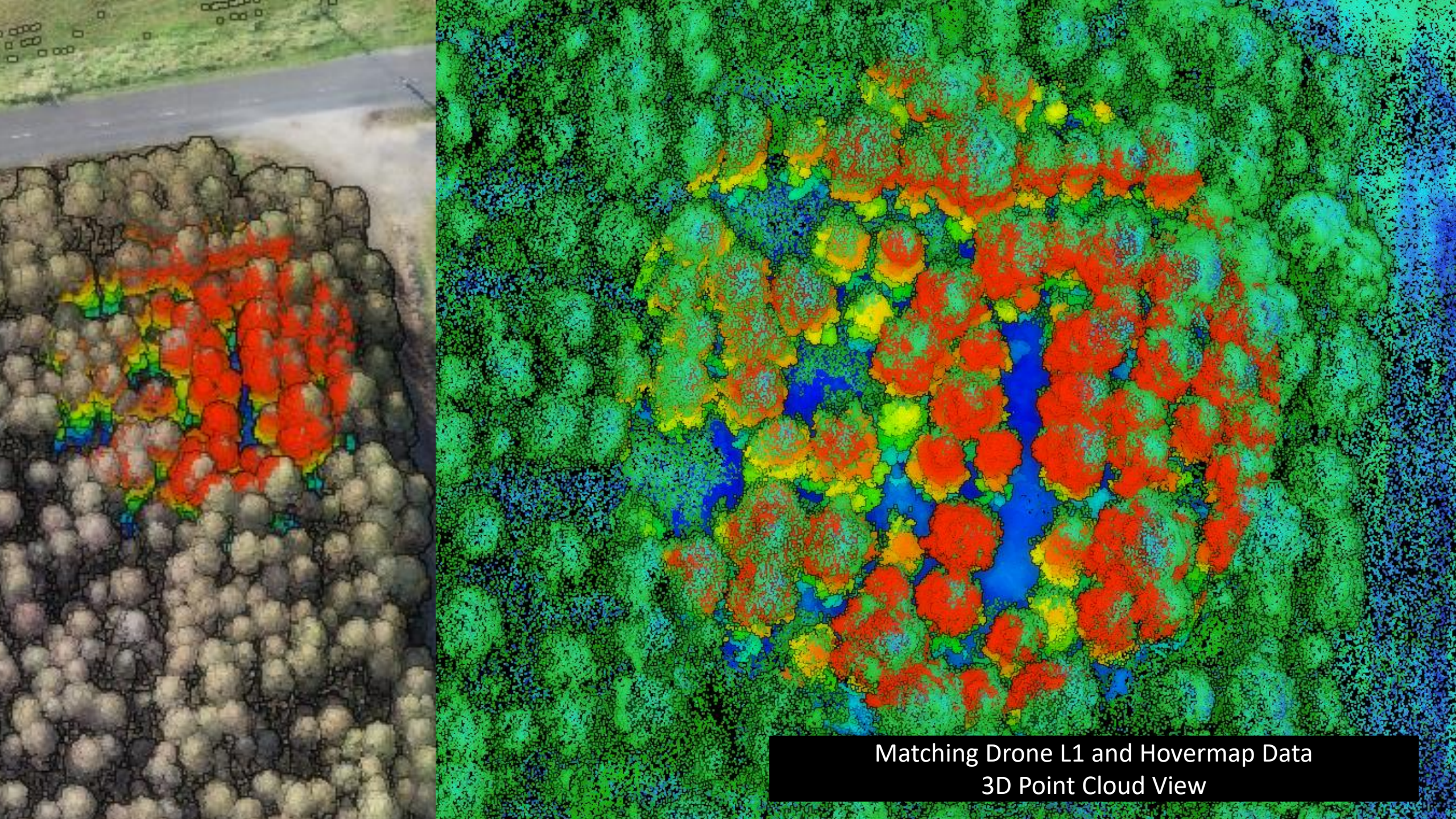



L1 Point Cloud Quality
Slice View


Example of Individual Tree Segmentation
3D Point Cloud View

