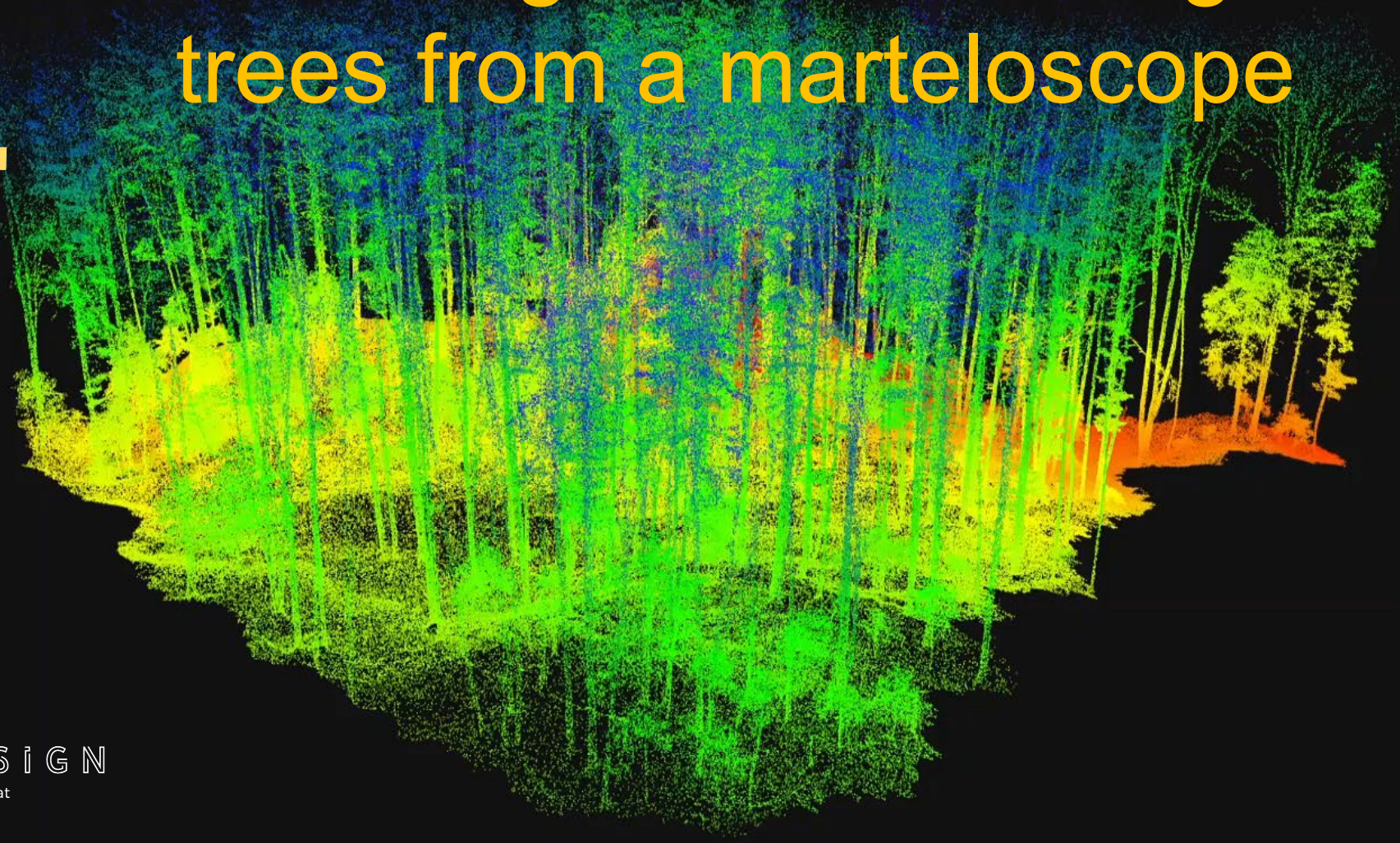
VirtSilv - a complementary solution for locating and monitoring trees from a marteloscope



FOREST DESIGN

the nature in digital format

Forest design®
the nature in digital format

Forest Design works with companies in the **timber industry and environmental sector that value sustainability**, giving them transparency and control over their supply chain on their road to the sustainable forest management.

This innovative approach combines **objective data** with **space technology and artificial intelligence** to create value in a sustainable circular economy.

ERASMUS+ PROJECTS

Co-funded by the Erasmus+ Programme of the European Union

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MANCHESTER 1824 The University of Manchester

BFW. Austrian Research Centre for Forests

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UAB Universitat Autònoma de Barcelona

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Universitatea Transilvania din Brașov

WAGENINGEN UNIVERSITY & RESEARCH

UBC University Of British Columbia

Trinity College Dublin Coláiste na Tríonóide, Baile Átha Cliath The University of Dublin

NBSI NATURE BASED SOLUTIONS INSTITUTE

Ecosystem Marketplace A FOREST TRENDS INITIATIVE

ERSAF ENTE REGIONALE PER I SERVIZI ALL'AGRICOLTURA E ALLE FORESTE

CREAF

meath partnership engage · enable · participate · progress

UCD DUBLIN

elevate

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ETIFOR valuing nature

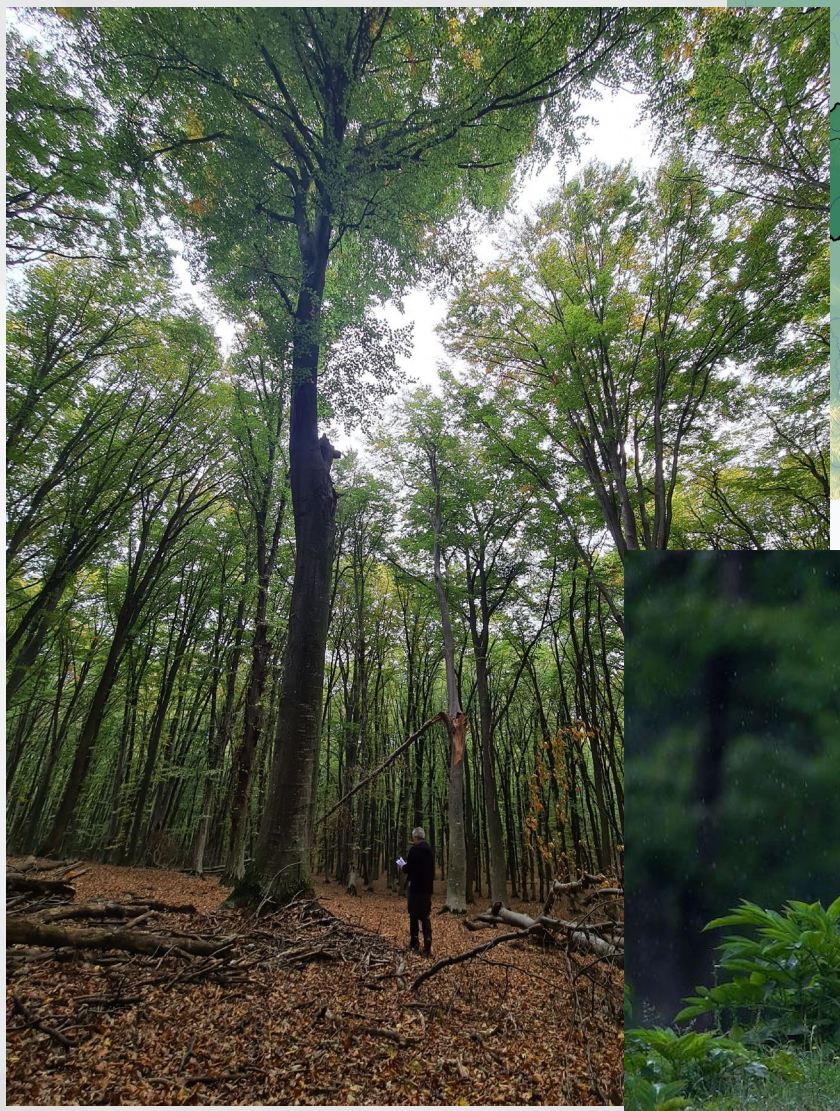
EFI

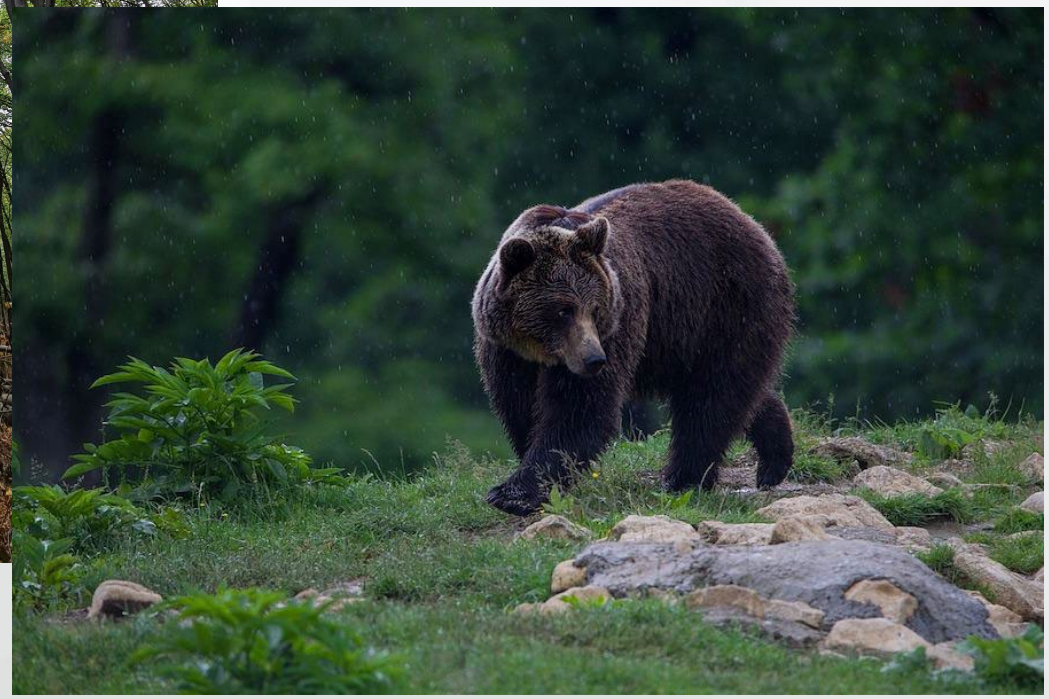
BFW. Austrian Research Centre for Forests

