

Emerging Remote-sensing Technologies for Studying the Vermont Landscape

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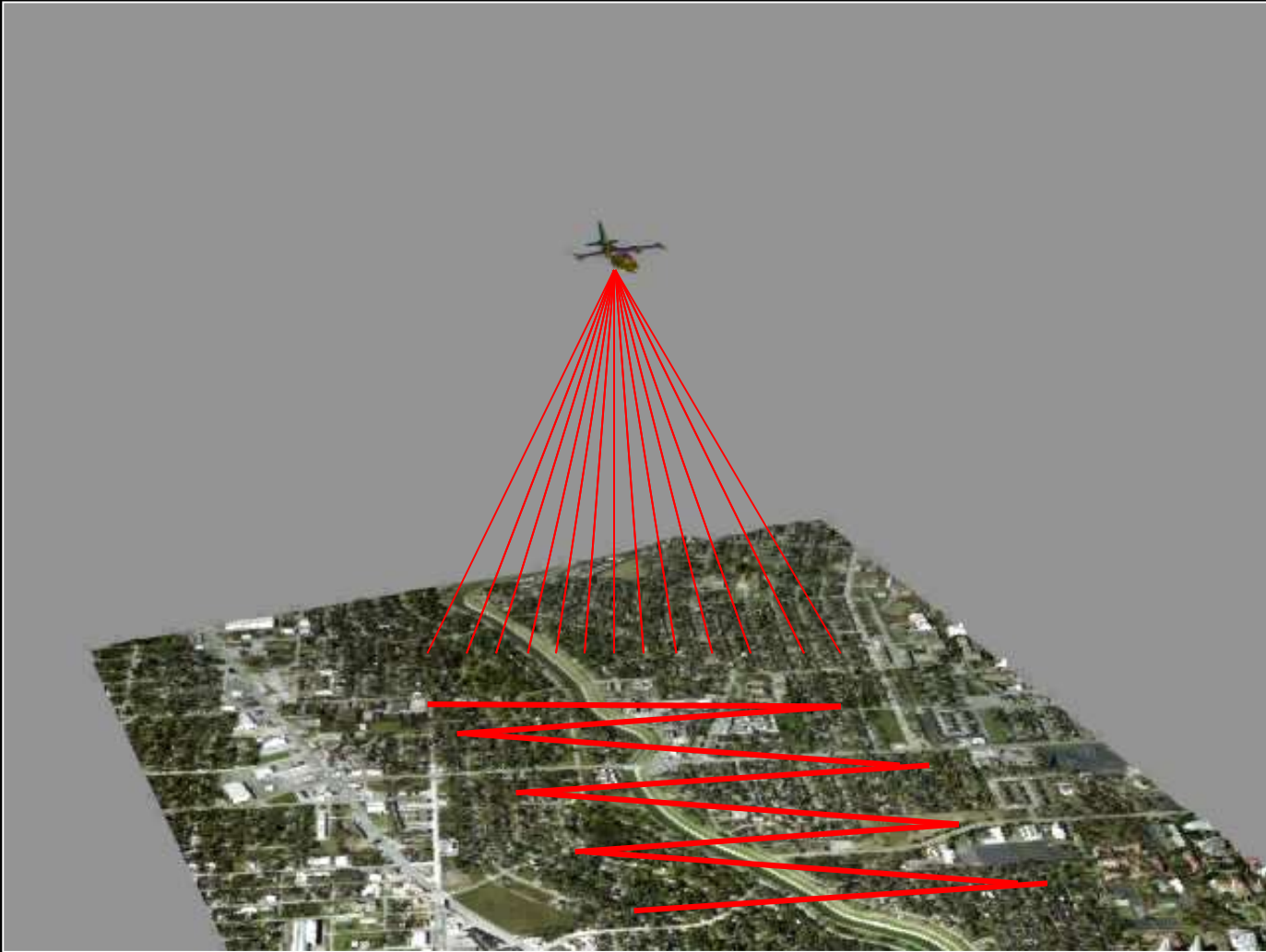