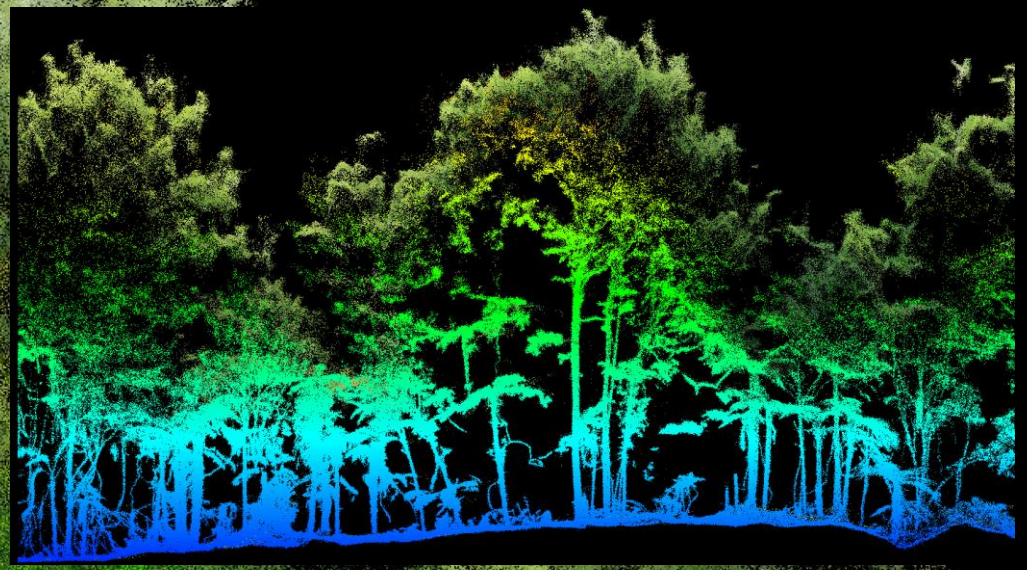




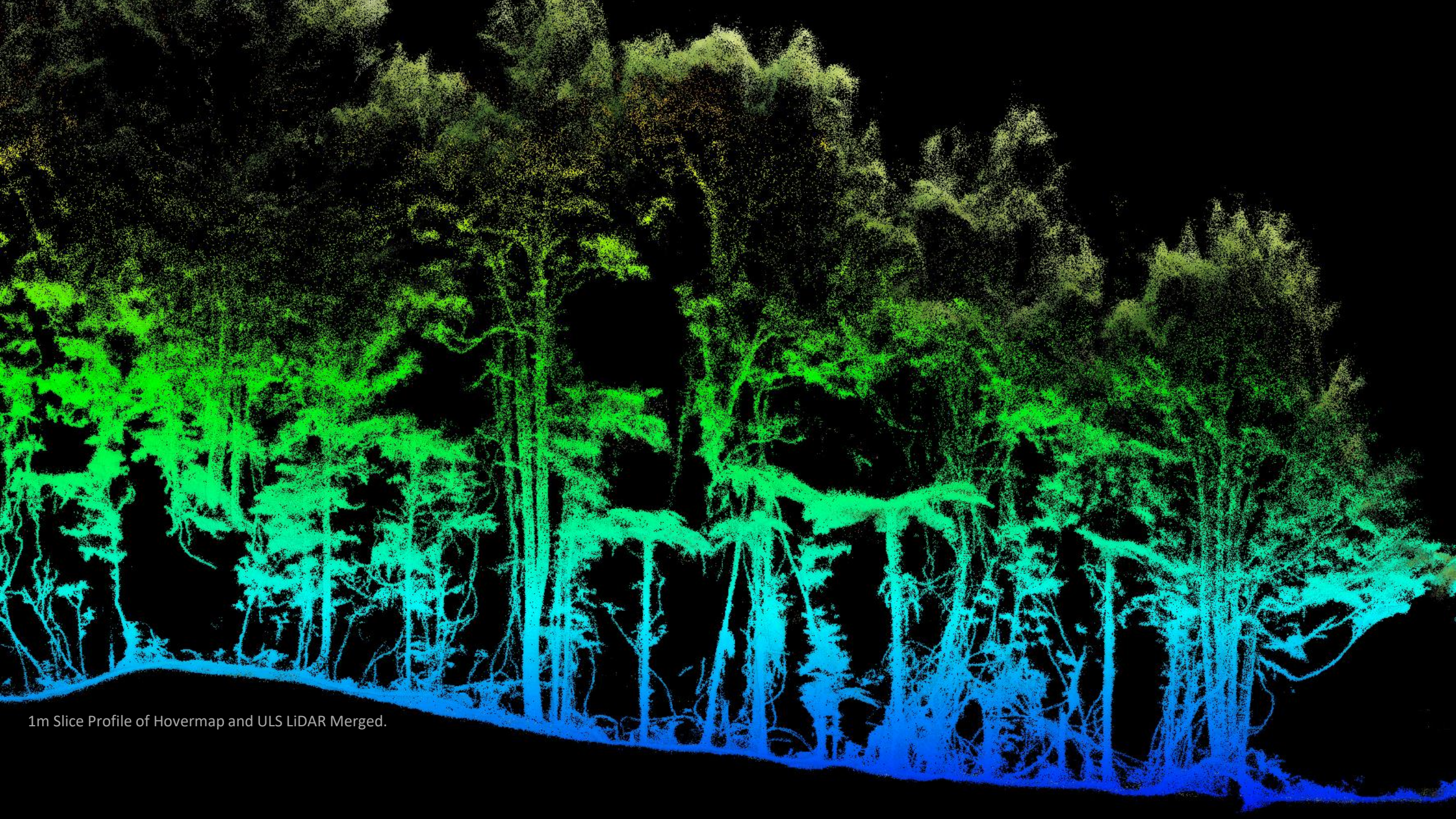

Matching Drone L1 and Hovermap Data
3D Point Cloud View

Where to Next ?