NEPCon Preferred by Nature™

ADAPT

Marteloscopes placement



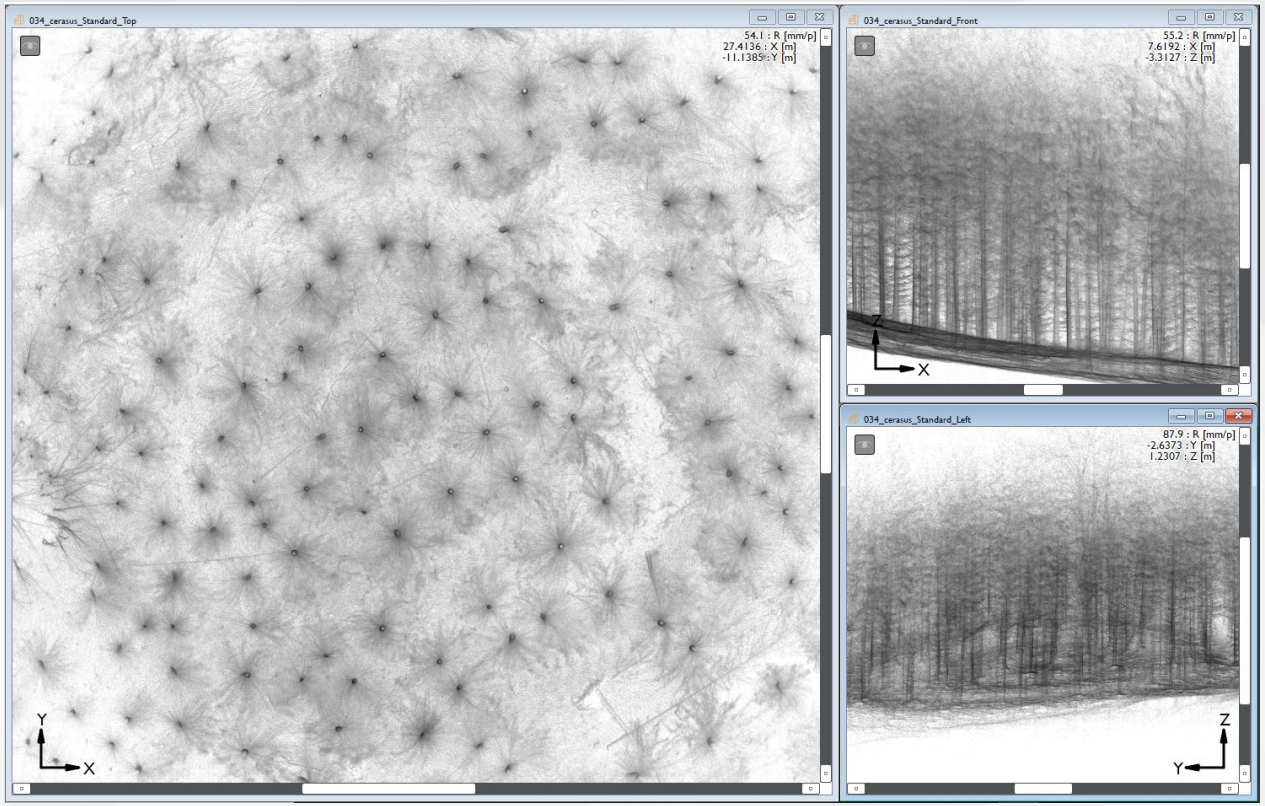


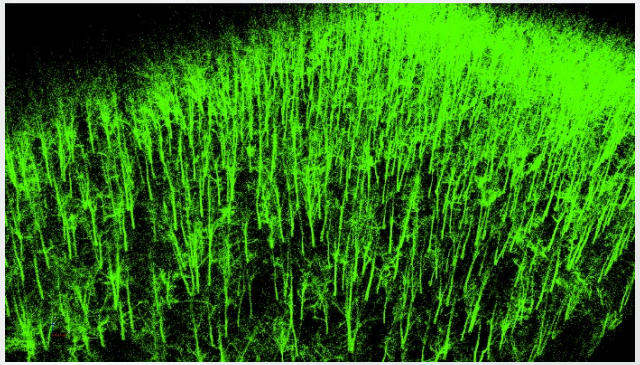
- Marteloscopes near turistic zones

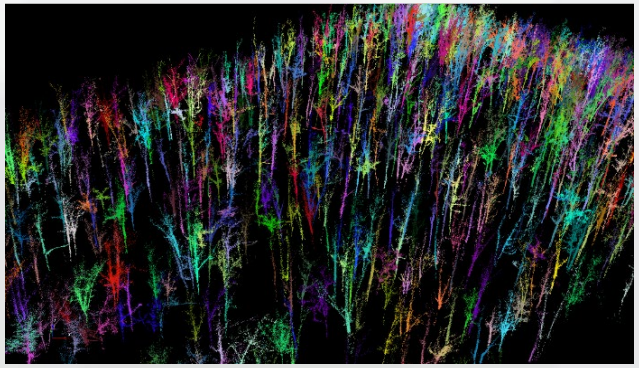
01 Classic measurements

- Time consuming
- Demanding
- Predisposed to human errors

Digital twinning works



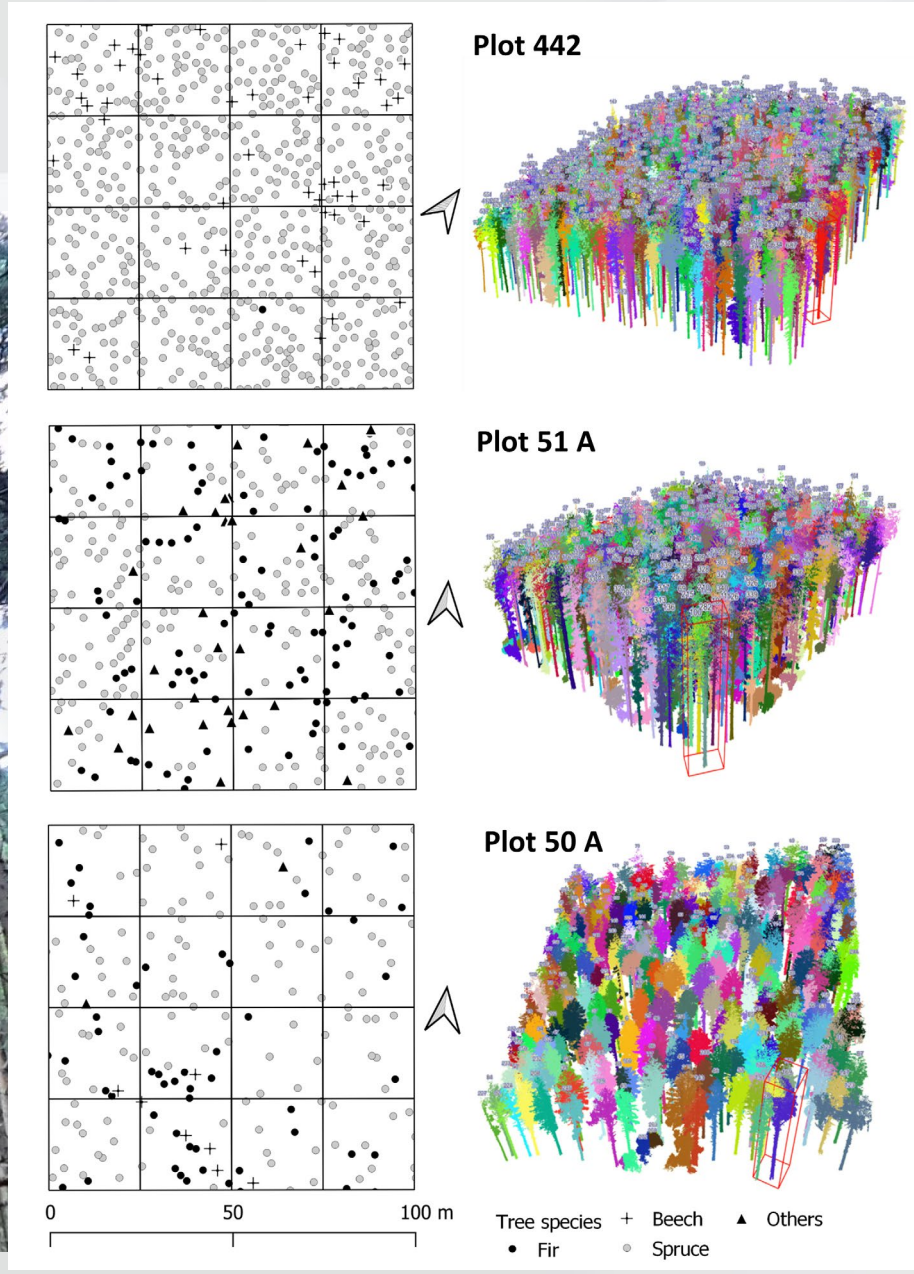




- Buildings, factories, and even entire cities are now digitally represented as digital twins (Dietz and Pernul, 2020).
- Some have suggested even people, processes, and organizations have digital twins, expanding the concept of digital twins even further (Raj, 2021).

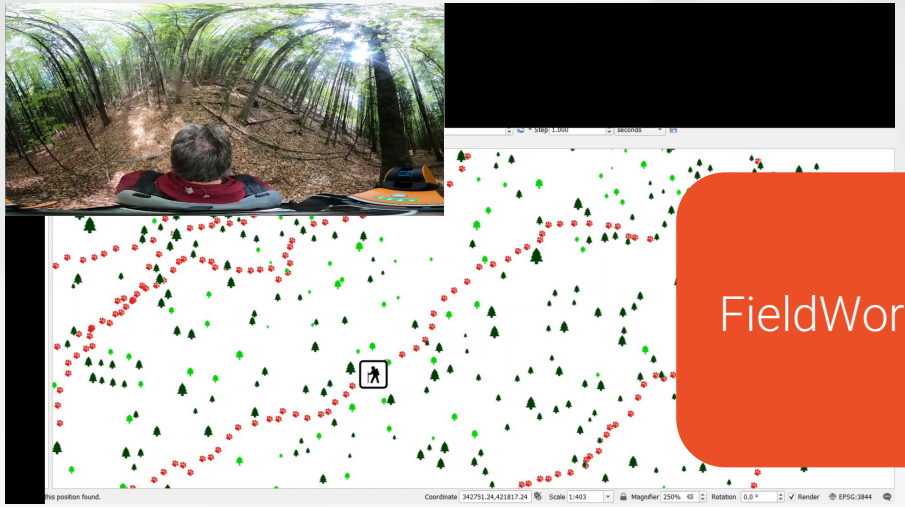
Digital twinning

Always the same. Objective!