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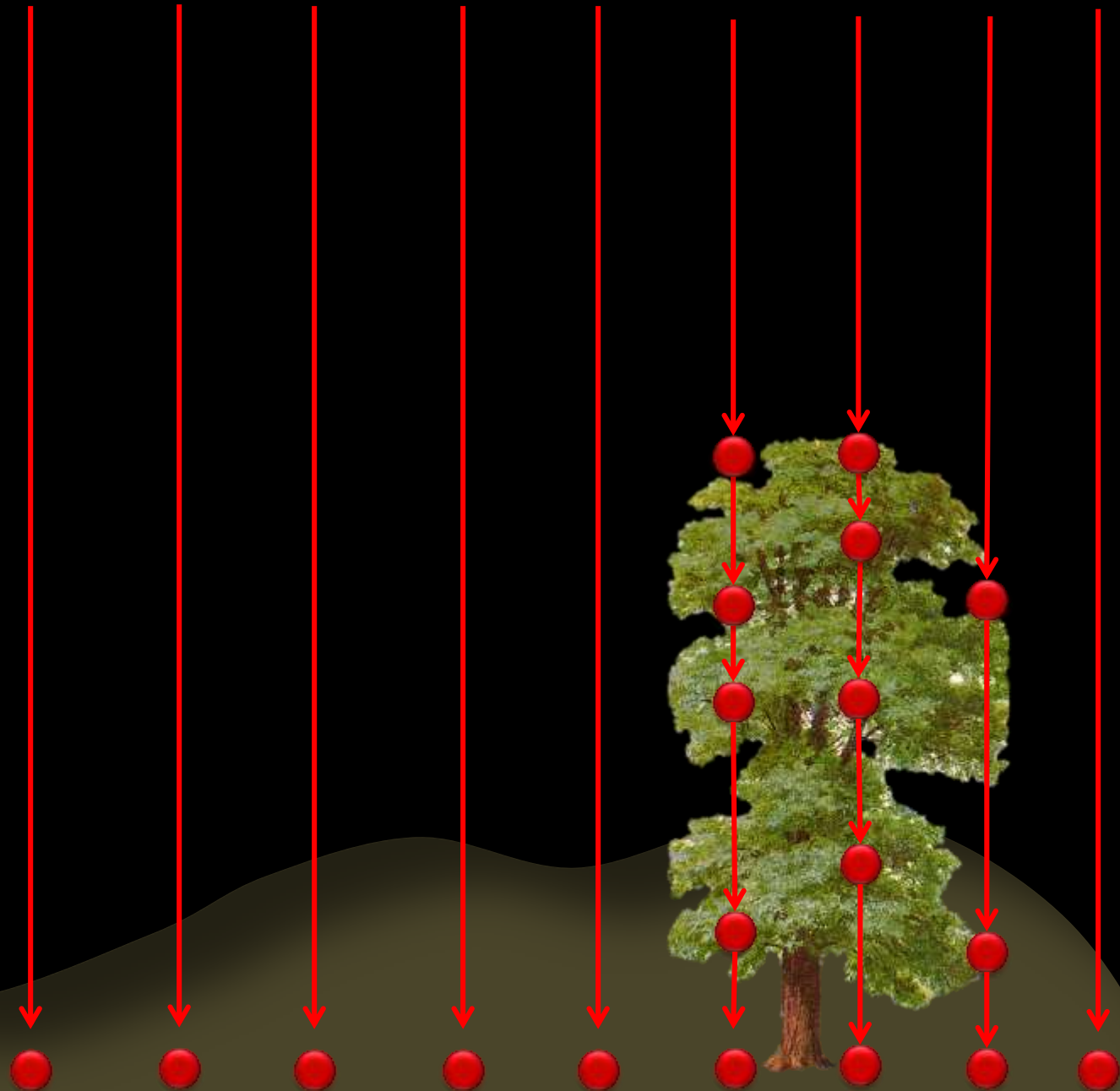
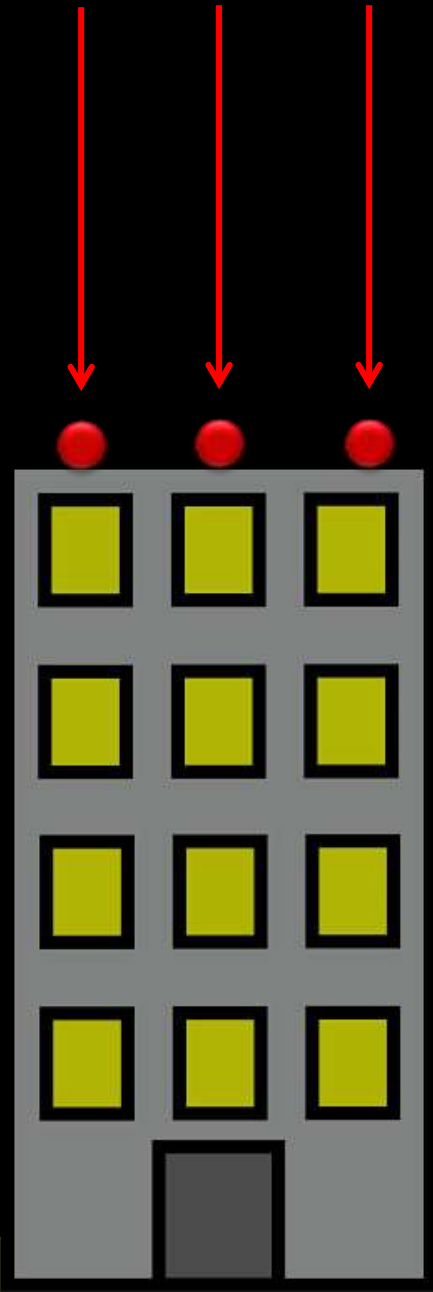
LiDAR

