

# Improved Techniques for Inventory Remote Sensing

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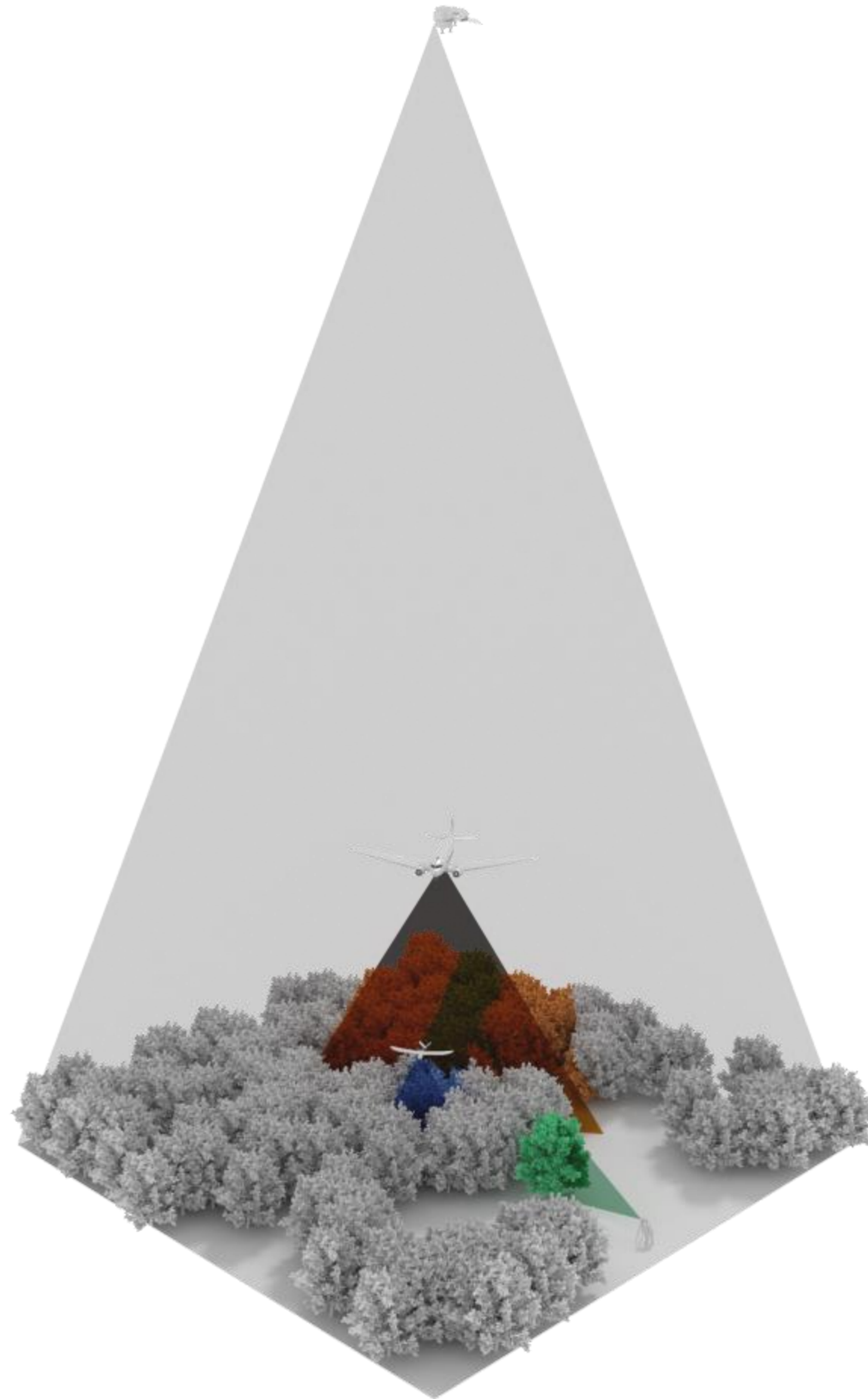
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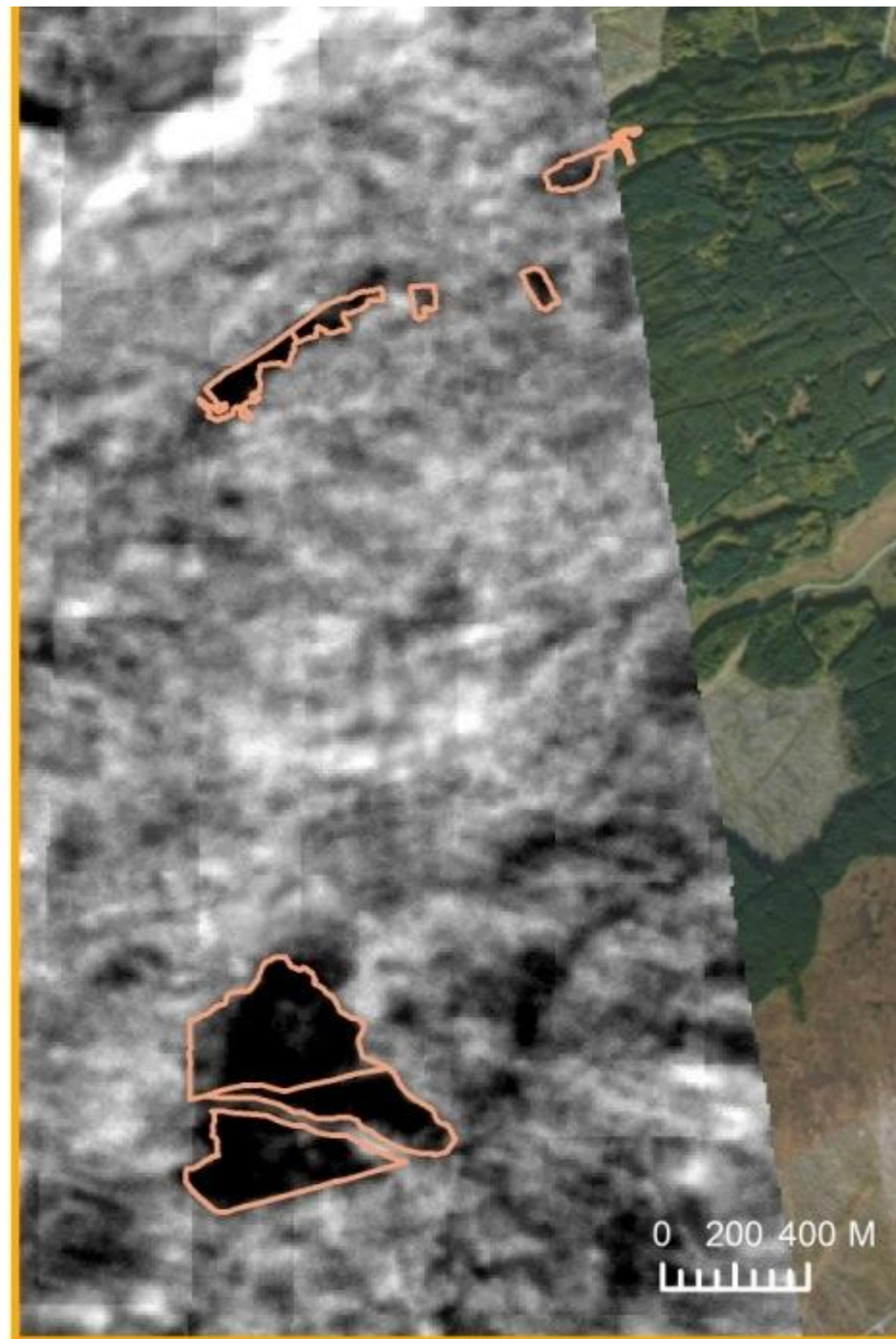
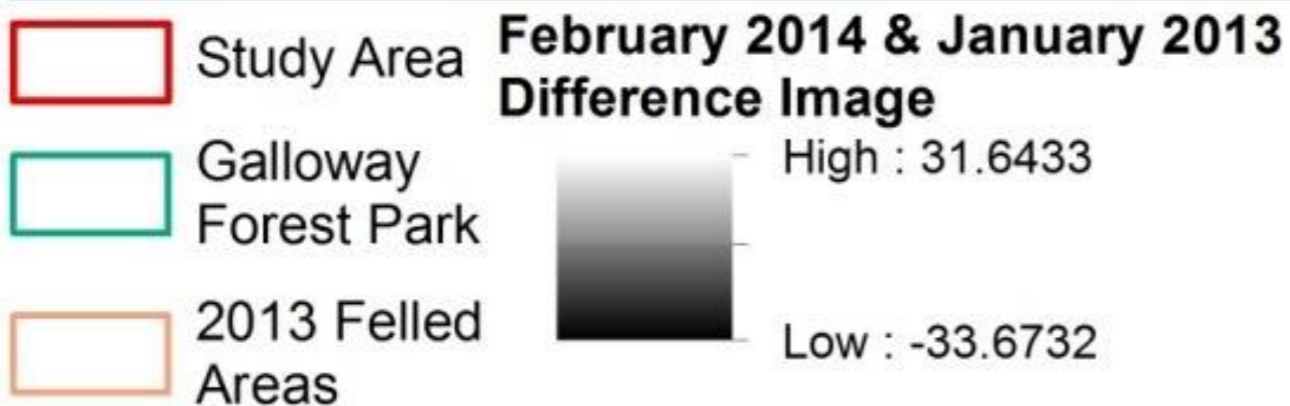
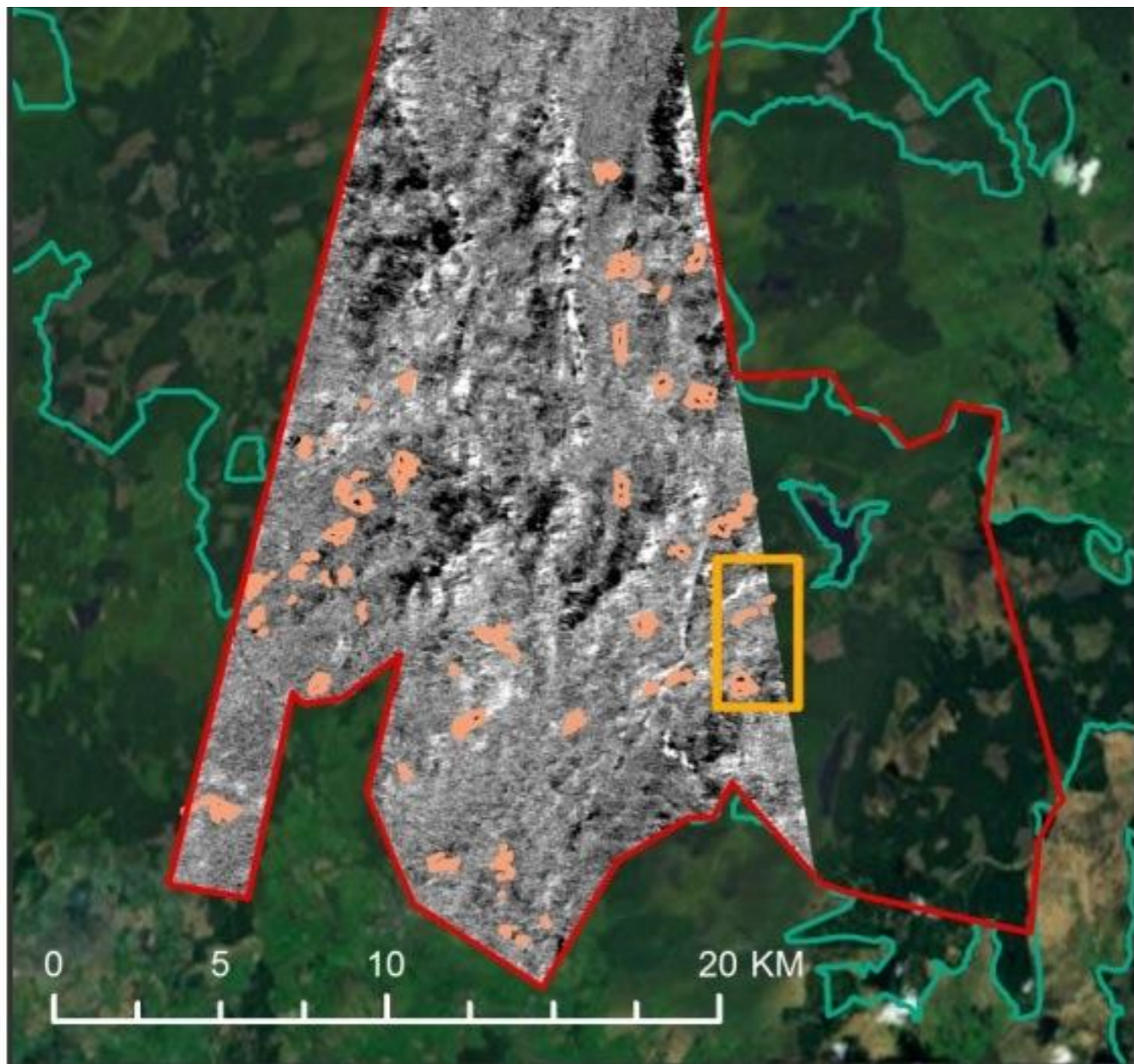