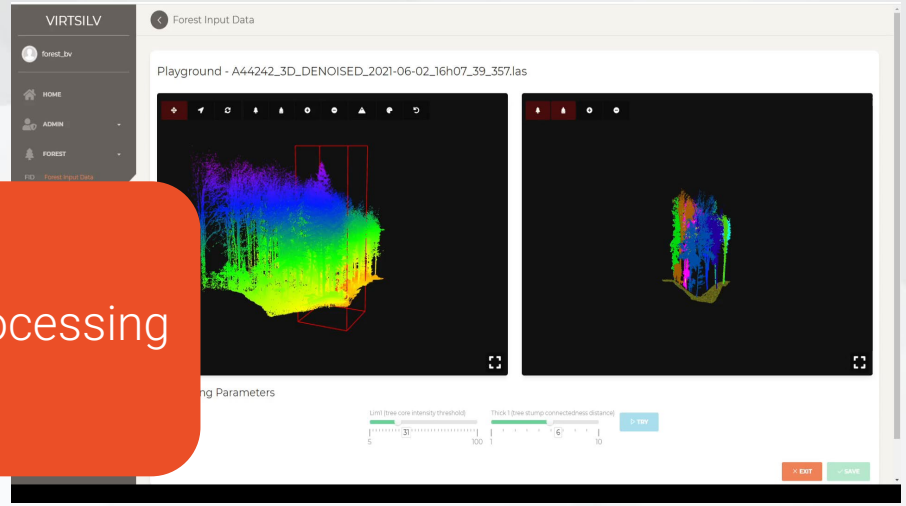
How we do it?

Piloting – Digital twinning



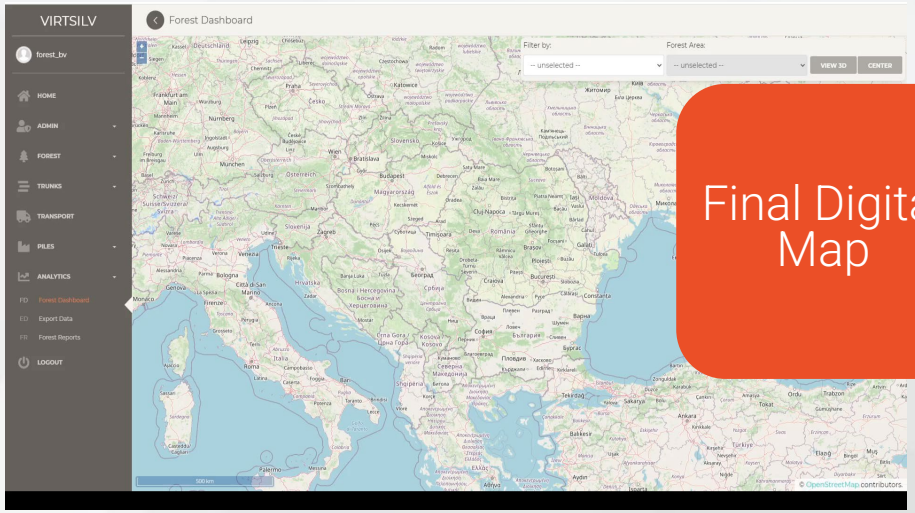
FieldWork

The AI algorithm begins at a large nucleus of points with high density and then grows by accretion until it meets neighboring trees.



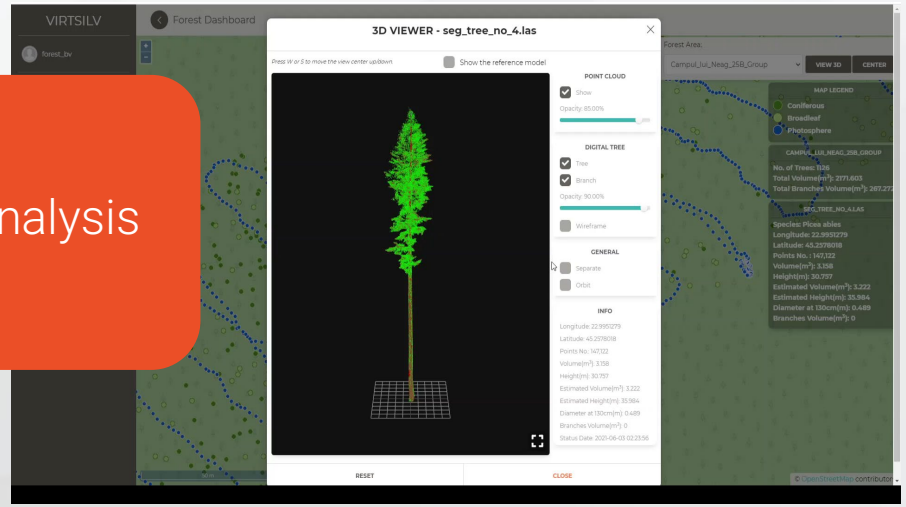
Processing

VirtSilv Forest



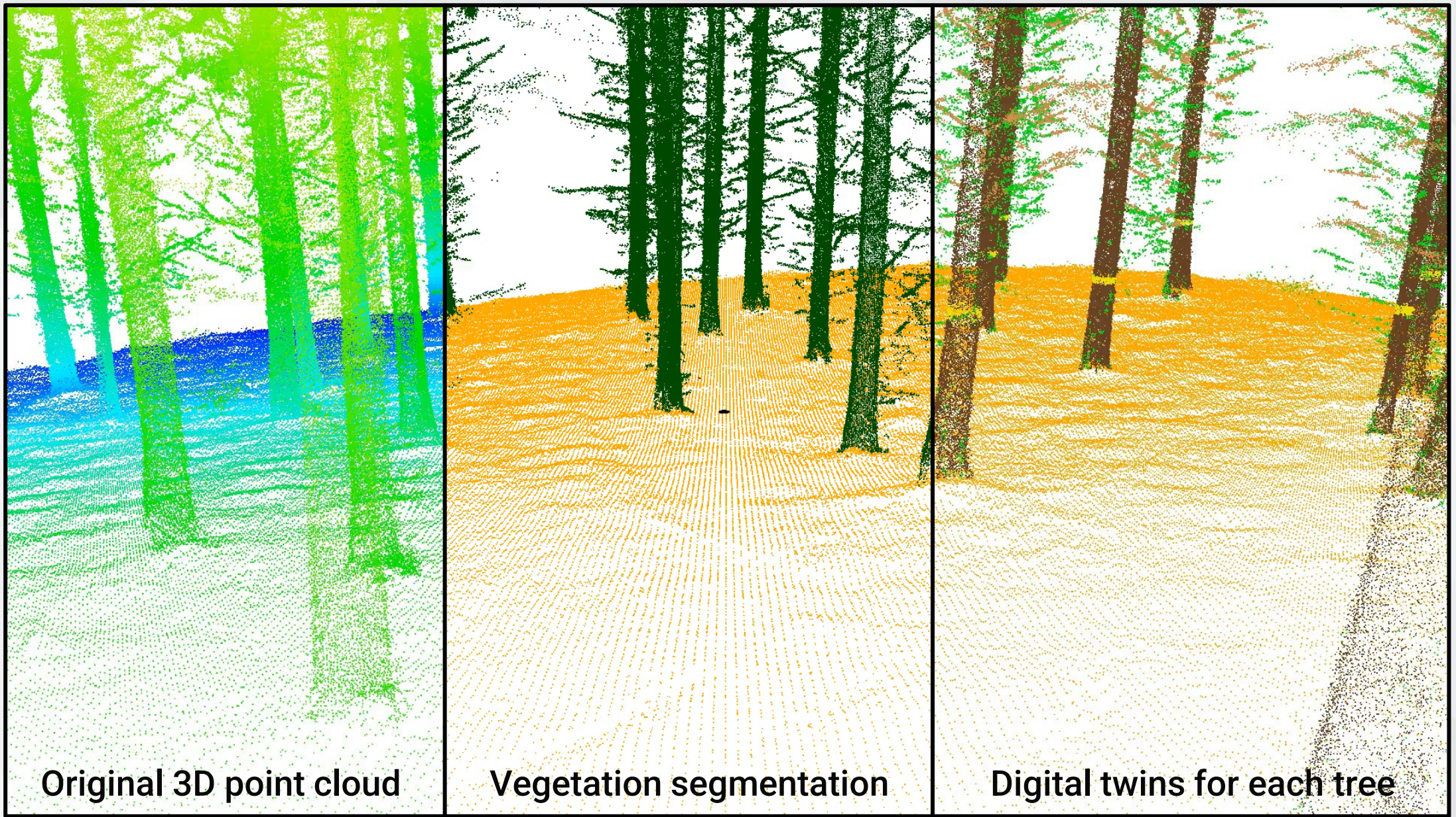
Final Digital Map

Each individualized tree:
- the x, y, z position,
- the volume determined based on a unique allometric equation,
- the group of species
- DBH, Heigh, CBH etc.