LiDAR

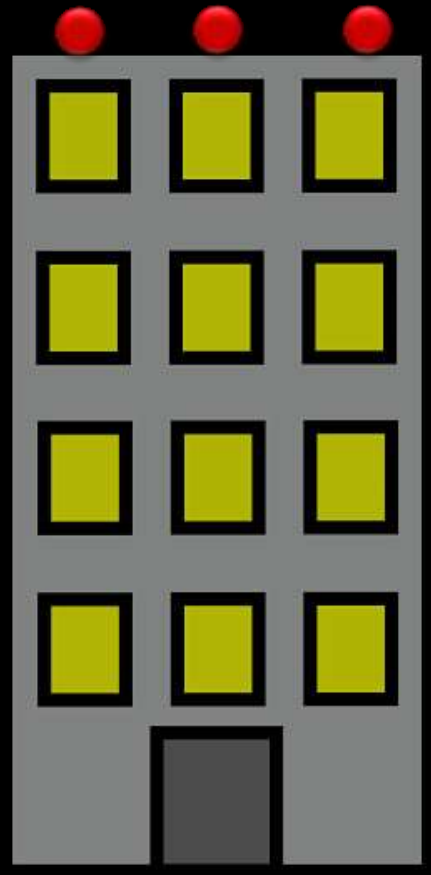
Light Detection And Ranging



Courtesy of Dodson & Associates