# Spaceborne







Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

# Airborne - Super High Altitude





Geiger Mode Lidar



Single Photon Lidar



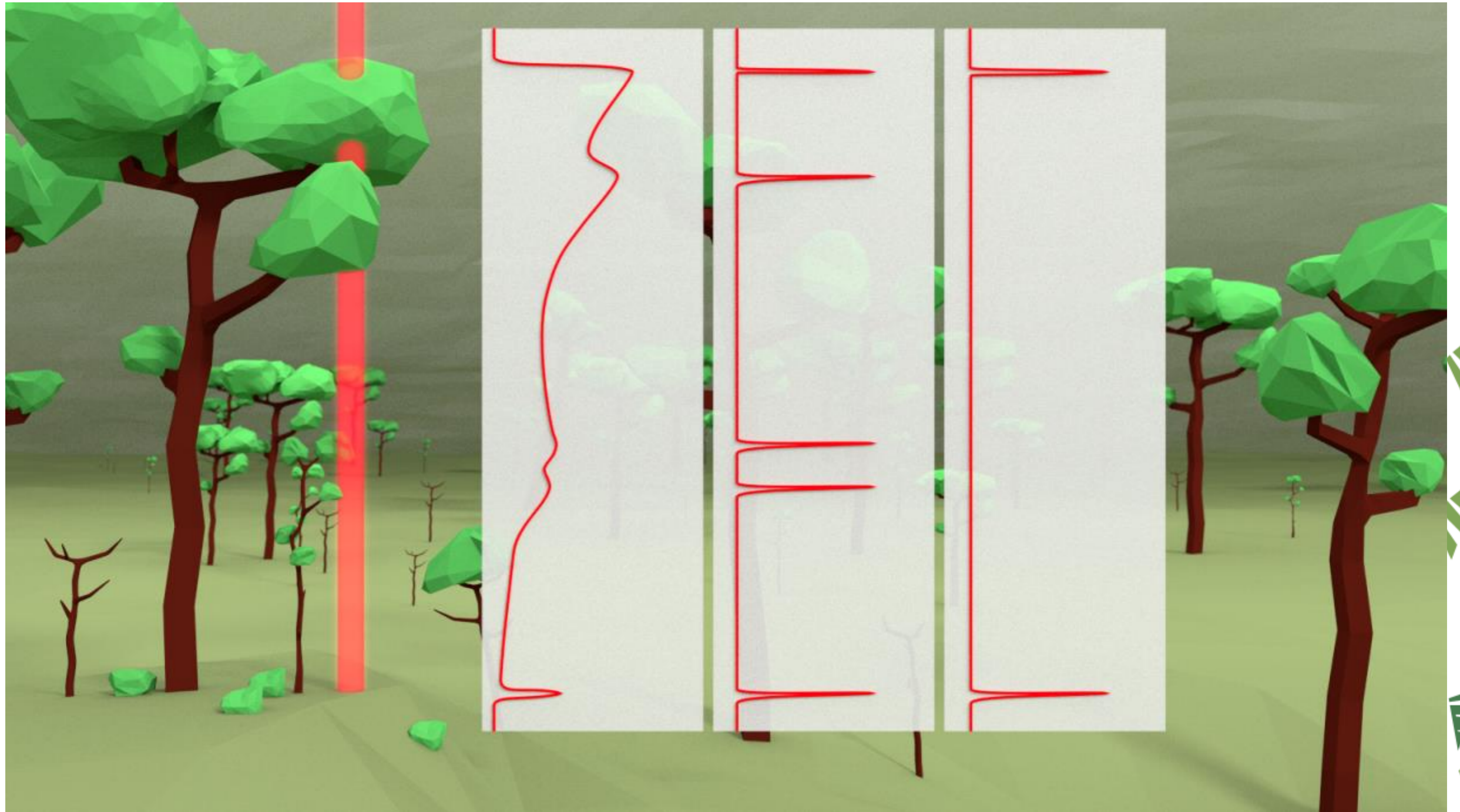
# Airborne - High Altitude



# LiDAR 101







# Multispectral Lidar





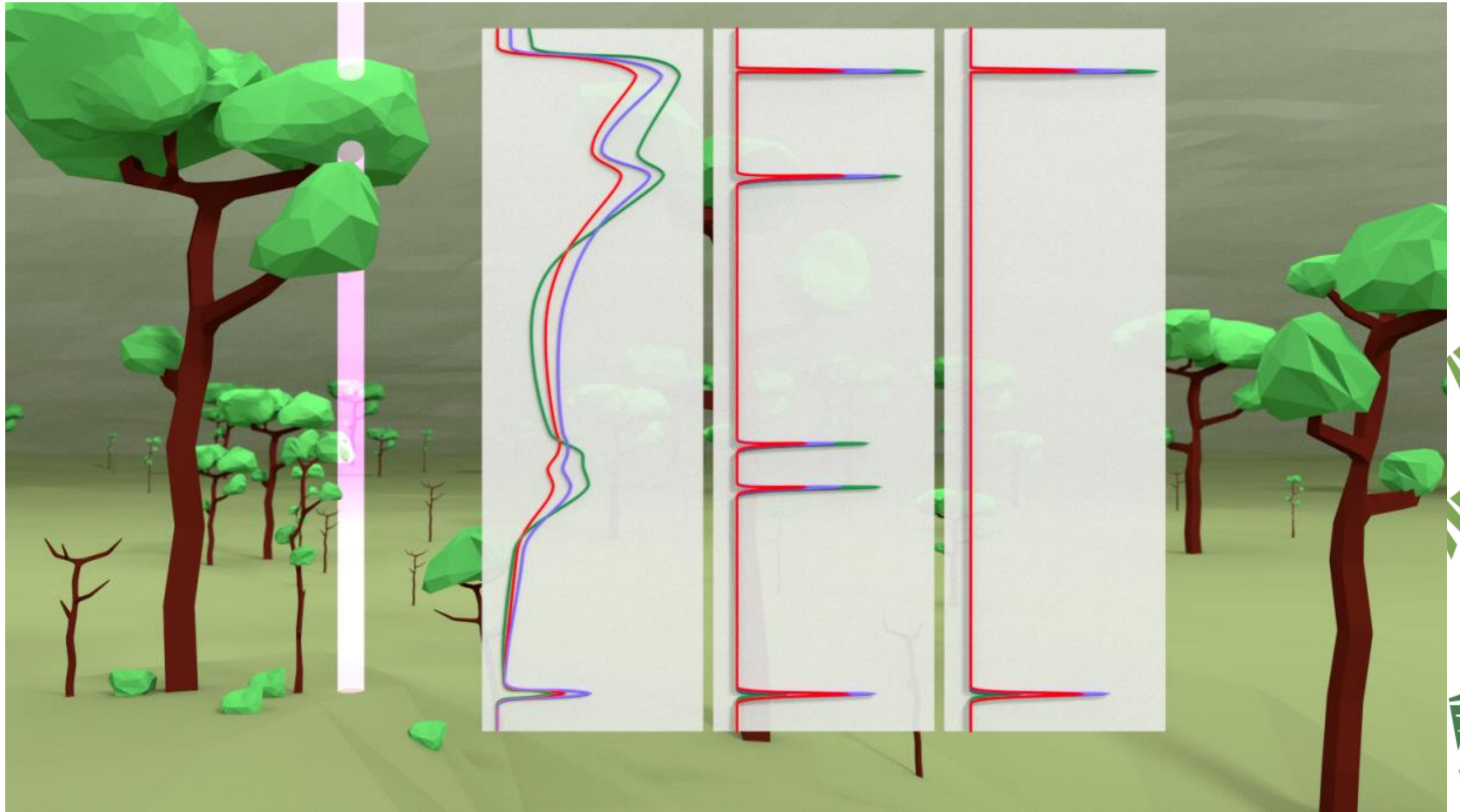