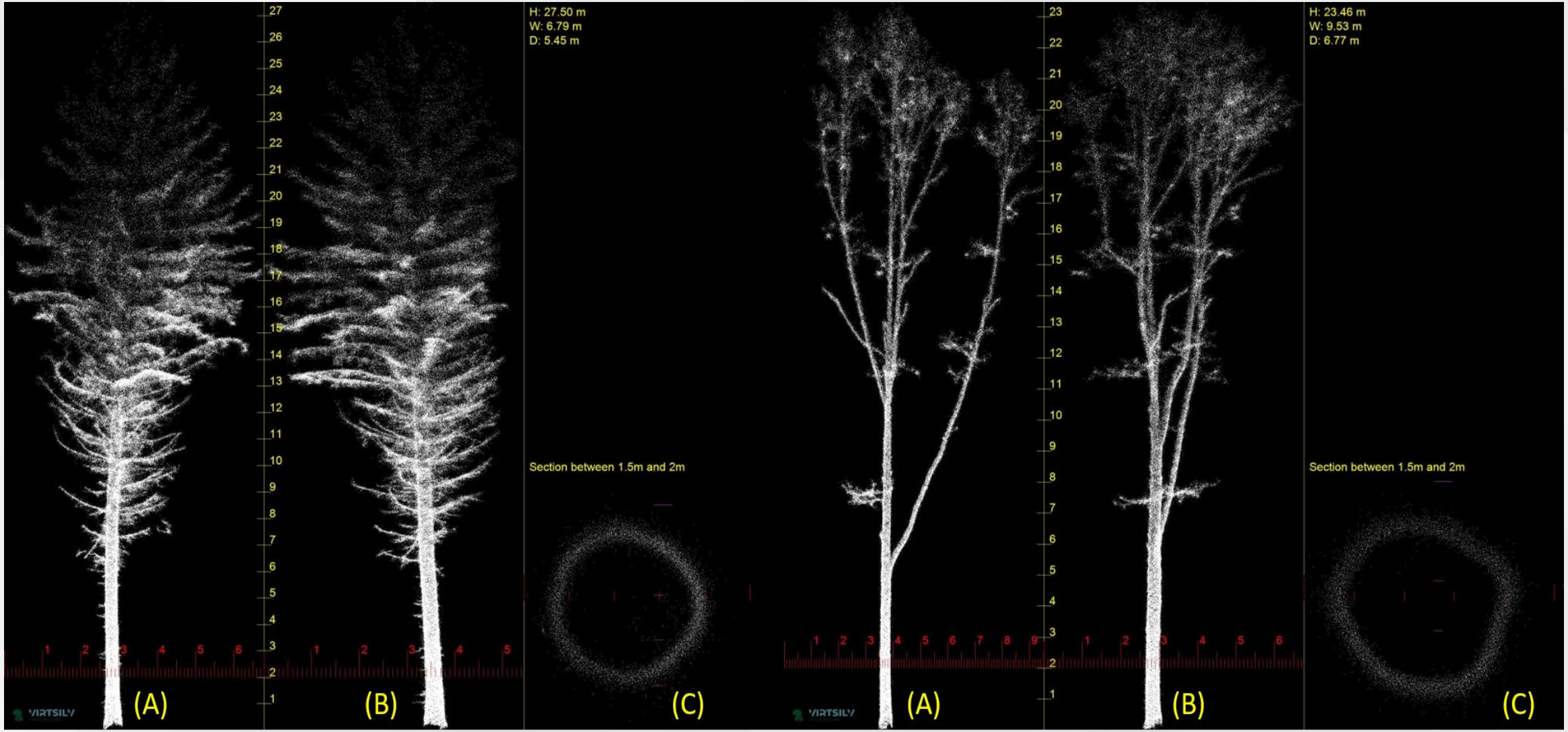
Analysis

A video = 1000 words



Outcomes

Tree data

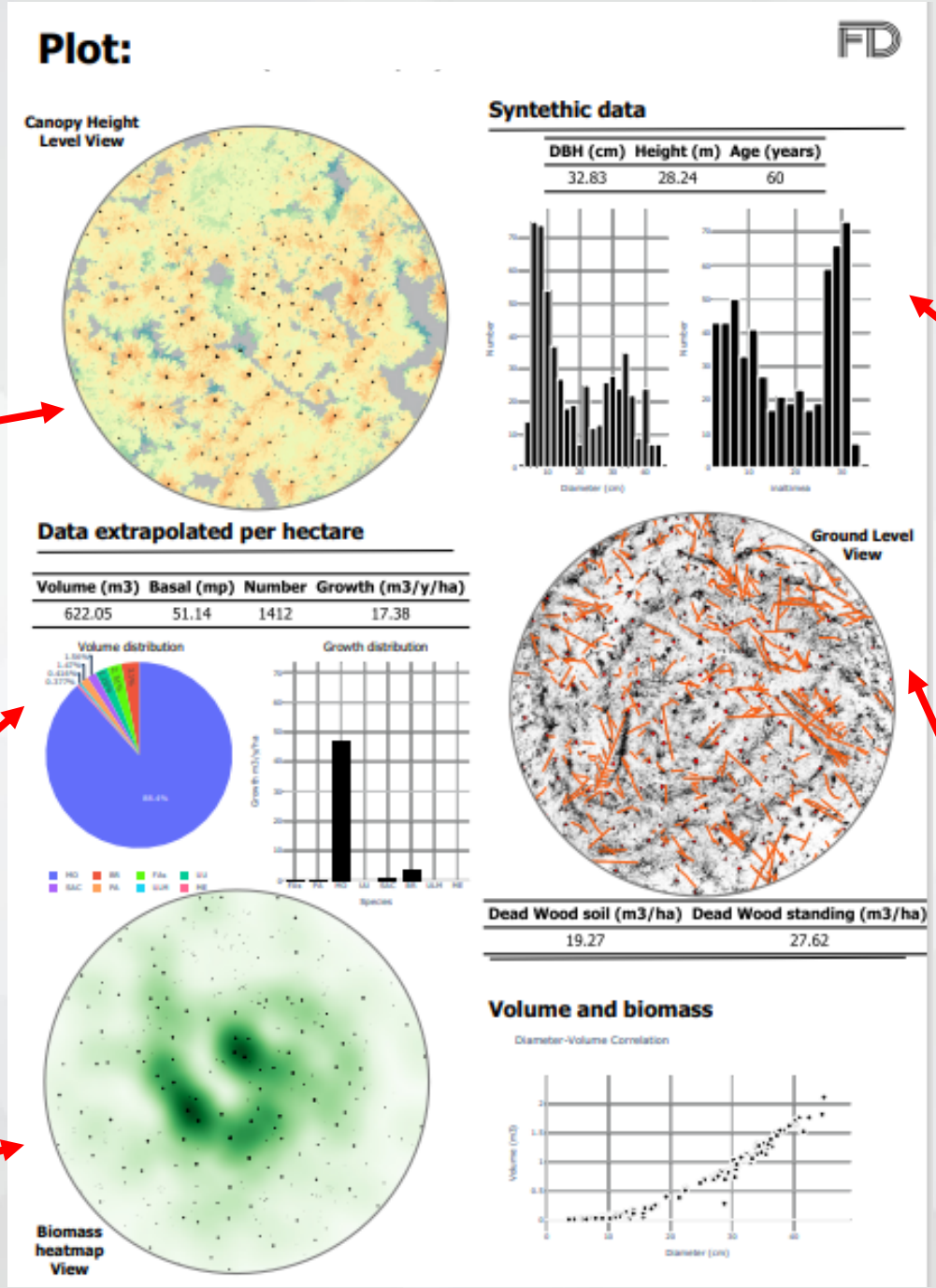

H: 27.50 m
W: 6.79 m
D: 5.45 m
Section between 1.5m and 2m
(A)
(B)
(C)
H: 23.46 m
W: 9.53 m
D: 6.77 m
Section between 1.5m and 2m
(A)
(B)
(C)

Plot data

Canopy height Level View
the canopy height level view showing the projection of the trees and the location of each tree drawn as a circle with a diameter equal to DBH

Data extrapolated per hectare
data extrapolated per hectare: volume, basal, number, and growth extrapolated at 1 hectare based on the data in the plot. This section comes with 2 graphs showing the volume and growth distribution per species

Volume and biomass distribution, volume and biomass showing the diameter-volume correlation, carbon stock measured on 3D unique shapes of the trees, and a biomass heatmap view

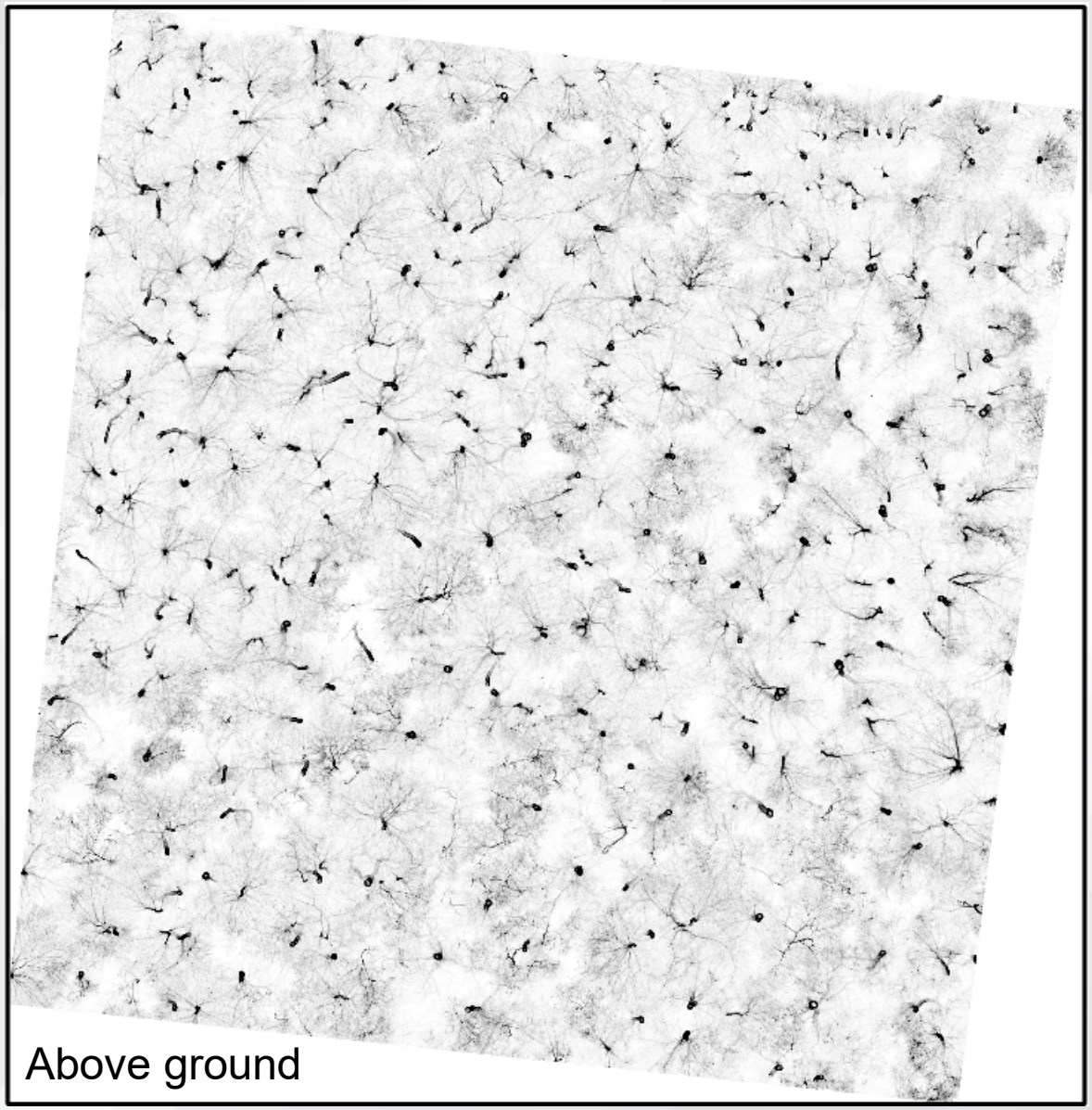


Synthetic data
data about the average DBH, Height, and Age and 2 histograms showing the distribution of the trees in the plot on 2 criteria: diameter and height