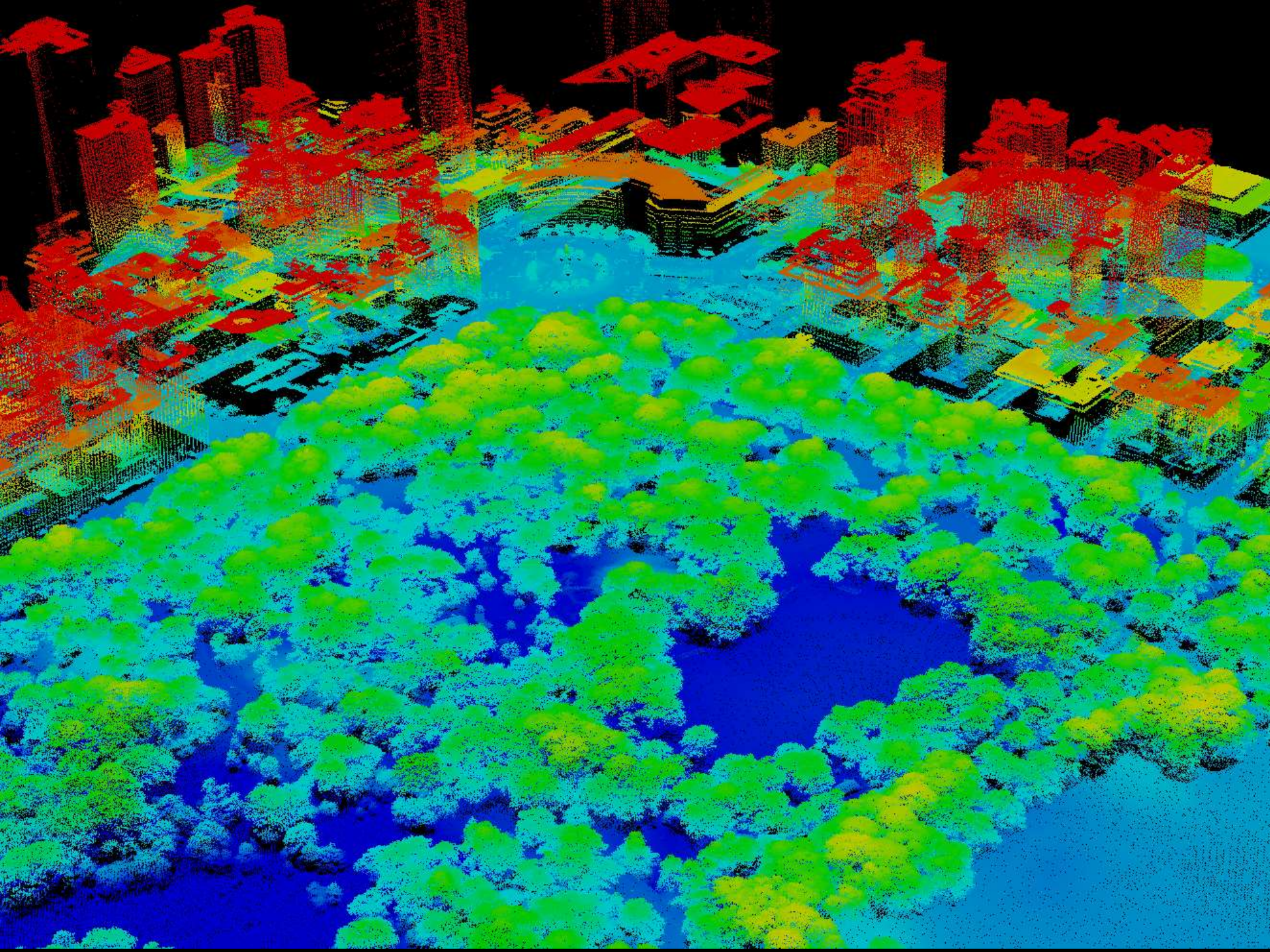


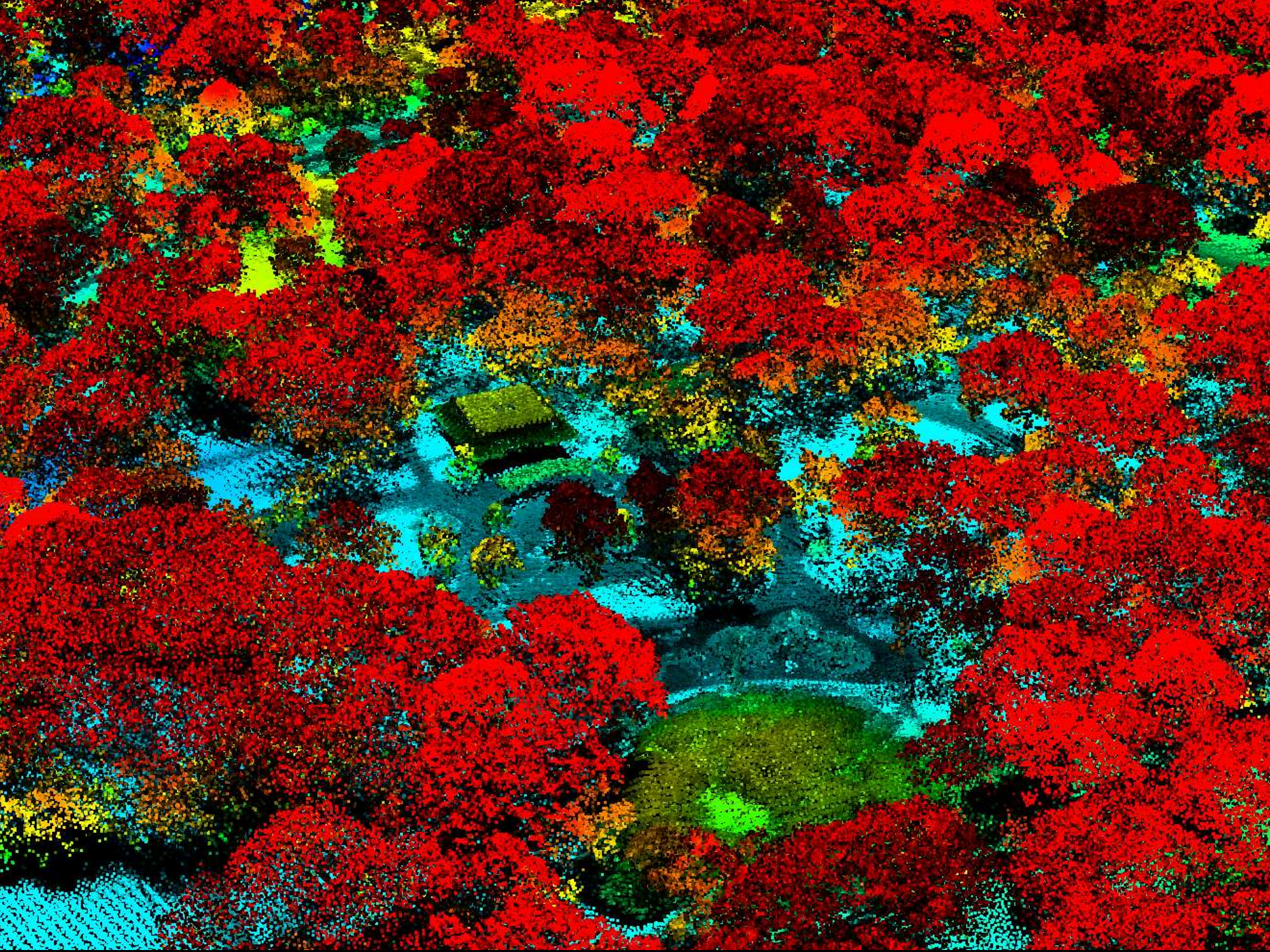
$X = 477589.675$
 $Y = 786620.334$
 $Z = 532$