# Multispectral LiDAR

## A wish...



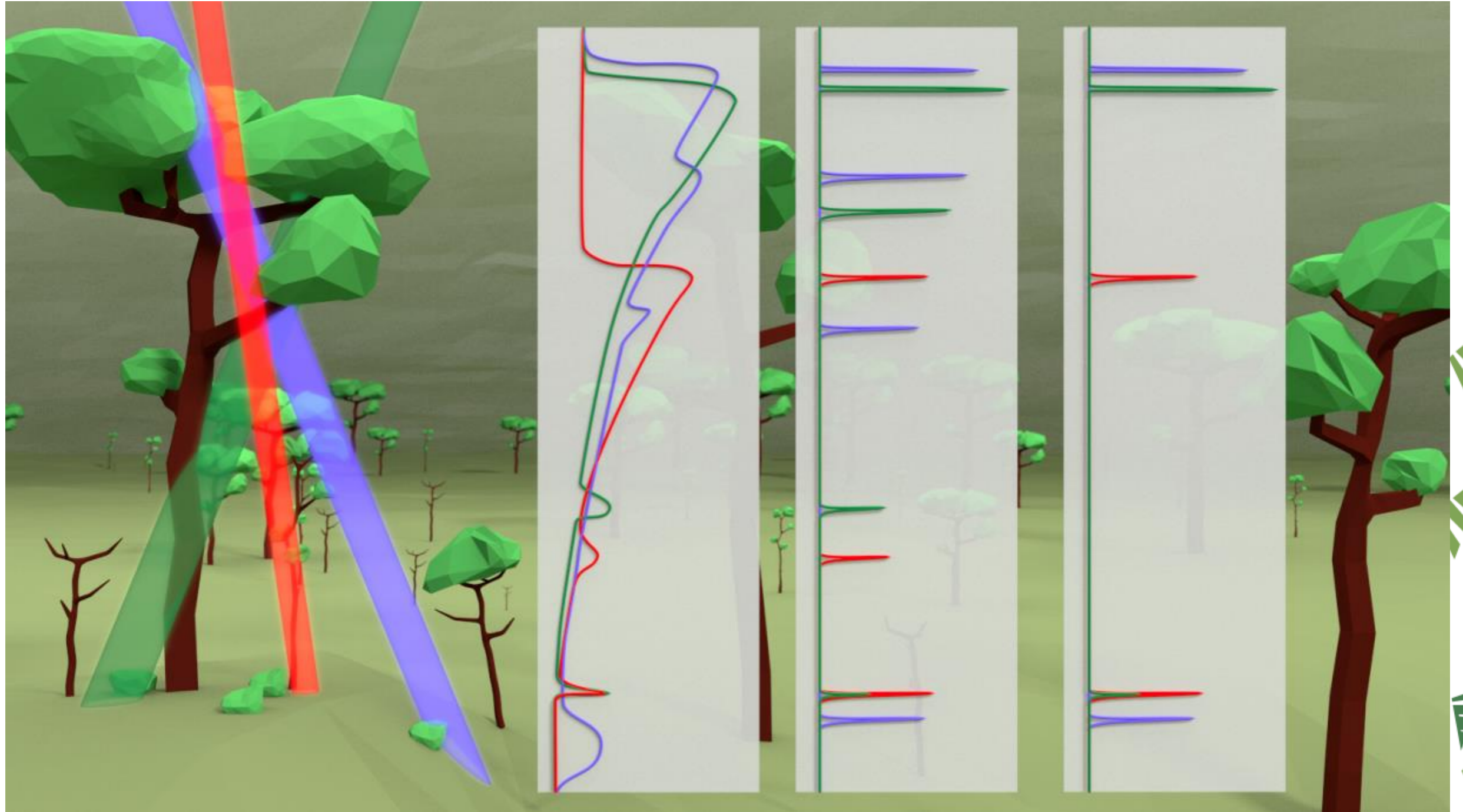




## Multispectral LiDAR

A reality... or where is my spectral info ?







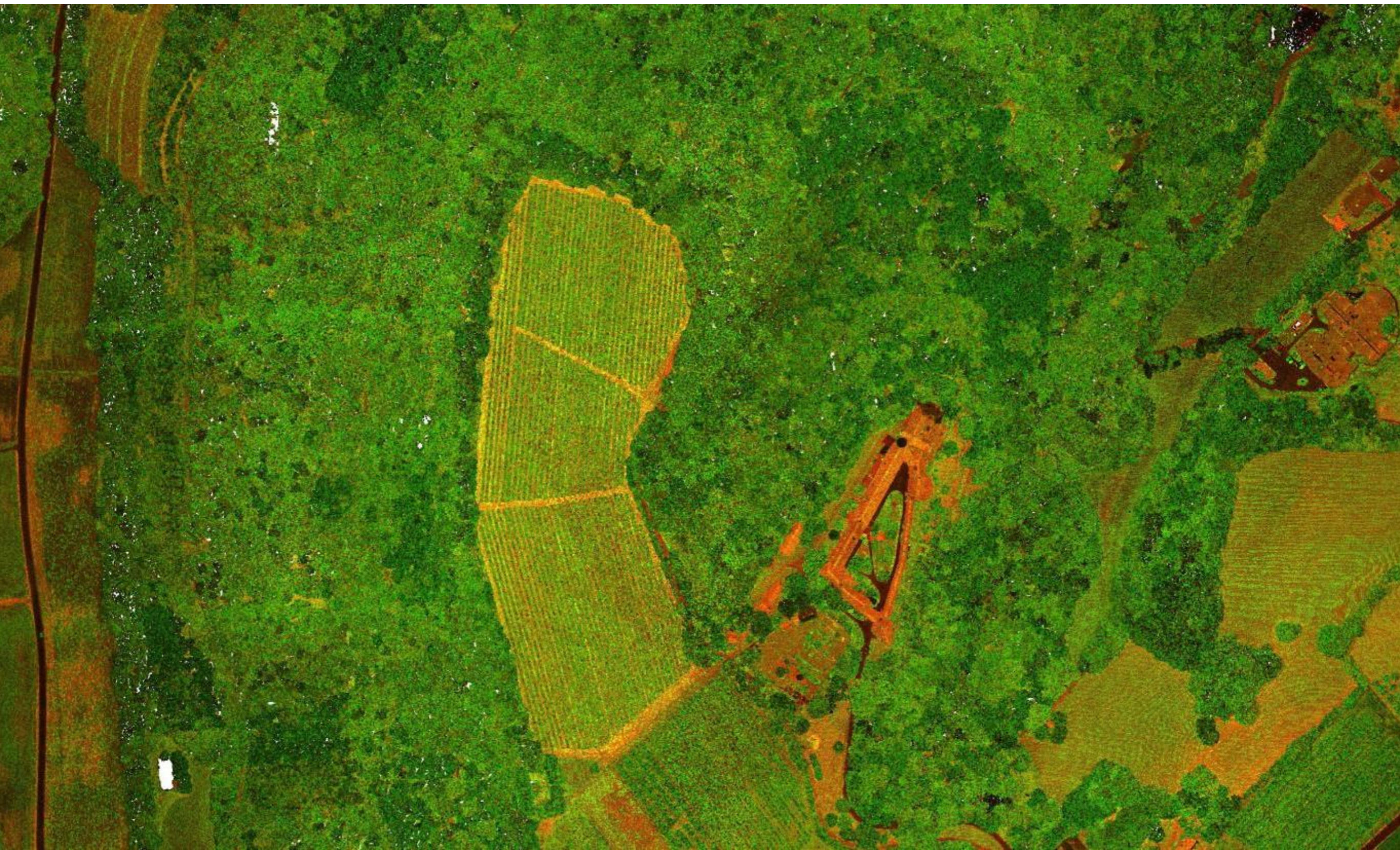
# Multispectral LiDAR Trial Missions 2015