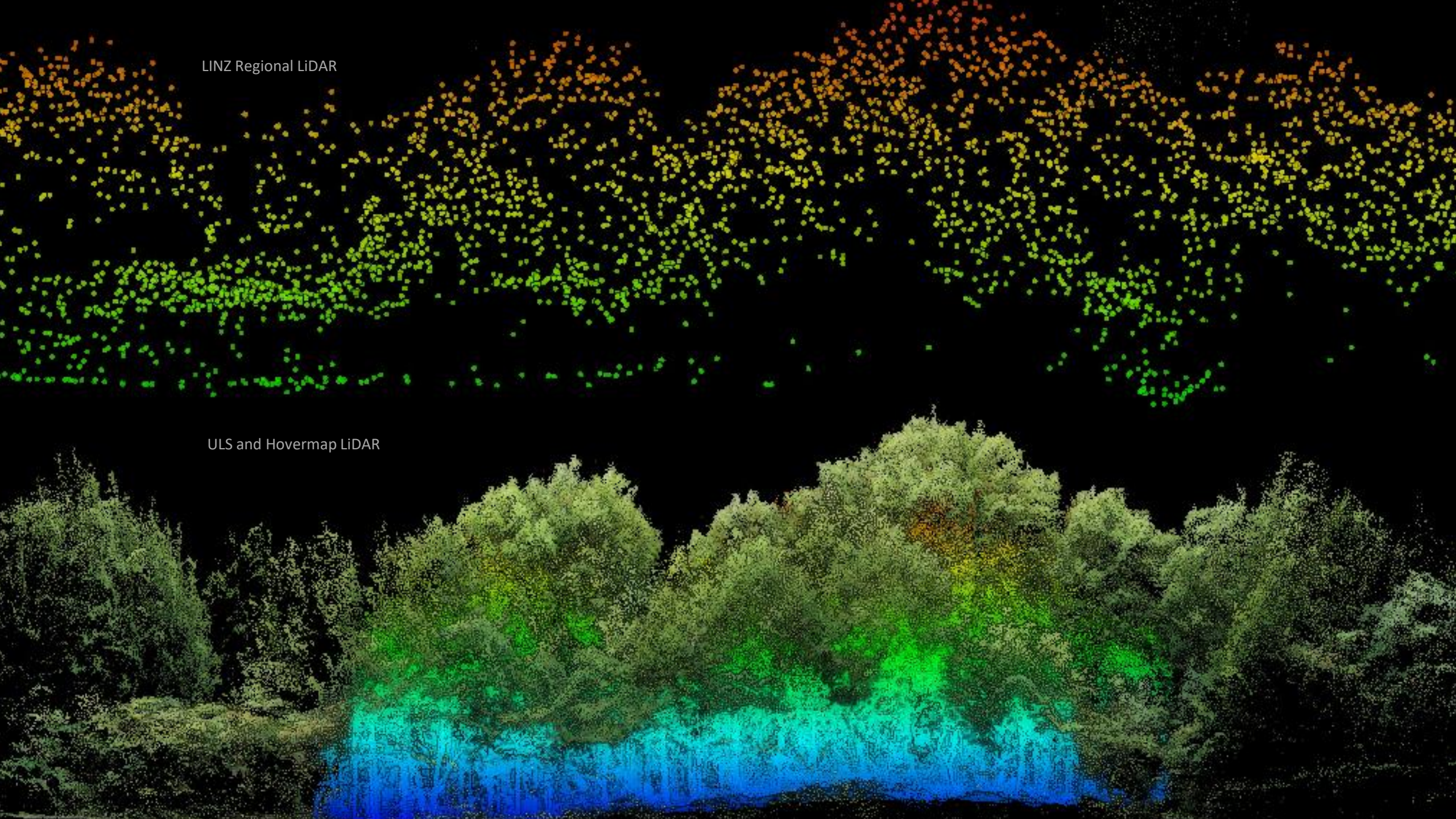
1m Slice Hovermap and ULS Data Merged



5m Slice Oblique View of Hovermap