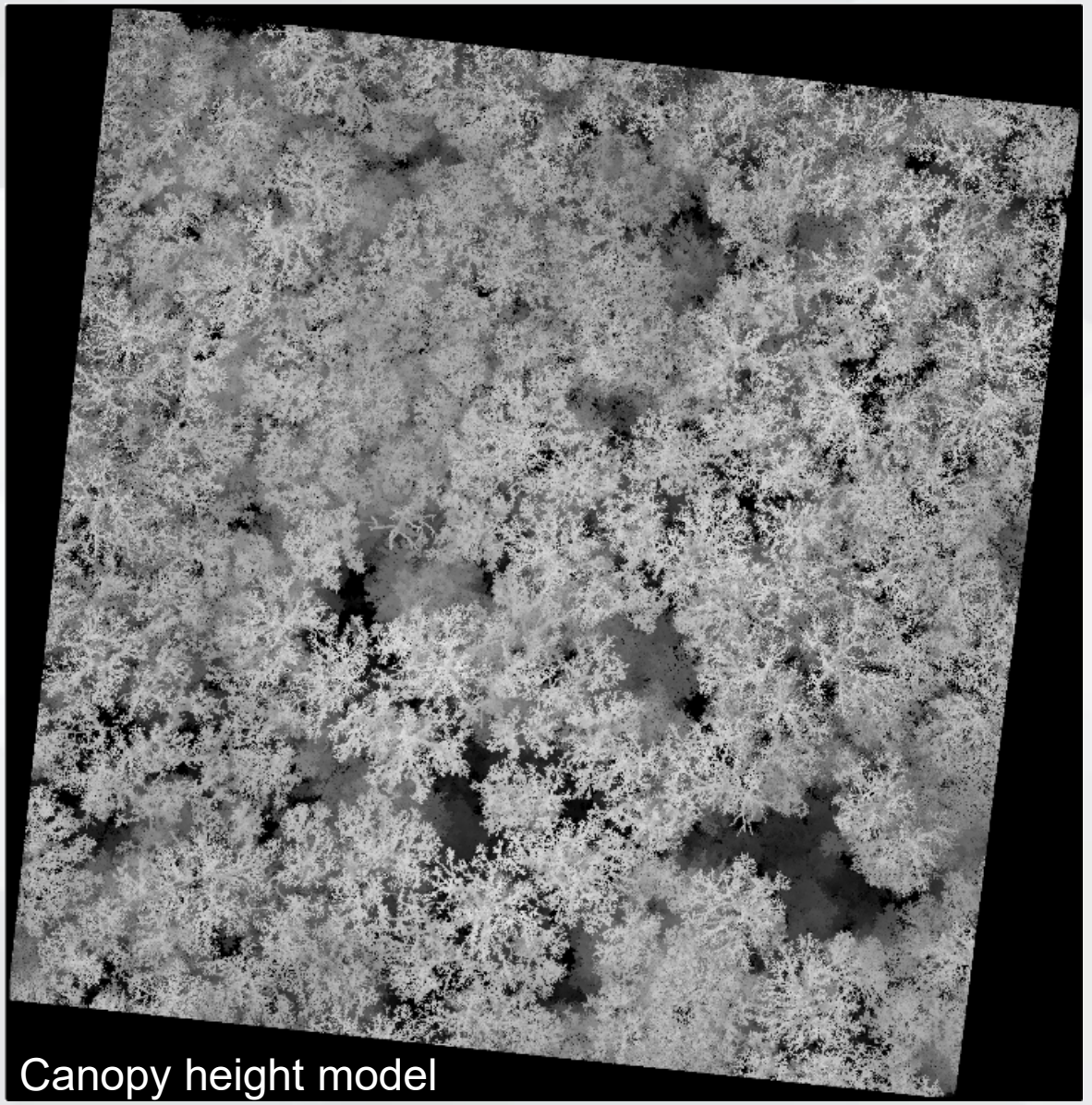
Ground Level View
the ground level view shows the data extracted from scanning to better identification of ground-floor elements such as dead trees, stumps, etc.

It's excellent for identification of dead wood on the ground.