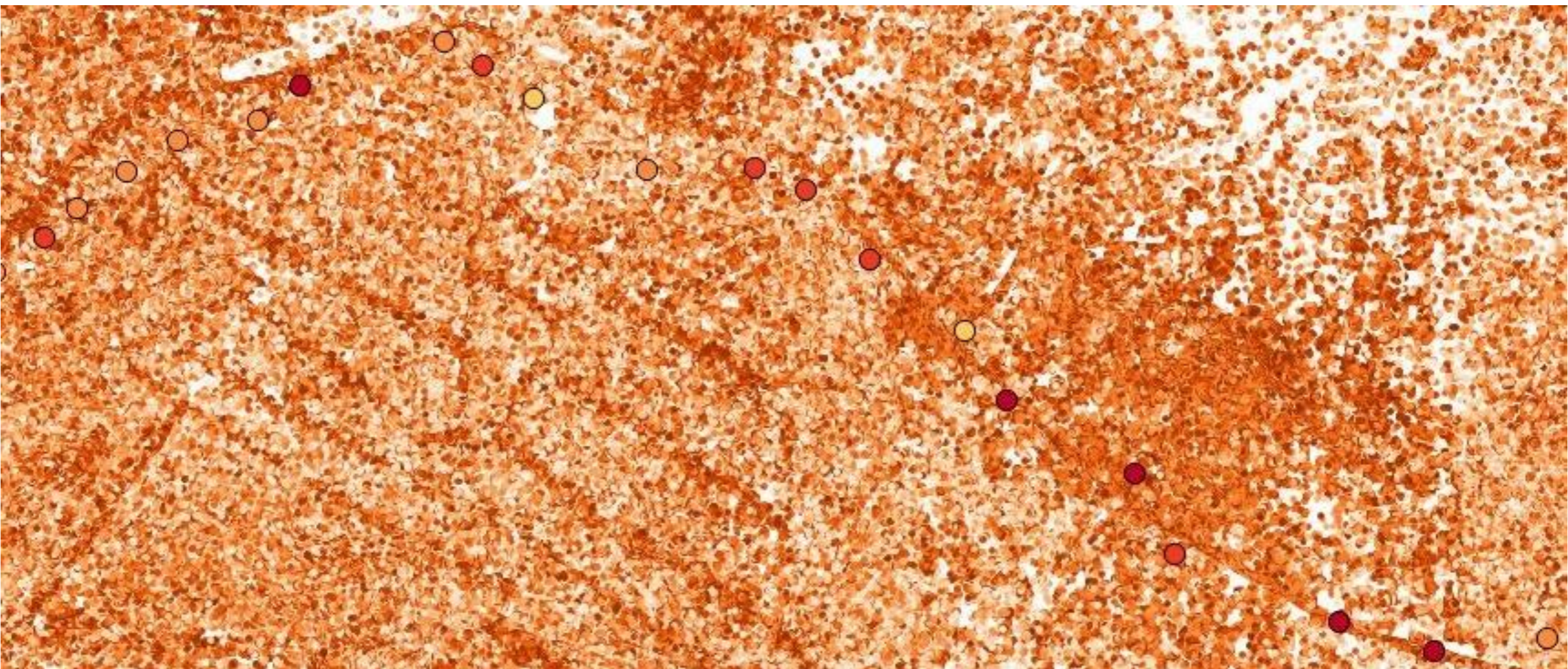




RGB Composite - Profile







GNDVI lidar vs GNDVI ASD  
ground returns

orange: -0.98  
red: 0.99





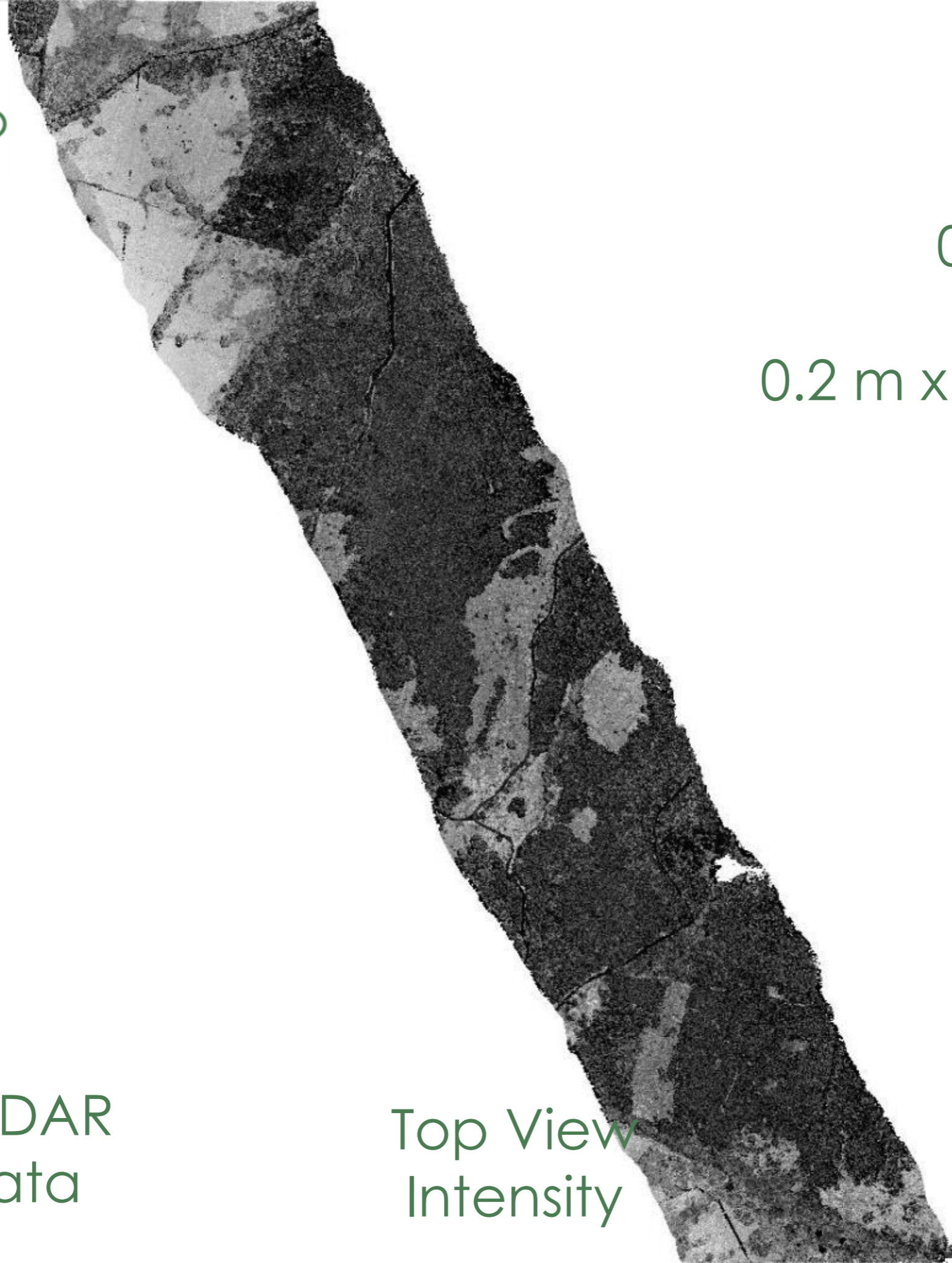
# *HD Airborne Lidar*



0.5 km x 2.6 km  
>25 pts.m<sup>-2</sup>  
0.2 m x 0.2 m spacing

Airborne LiDAR  
Roames data

Top View  
Intensity





Top View  
Ambient Occlusion



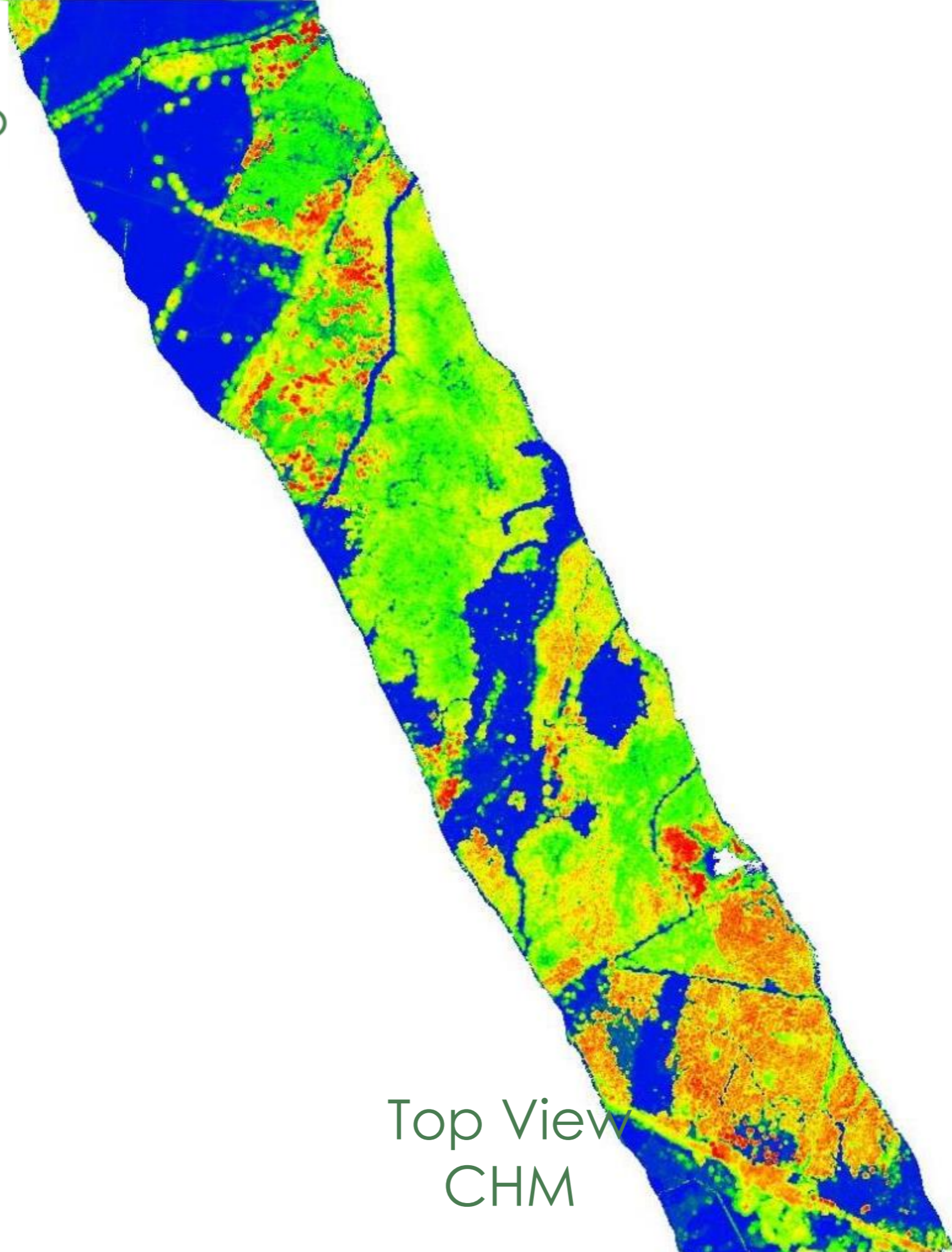




Side View



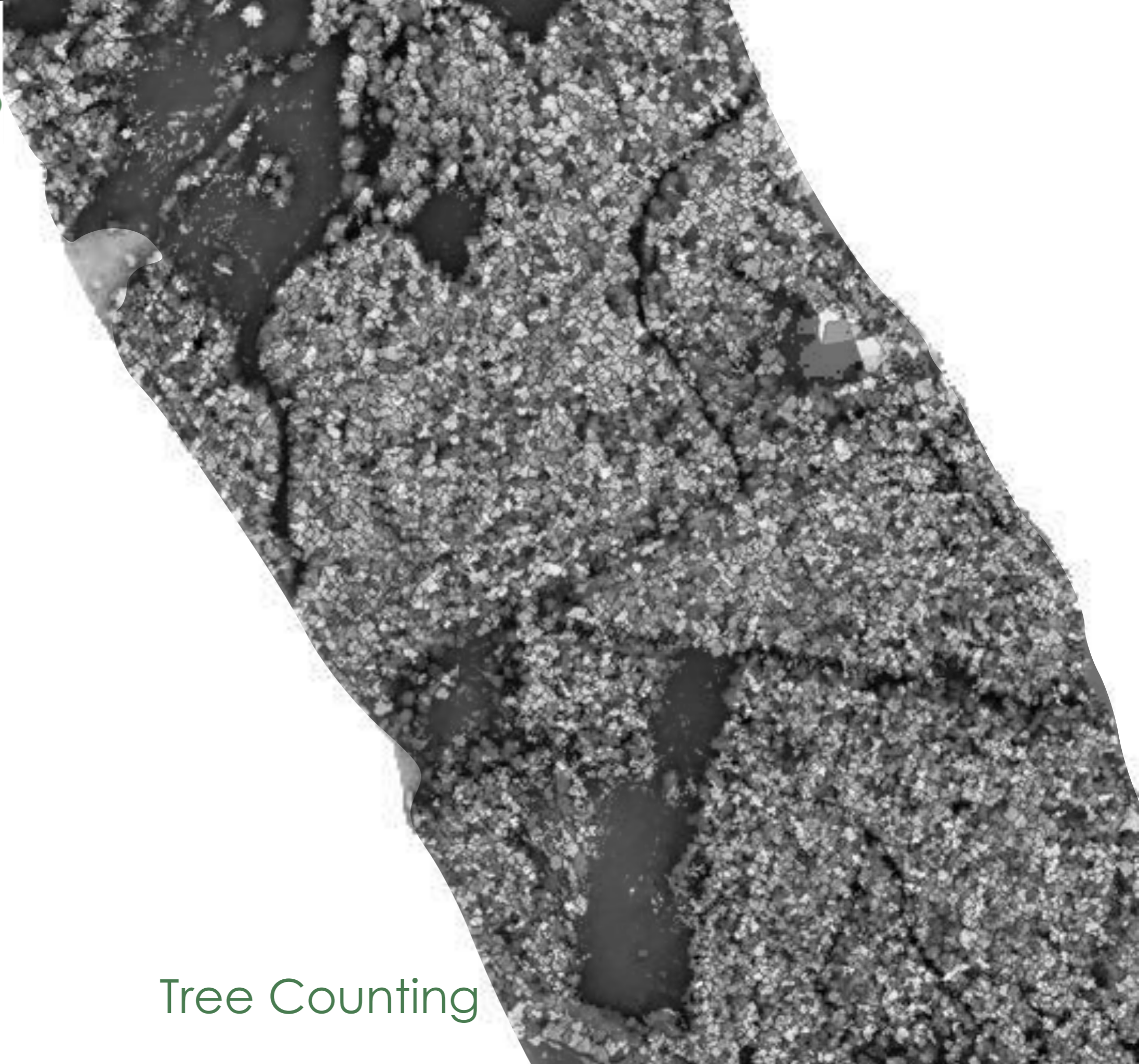




Top View  
CHM