and ULS Data Merged

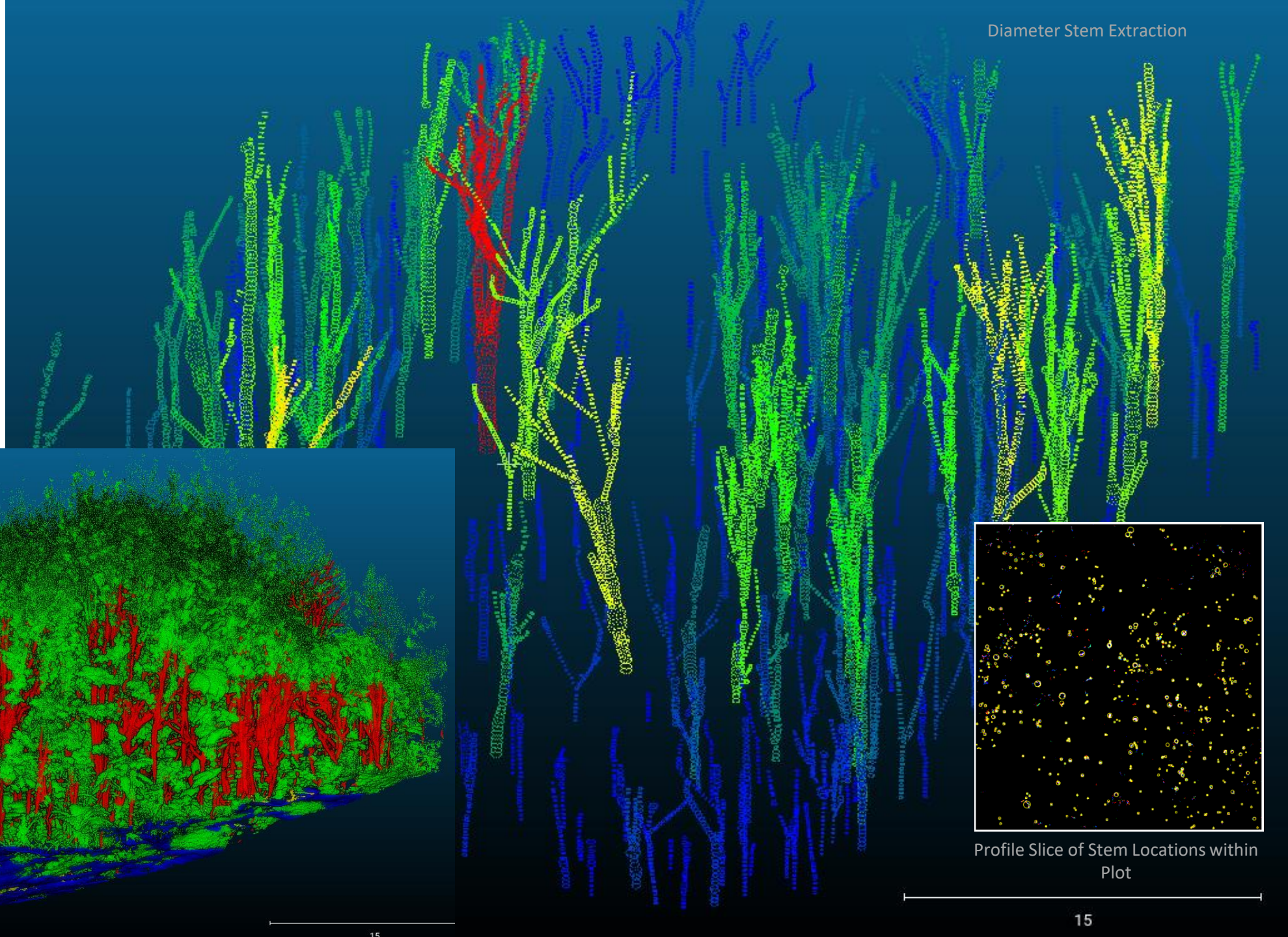


1m Slice Profile of Hovermap and ULS LiDAR Merged.