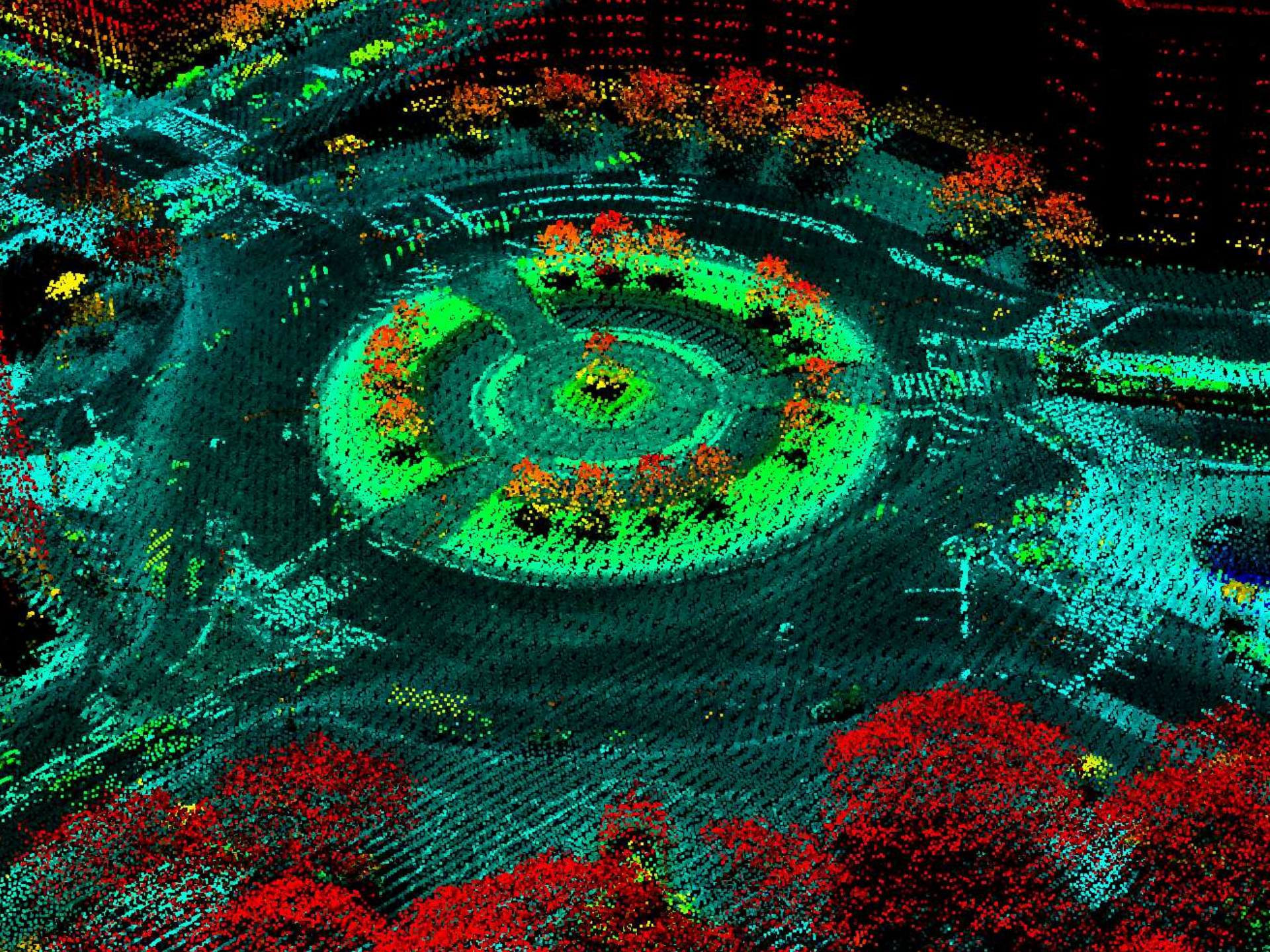


$X = 47780.122$