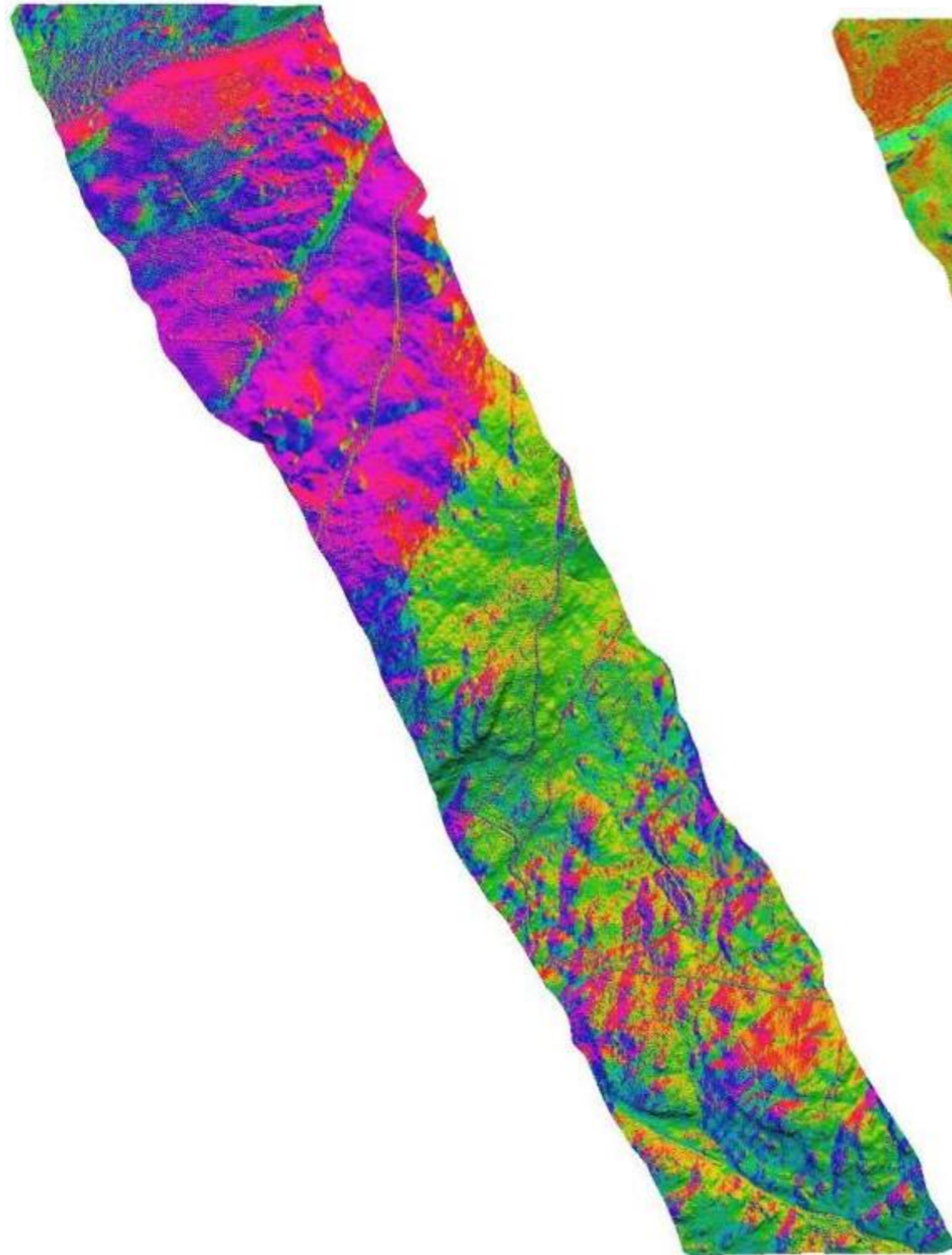
# Tree Counting



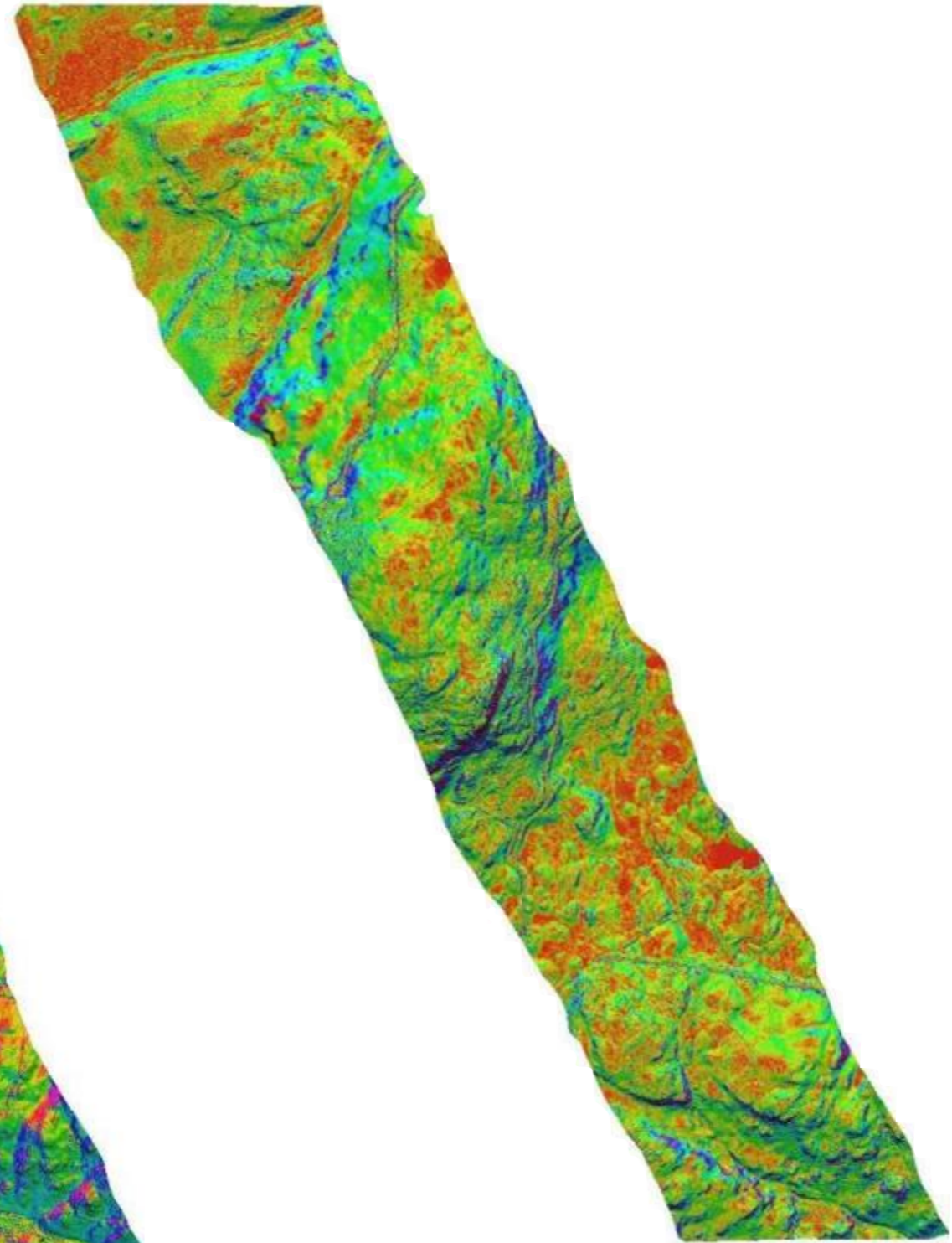
Top View  
DTM







Direction



Slope





# Airborne - Low Altitude



Passive Sensors  
or  
Thoughts on Photogrammetry







1 km x 2.6 km  
>12 pts.m<sup>-2</sup>  
0.3 m x 0.3 m spacing

Top View







Side View



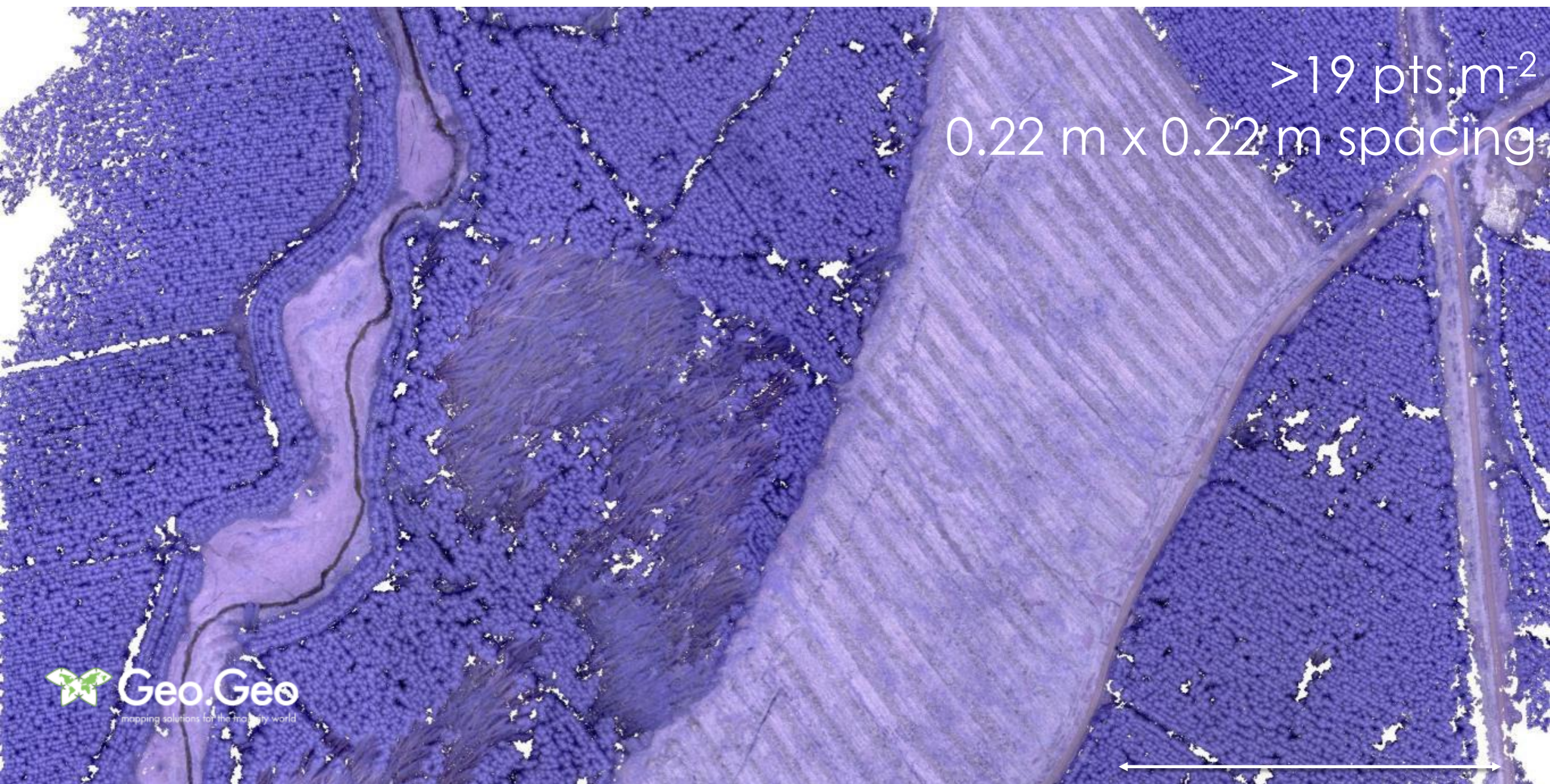




Tree Counting





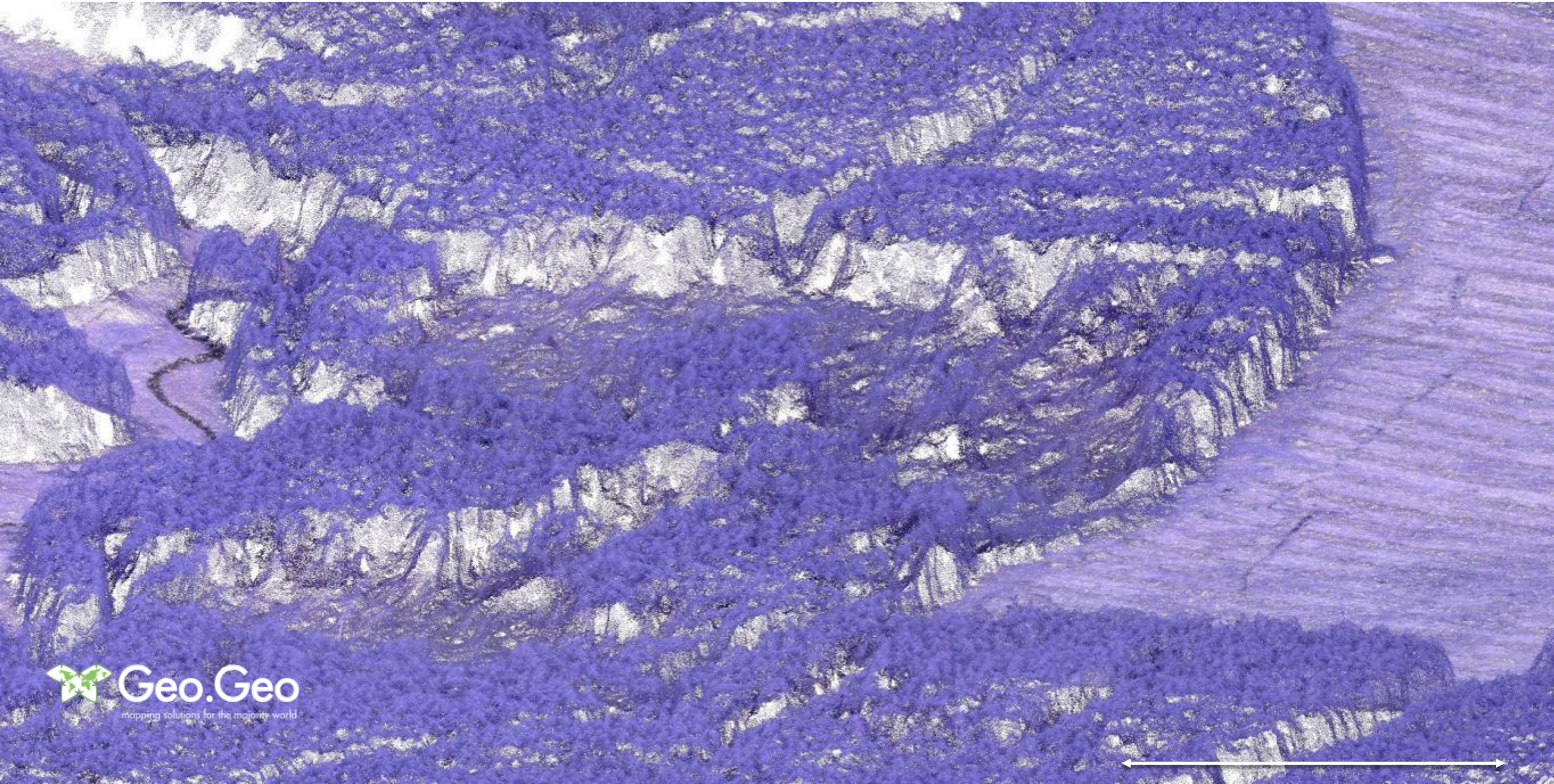


$>19 \text{ pts.m}^{-2}$   
0.22 m x 0.22 m spacing

Top View













# Active Sensors











€335k + VAT



€180k + VAT





## YellowScan



## Riegl







	<b>YS Mapper</b>	<b>YS Surveyor</b>	<b>VUX-Sys</b>
<b>IMU</b>	<b>included</b>	<b>included</b>	<b>included</b>
<b>Weight (kg)</b>	<b>2</b>	<b>1.5</b>	<b>3.85</b>
<b>Dimensions (cm)</b>	20 x 15 x 15	10 x 15 x 14	22.7 x 20.9 x 12.9
<b>Power consumption (W)</b>	10	15	60
<b>Max Altitude (m)</b>	150	150	320 - 1000
<b>Echos per shot</b>	3	2	unlimited
<b>Range Accuracy (cm)</b>	10	5	1
<b>Price (£)</b>	55k	78k	199k