2D images



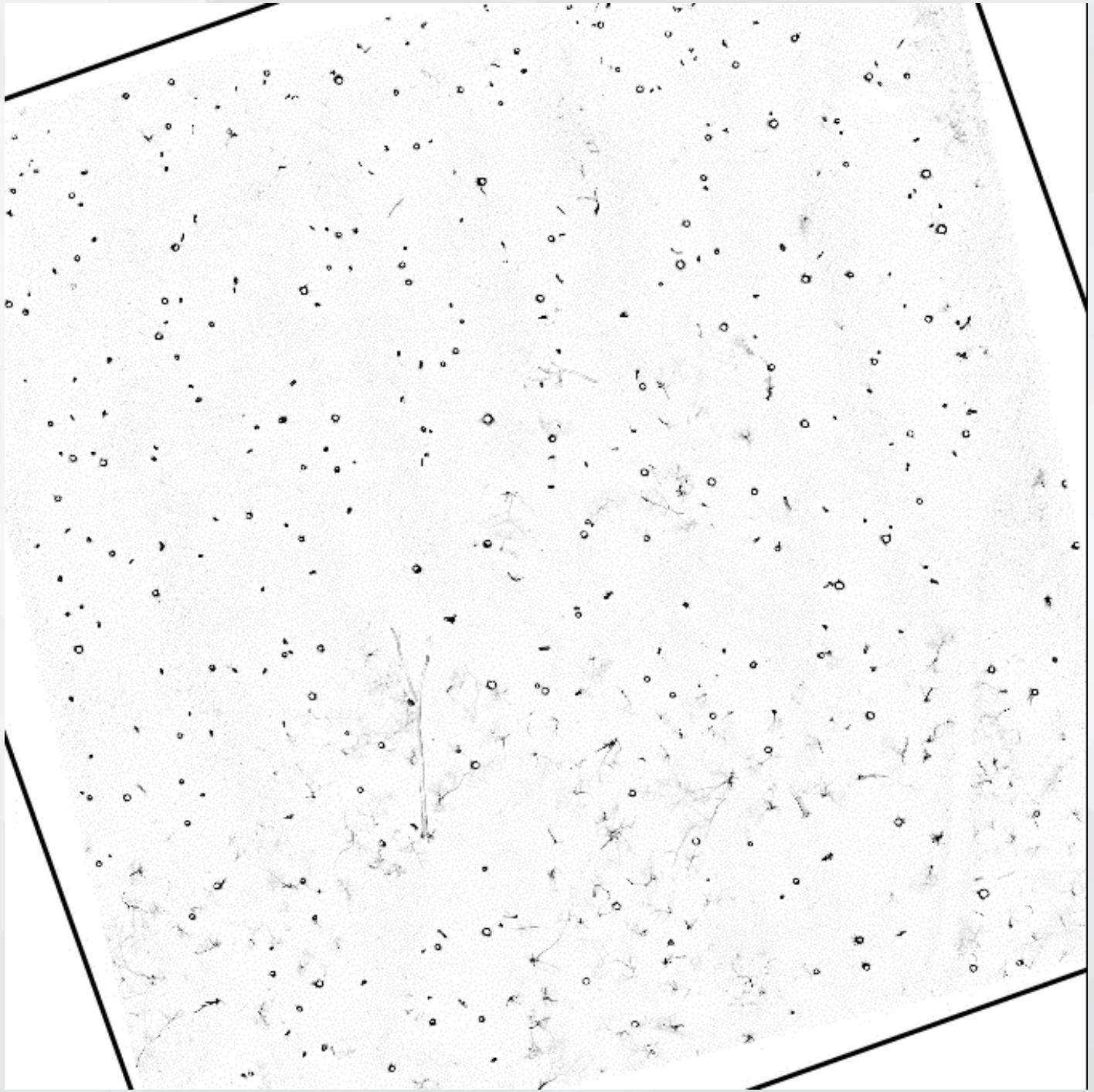
Above ground



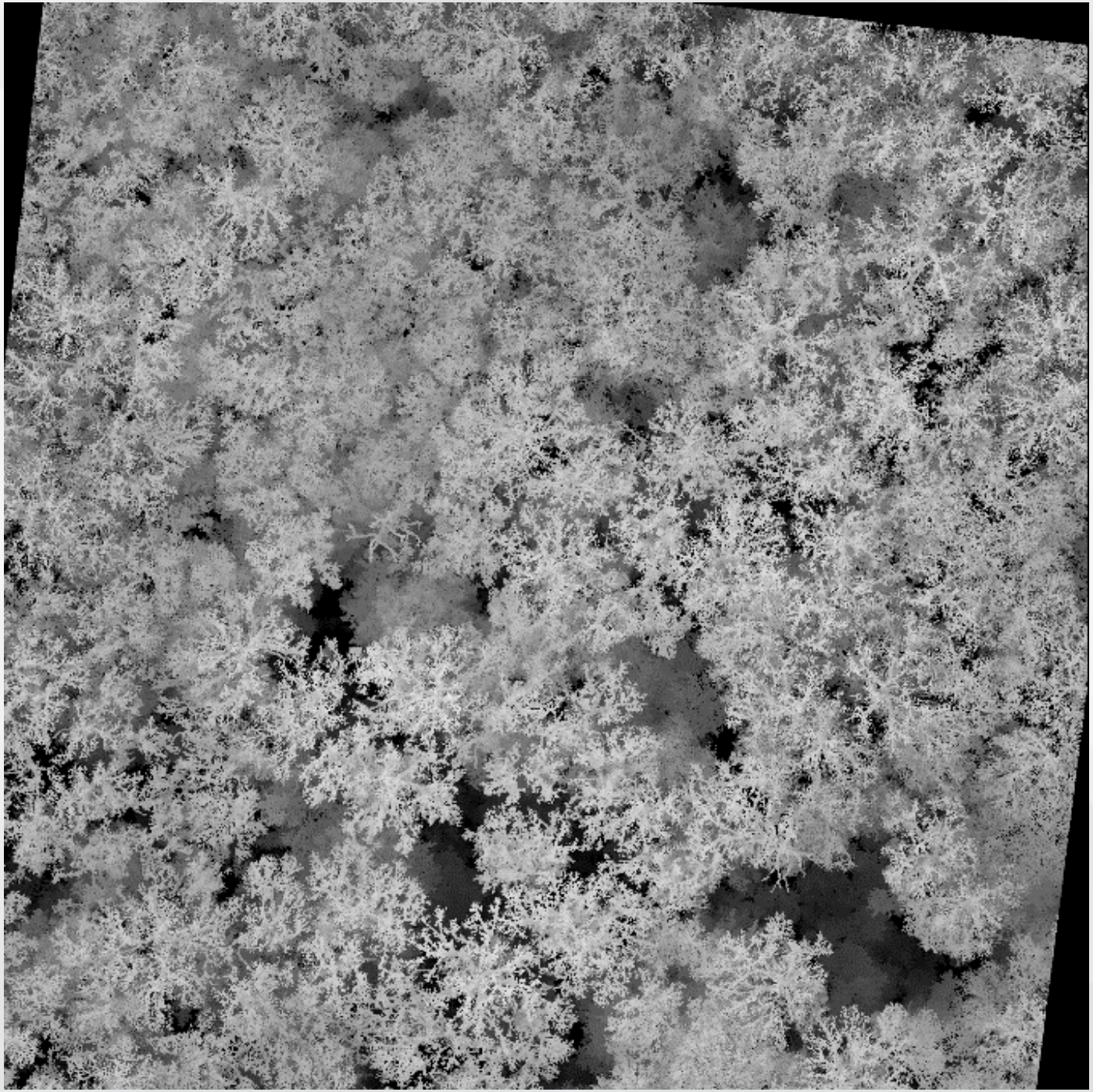
Canopy height model

Forest Changes monitoring

Forest history

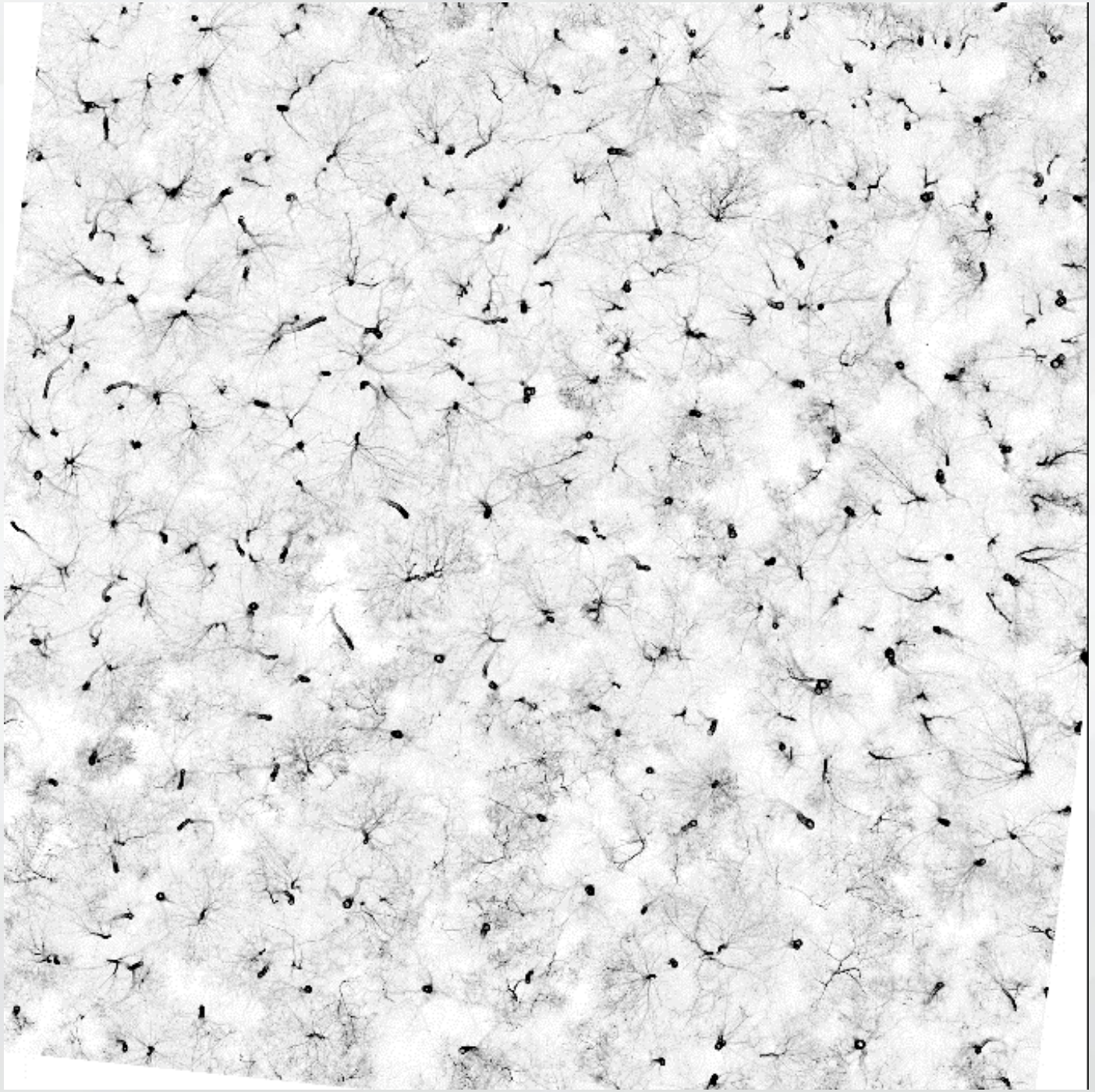


Forest Changes monitoring

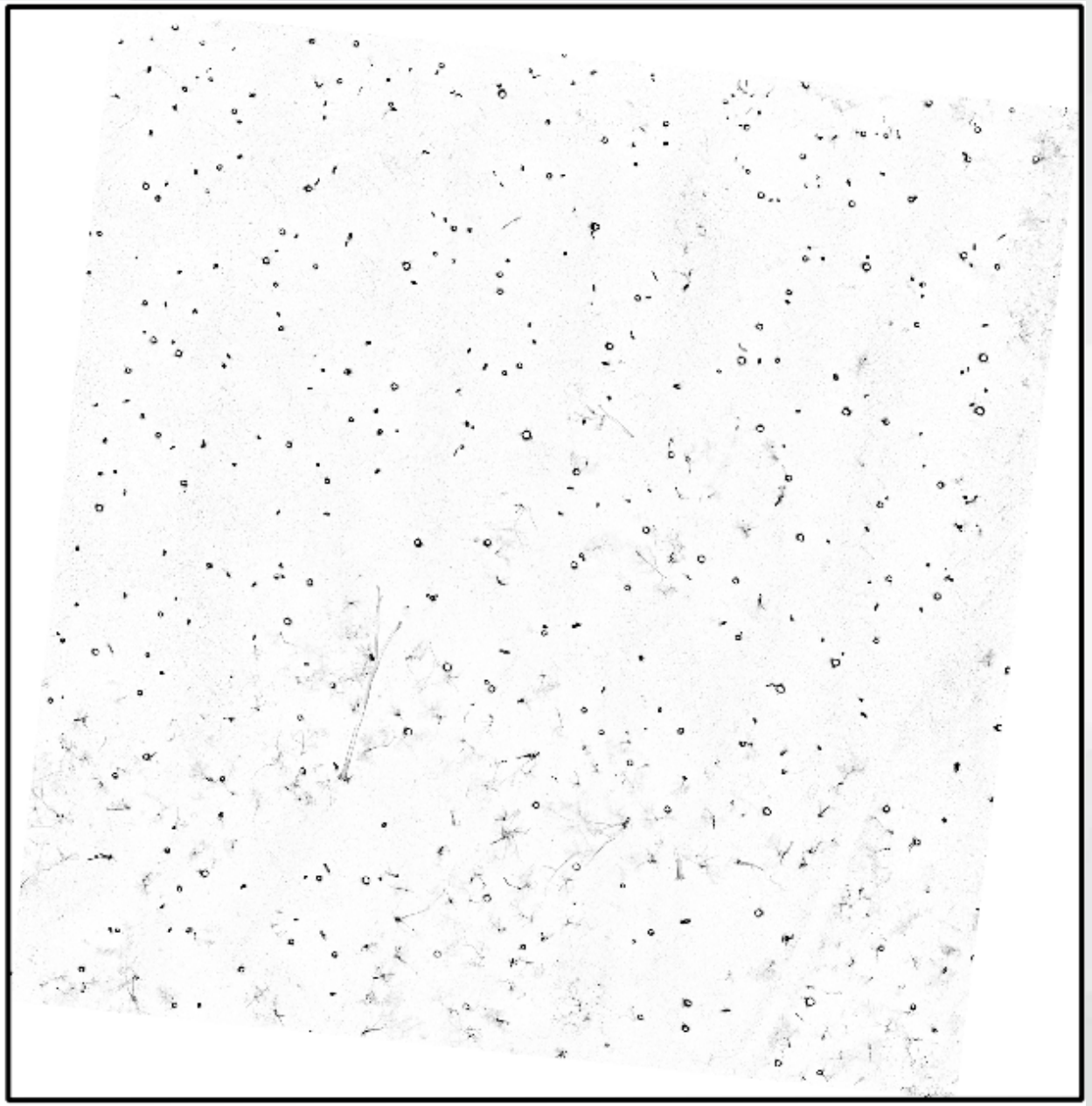


Forest Changes monitoring

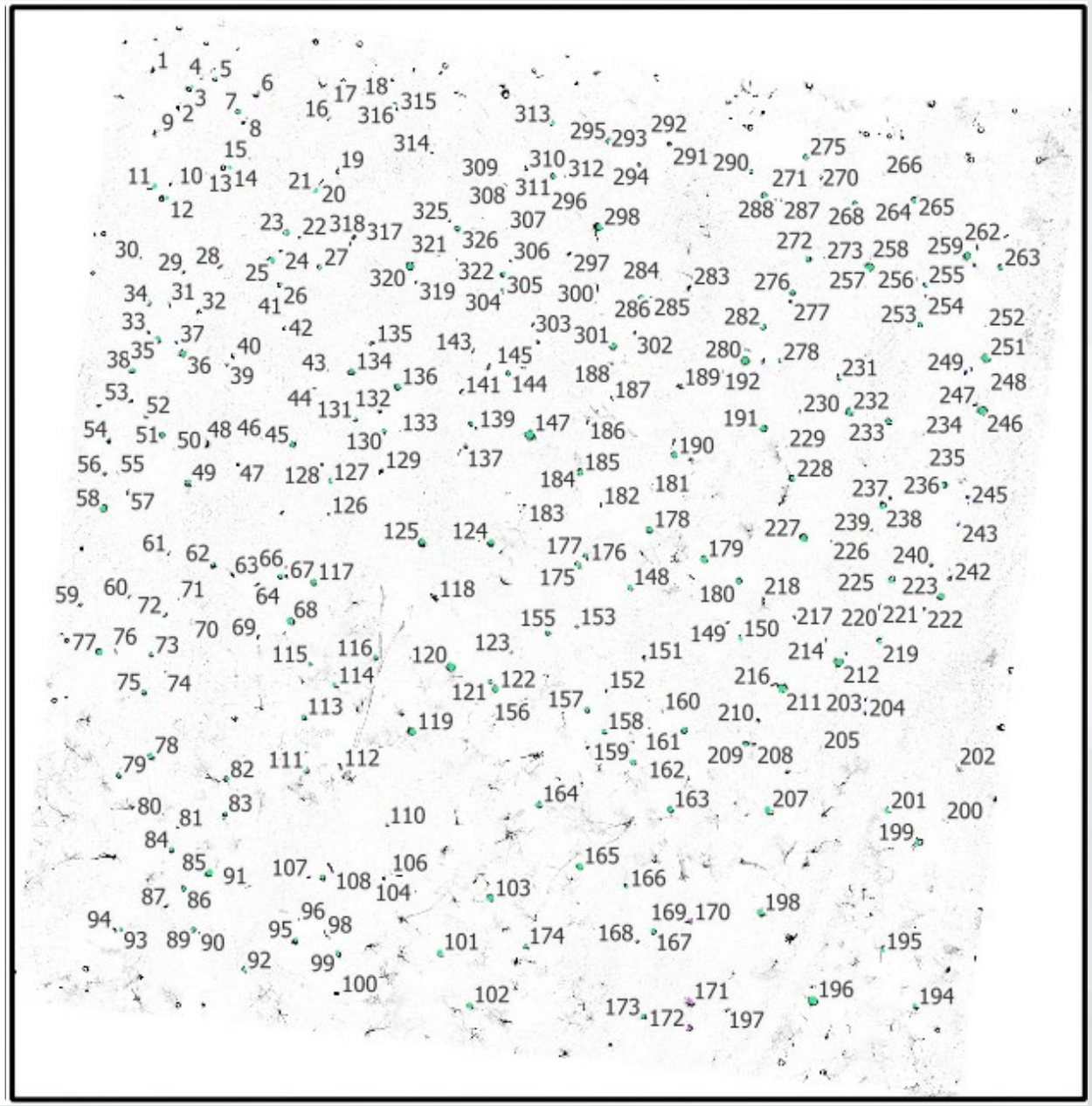
forest motion



The canvas

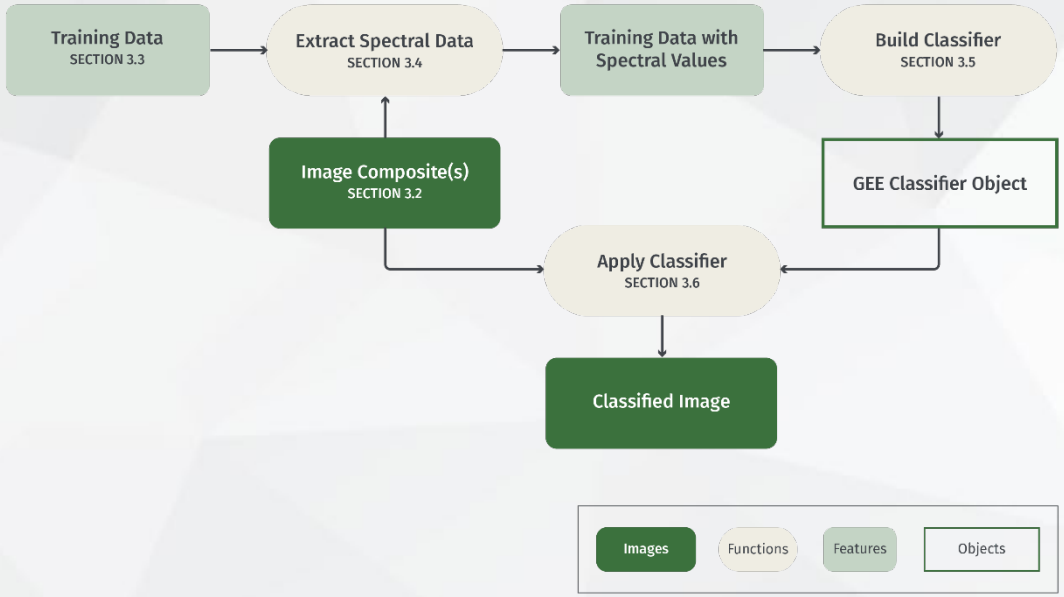


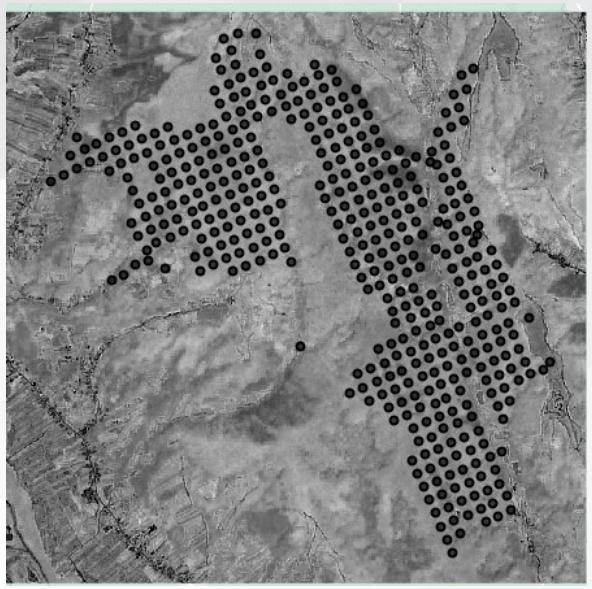