 $Y = 786621.913$
 $Z = 384$

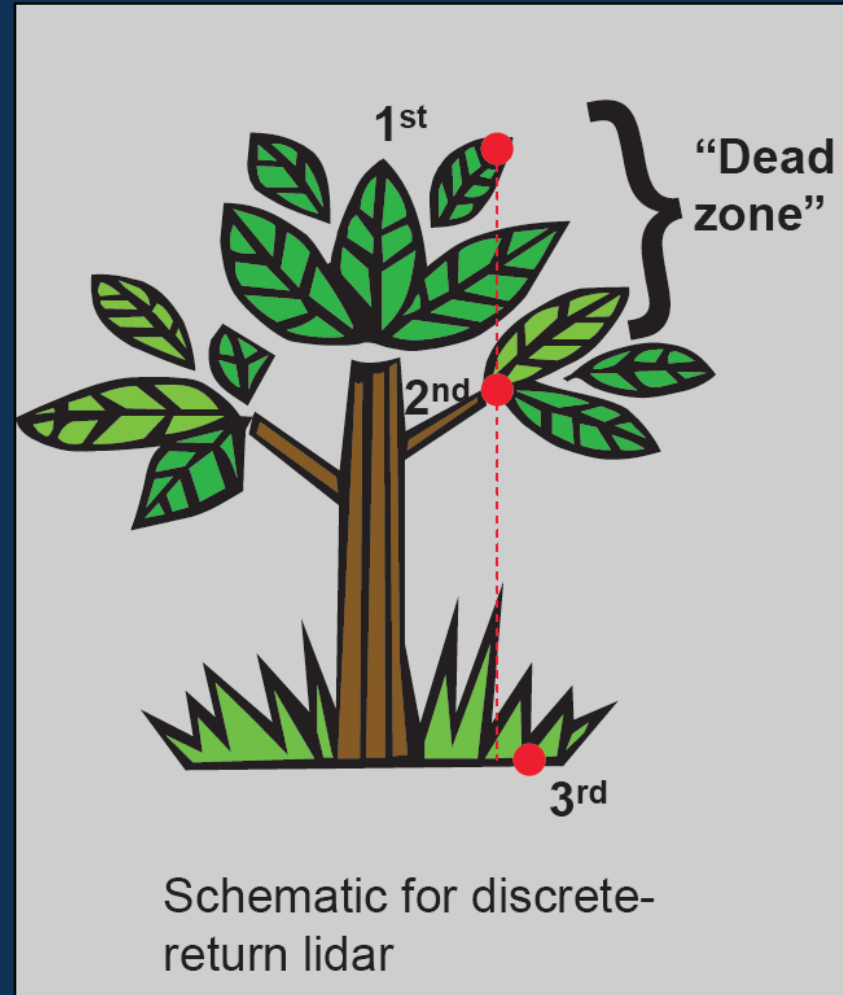