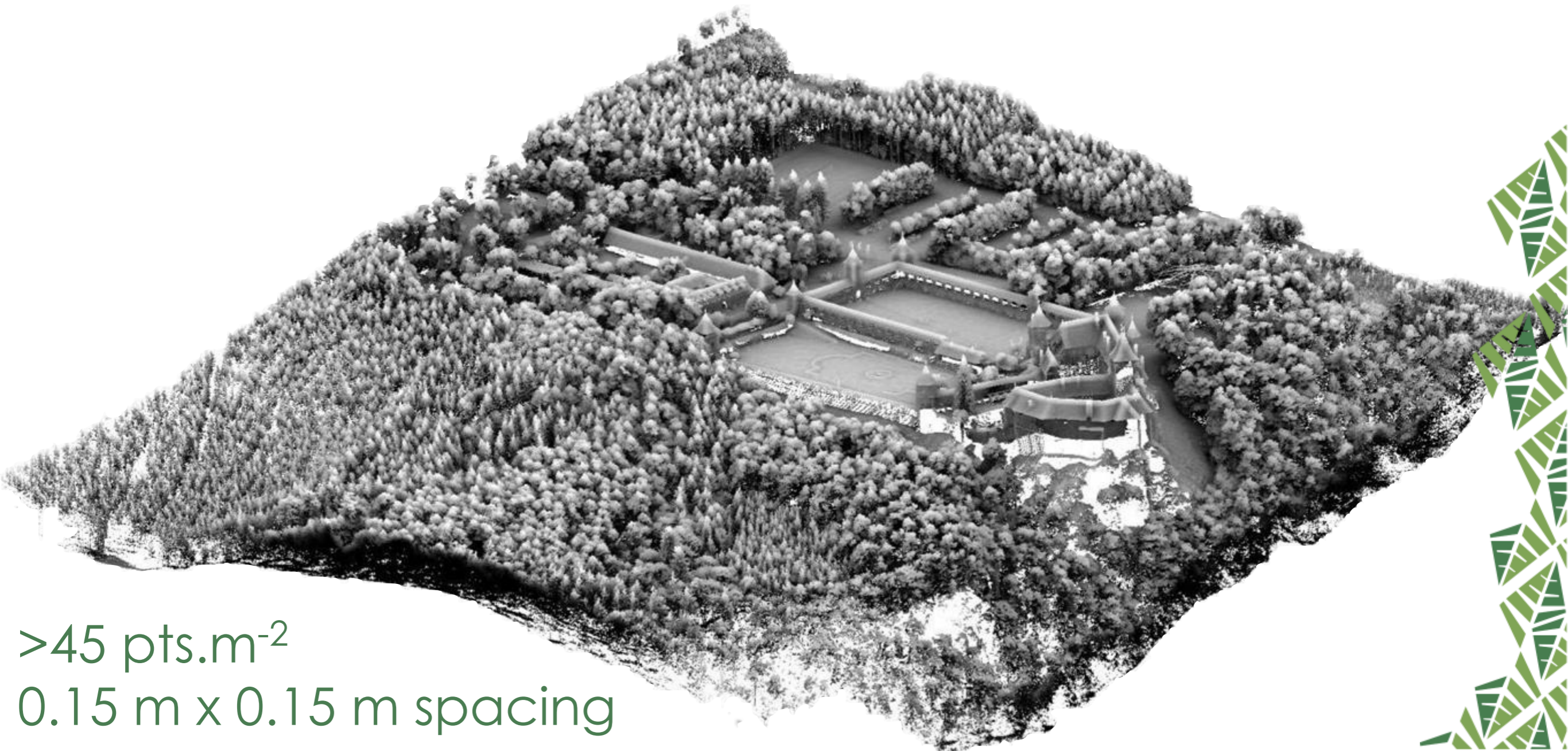


# Multi rotor costing example

Covered Area		Data Collectioning		*£.ha <sup>-1</sup>
Acres	Hectares	*Collection	*Processing	
<b>1-3</b>	<b>0.4-1.2</b>	£270	£5	£230
<b>3-6</b>	<b>1.2-2.4</b>	£600	£10	£255
<b>6-9</b>	<b>2.4-3.6</b>	£870	£15	£245
<b>9-15</b>	<b>3.6-6.0</b>	£1200	£24	£204
<b>15-40</b>	<b>6.0-16.2</b>	£2260	£65	£143
<b>&gt;40</b>	<b>&gt;16.2</b>	£2400	£4.ha <sup>-1</sup>	

\* indicative pricing, subject to change

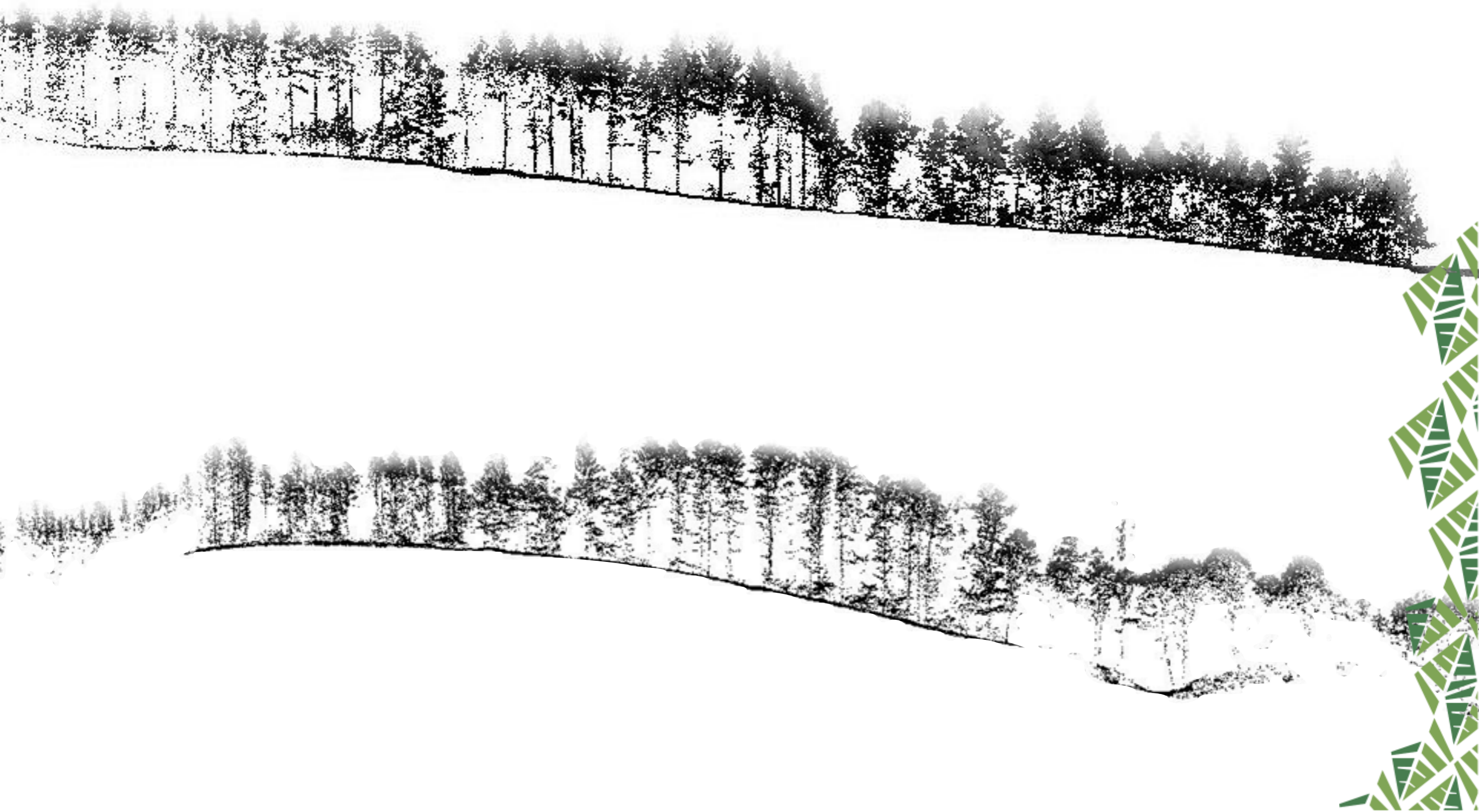




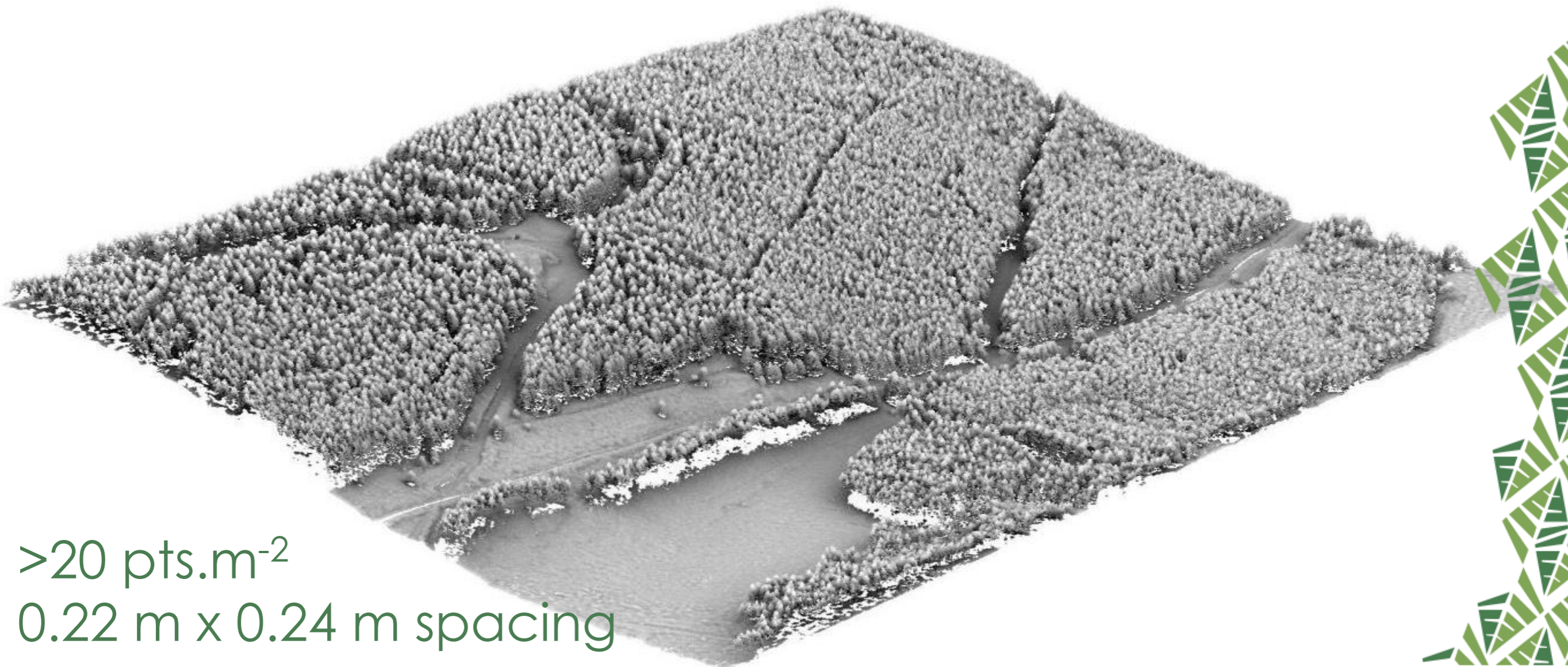
>45 pts.m<sup>-2</sup>  
0.15 m x 0.15 m spacing