The paint

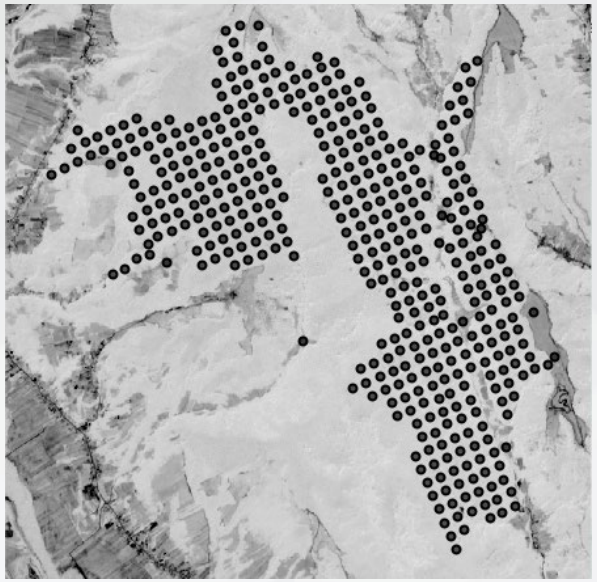


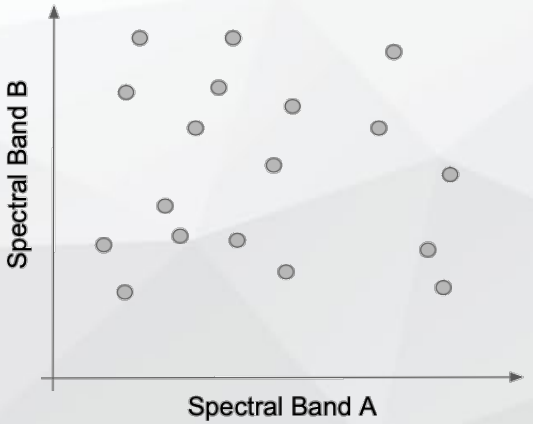
INTEGRATE

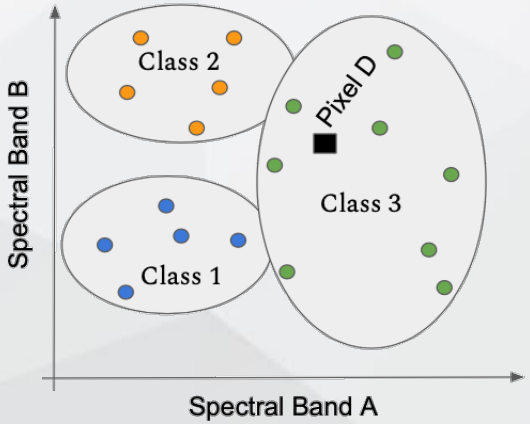
Data extrapolation





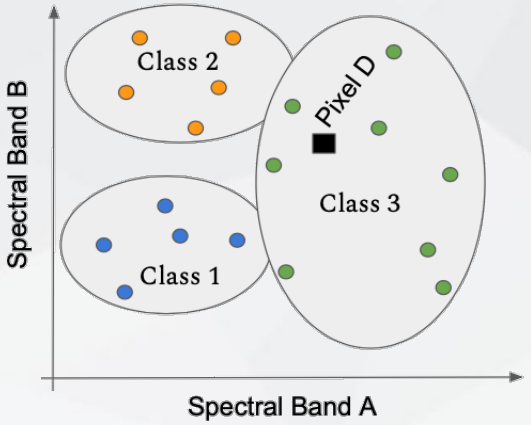


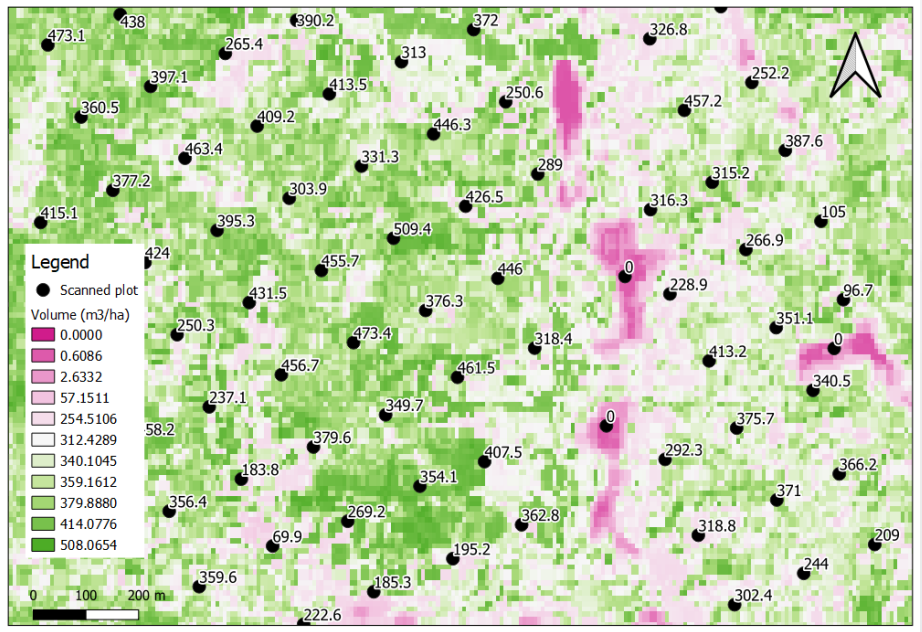




We are producing continuous data (e.g. raster data at pixel level constitution) using discontinuous data collected from the ground (e.g. plot data with ground-truth information)