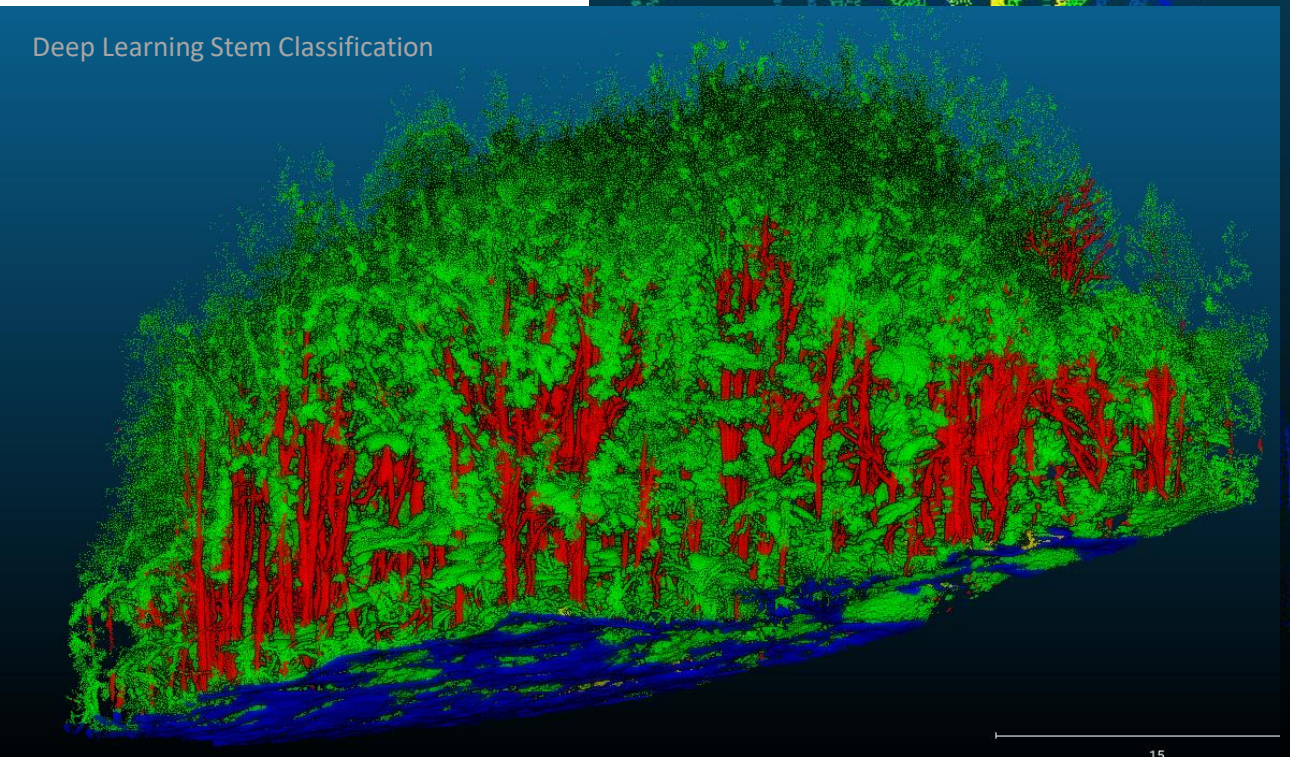

LINZ Regional LiDAR
ULS and Hovermap LiDAR

- **Native Forest Individual Stem Classification and Extraction Example**

Diameter Stem Extraction



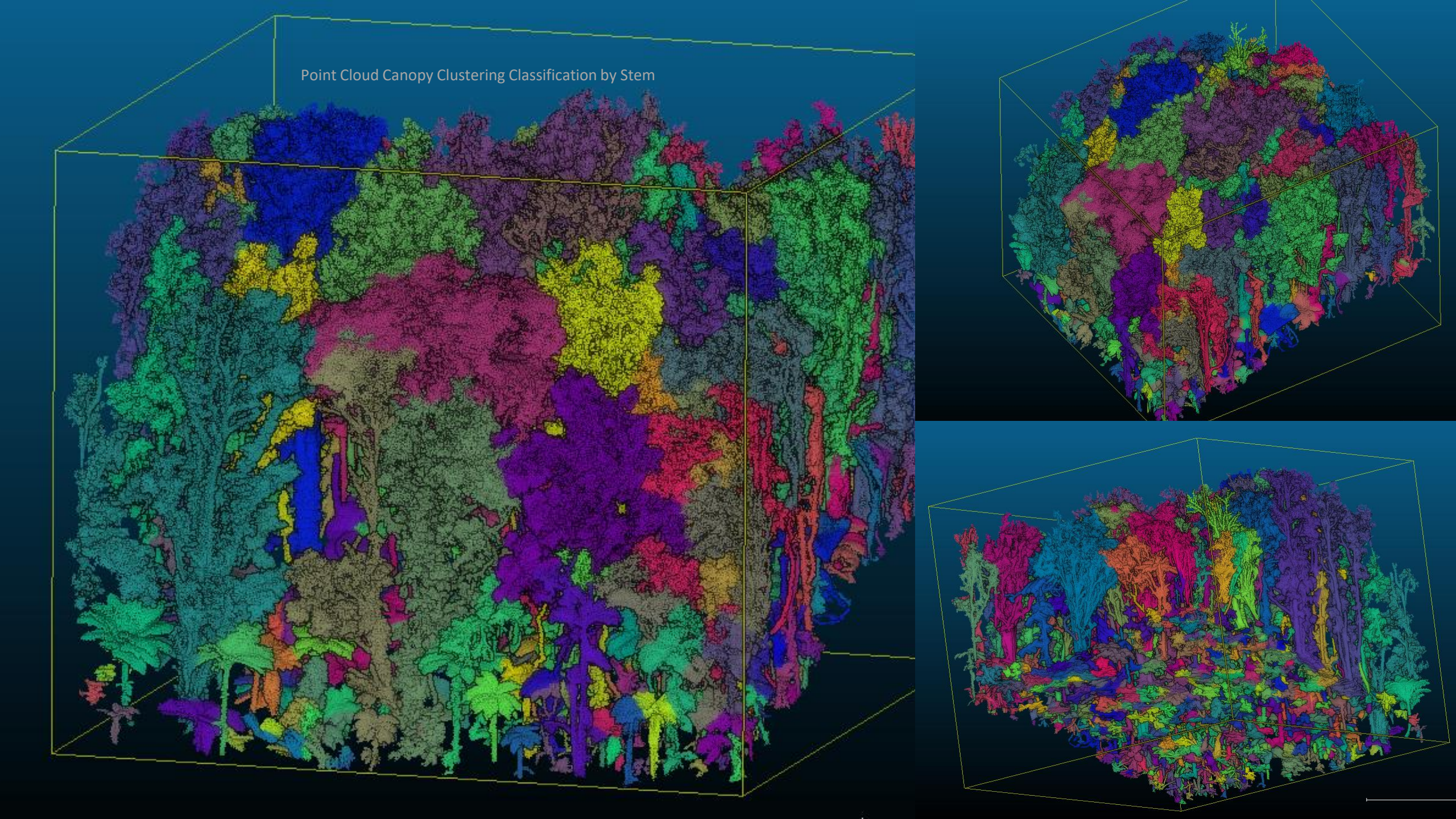
Deep Learning Stem Classification





Profile Slice of Stem Locations within Plot

15


Point Cloud Canopy Clustering Classification by Stem

Acknowledgements

Precision Silviculture
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and all the research programme partners and forest owners …

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