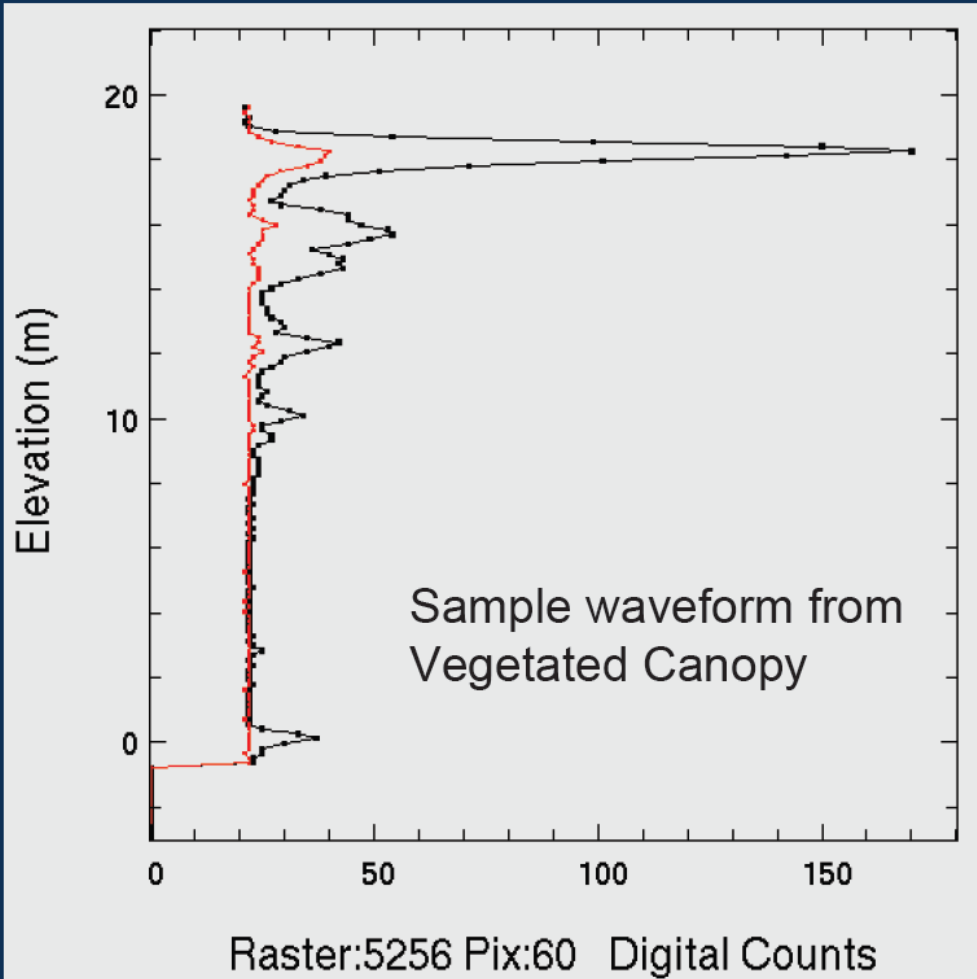