Data extrapolation





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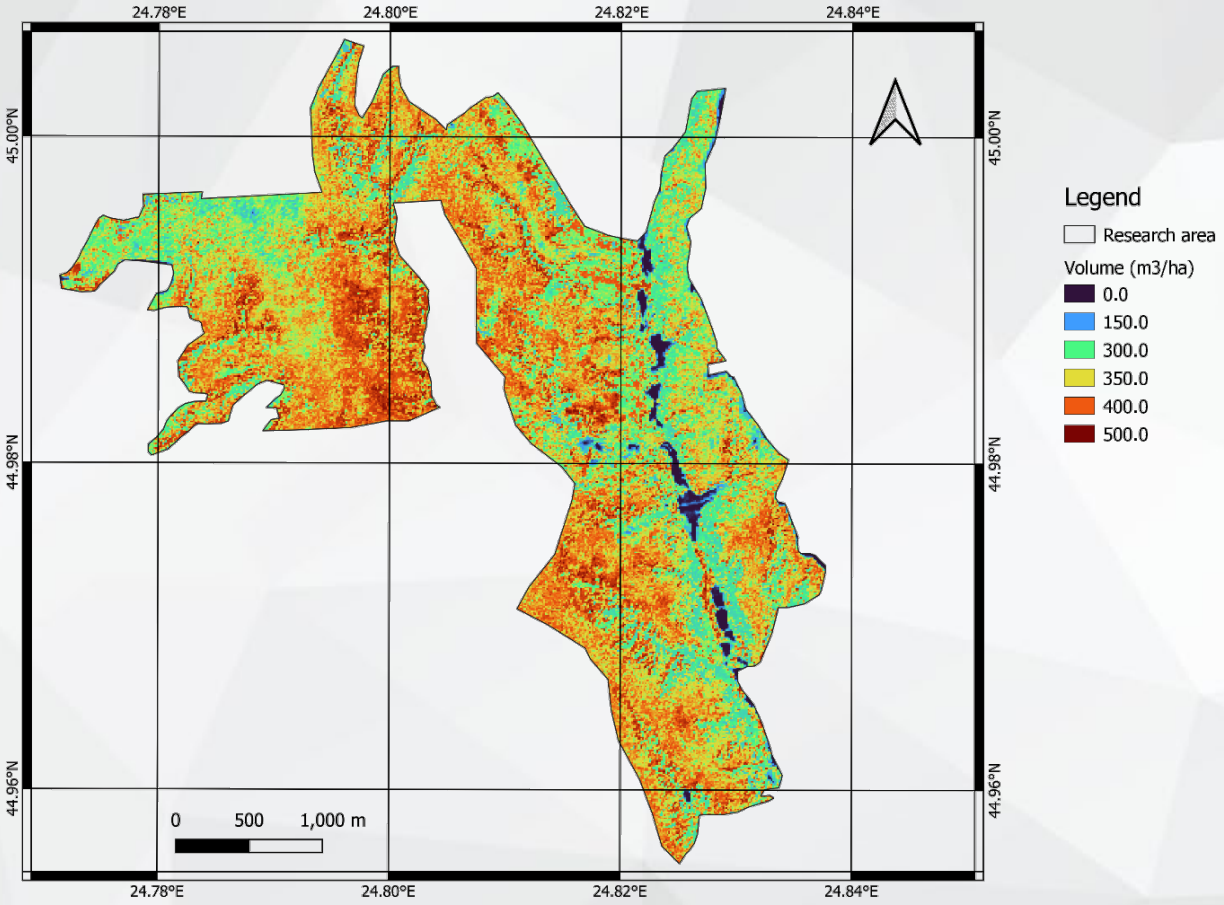
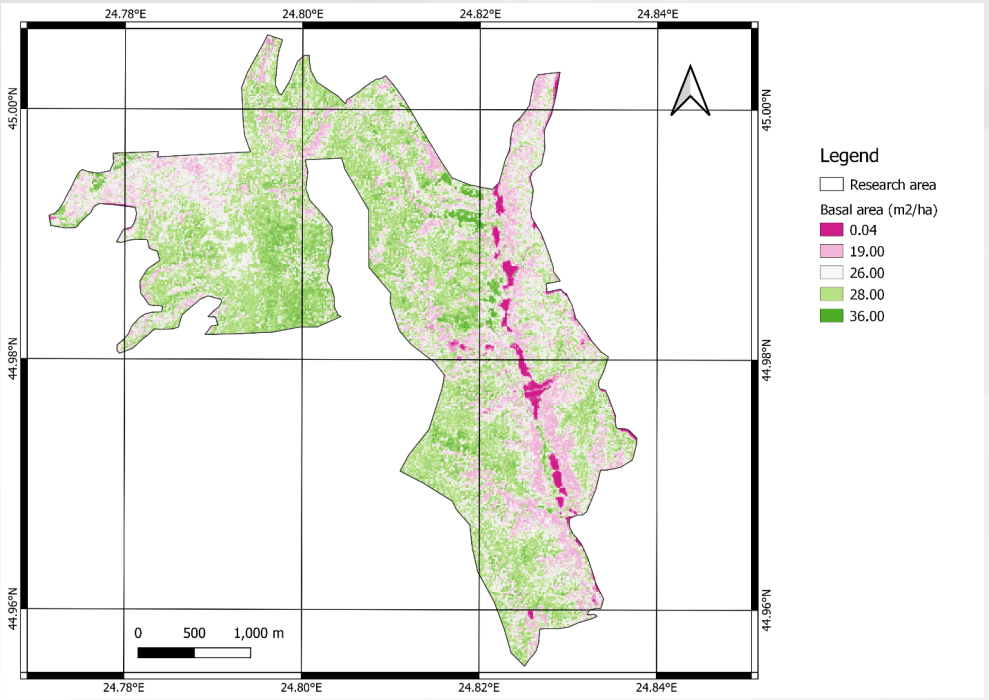
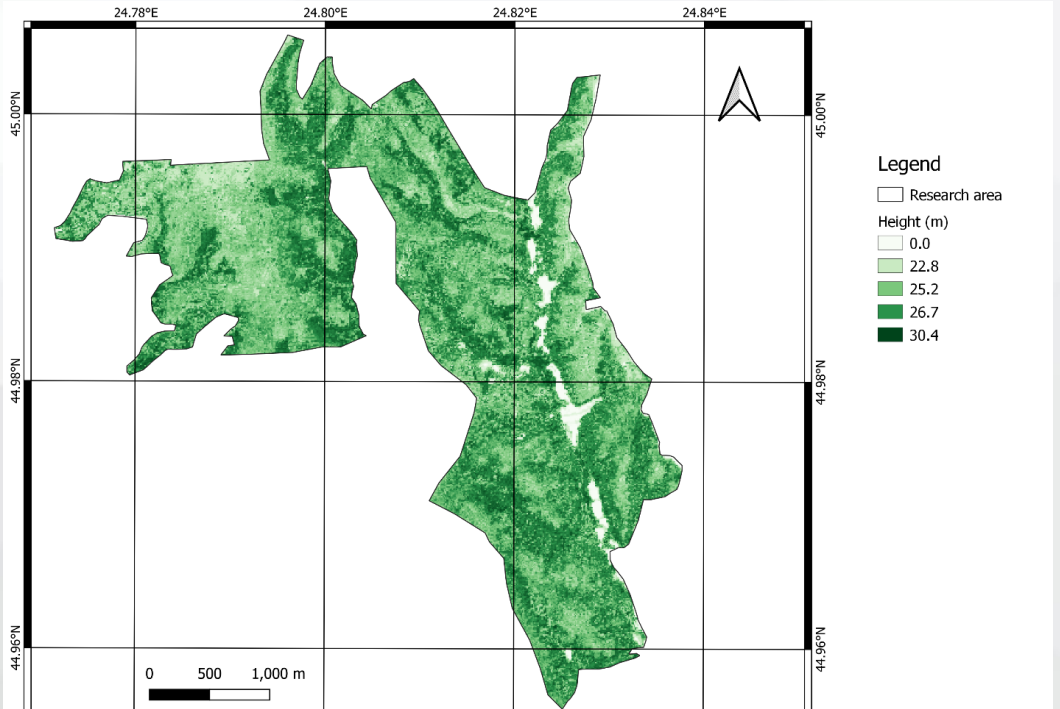
Continuous data results

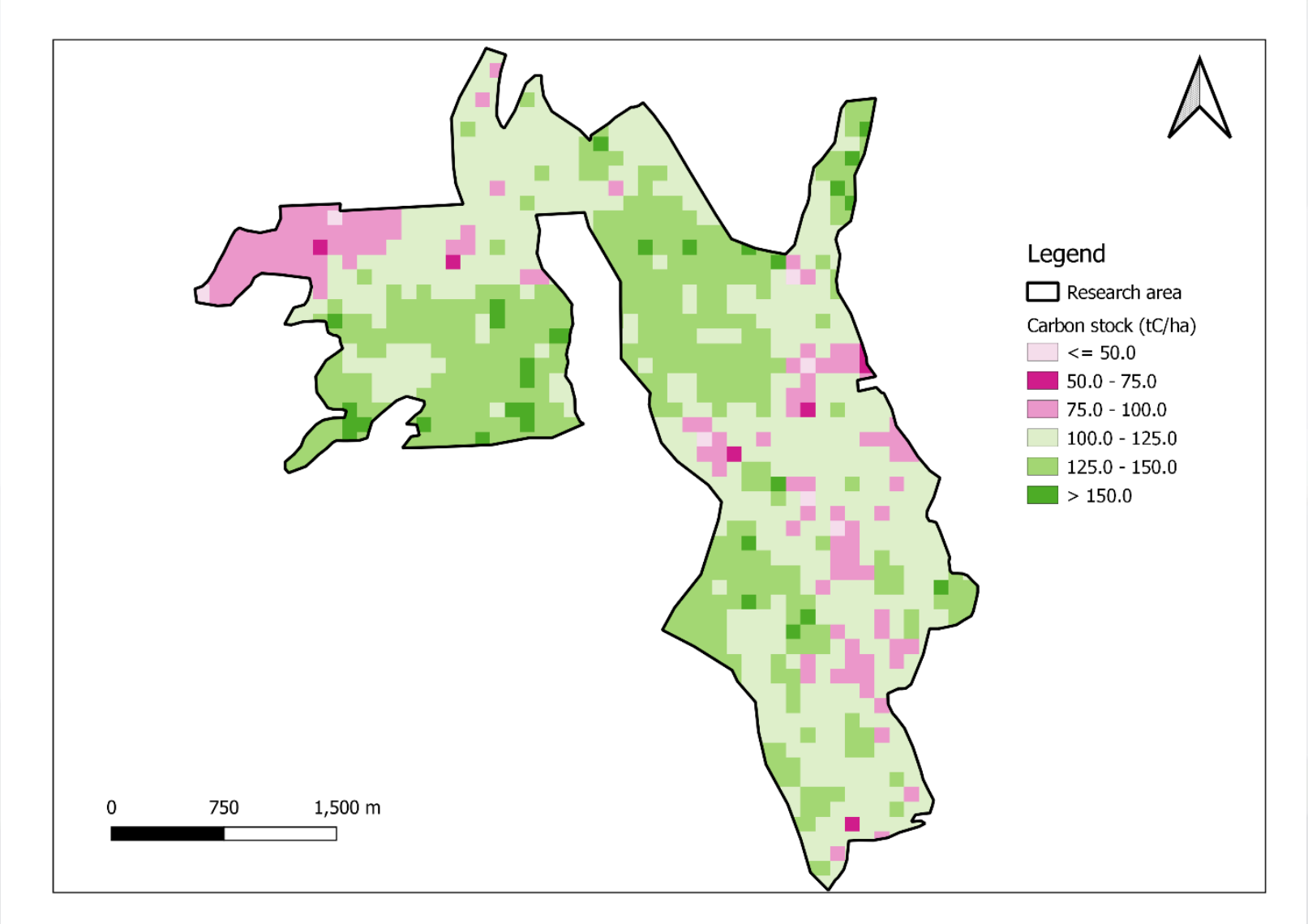






For forestry!!

Continuous data results



For carbon market!!

Conclusions

Highlights

Accurate and Fast

01

TLS is now fast and accurate, suitable for forestry. Mobile TLSs are reliable for complex ecosystems. TLS brings more objective data than the classical approach

Scalable and Adaptable

02

Merging terrestrial and aerial perspectives is key to reliable remote sensing products in forestry

VirtSilv

03

From the point cloud to the standing volume VirtSilv is the tool that **translates terrestrial remote sensing and data interpretation in common language**

sergiu@forestdesign.ro

Forest Design – social media