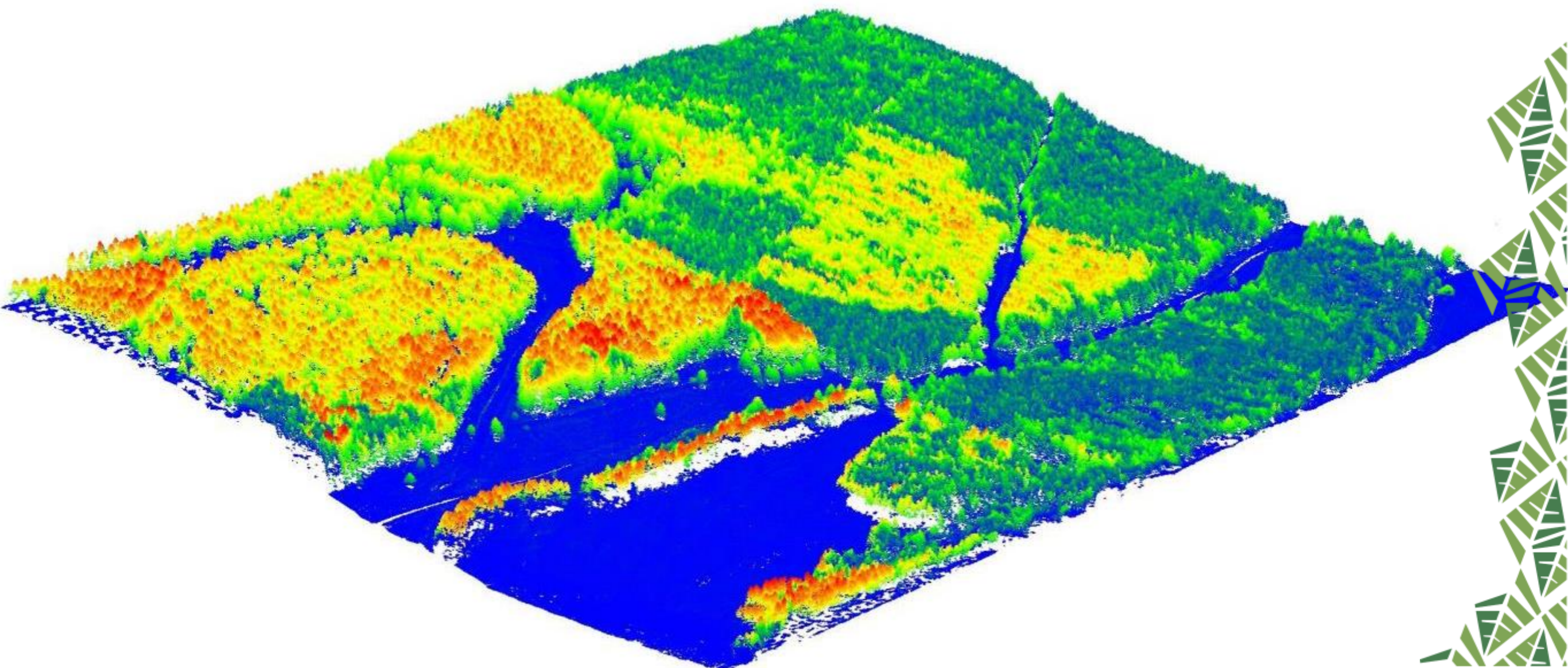


>20 pts.m<sup>-2</sup>  
0.22 m x 0.24 m spacing

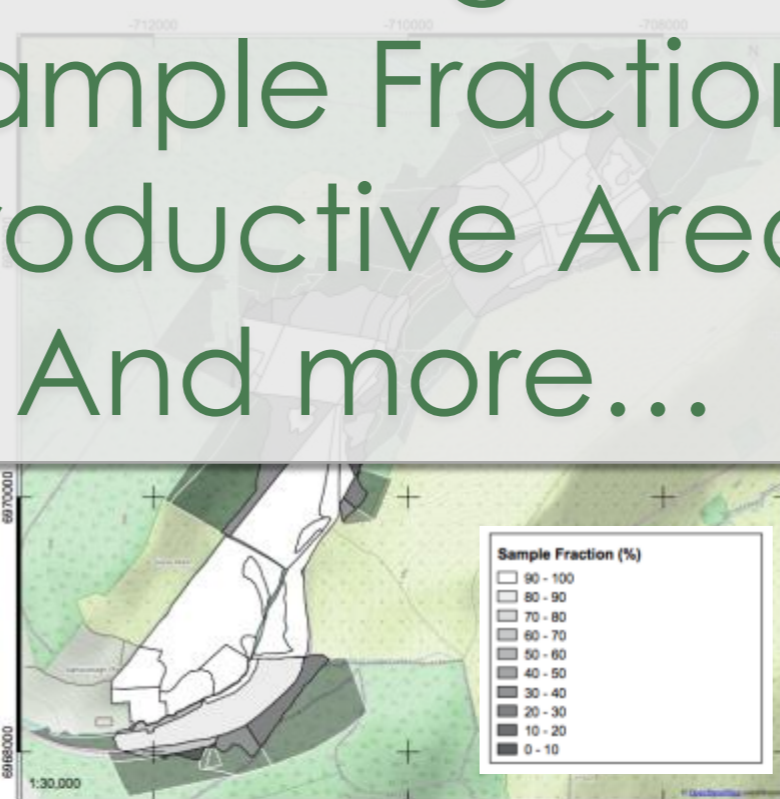
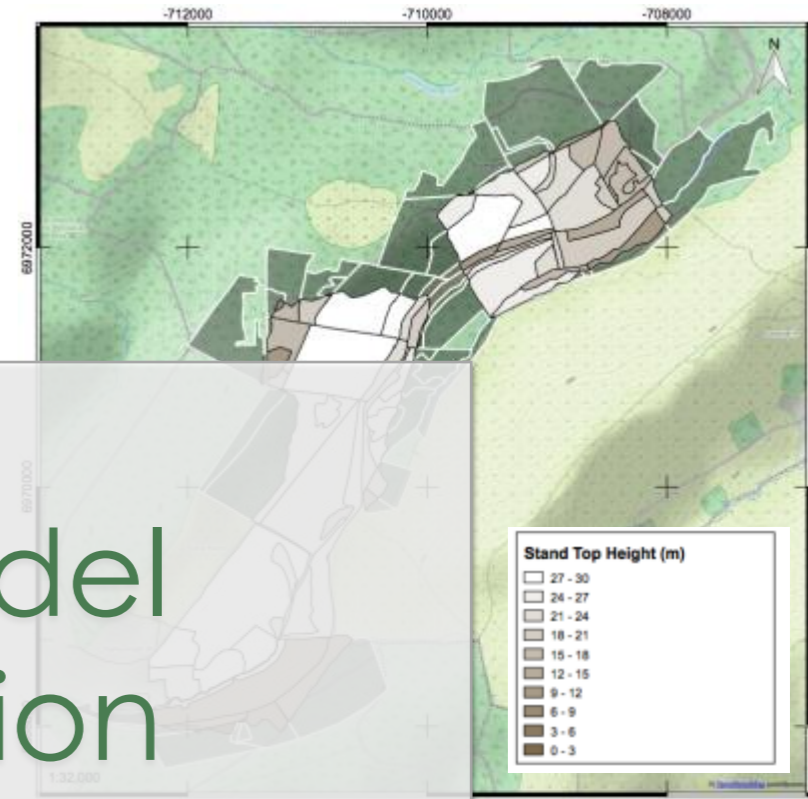
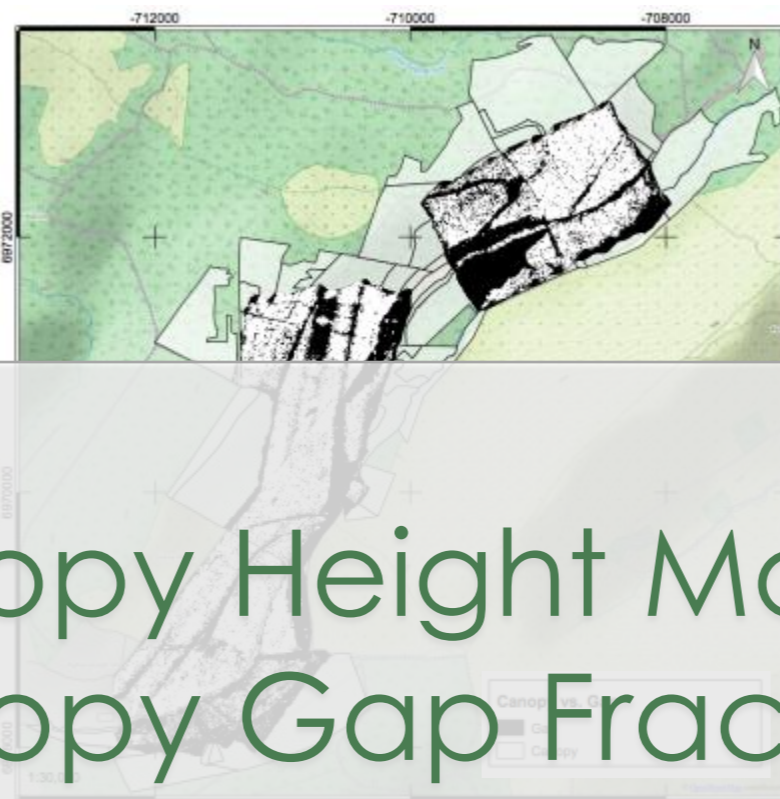
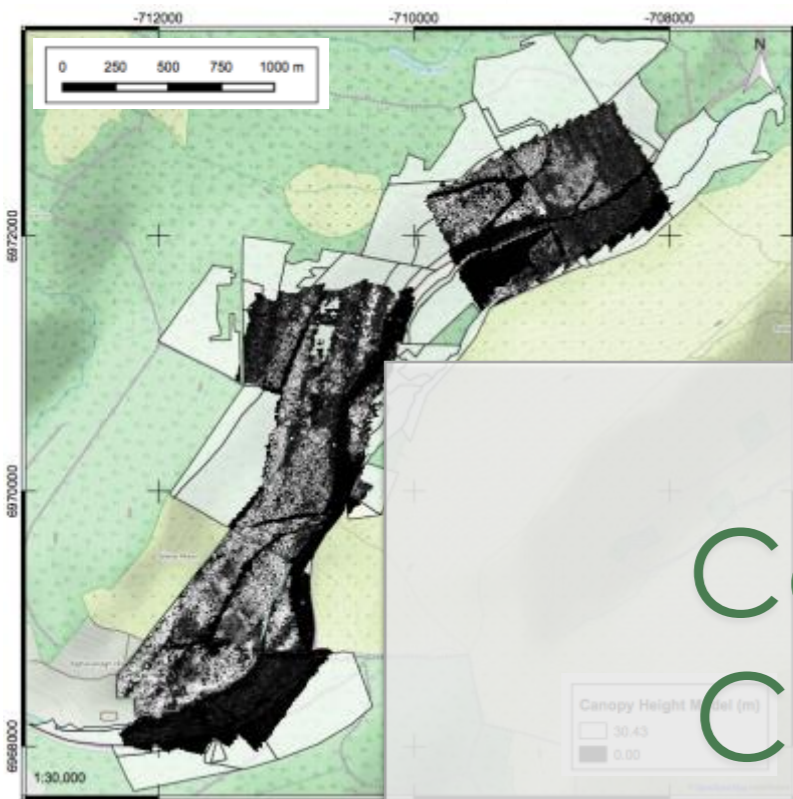




# Original Points Cloud with Canopy Height Model color coded







Canopy Height Model  
 Canopy Gap Fraction  
 Stand Top Height  
 Stand Average Height  
 Sample Fraction  
 Productive Area  
 And more...







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