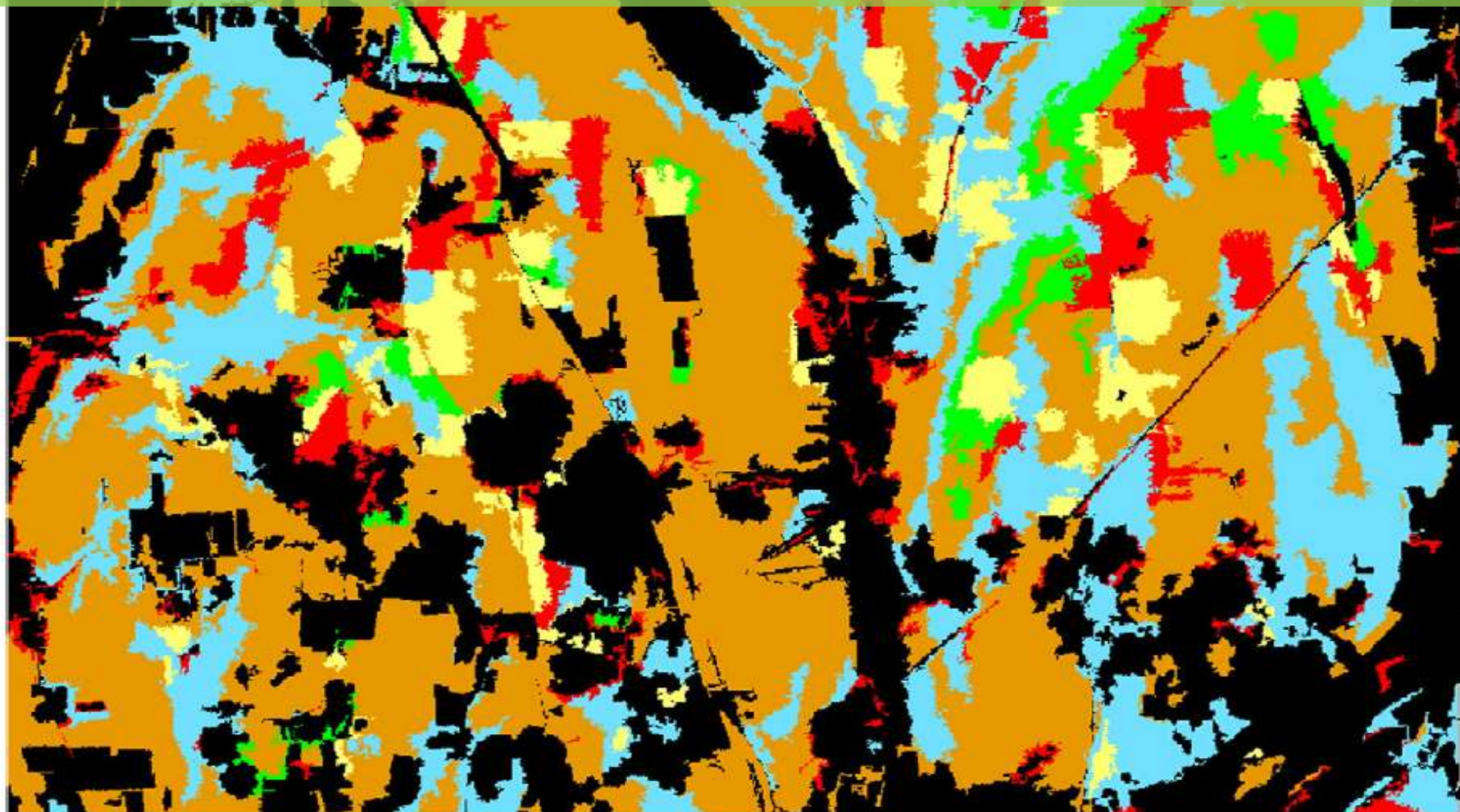




Waveform-digitizing vs. Discrete-return



Cover-type Mapping



Legend for the classification map:

| | | | | | | | | | | | |
|--------|---------------|-----|----------|------------|---------|-------|----------------|--------|-----------|-------|------------|
| Yellow | Norway spruce | Red | Red pine | Light blue | Hemlock | Green | Tamarack larch | Orange | Deciduous | Black | Non-forest |
|--------|---------------|-----|----------|------------|---------|-------|----------------|--------|-----------|-------|------------|

Ke et al. 2010

Fig. 10. Classification map based on spectral/LIDAR-based segmentation using both spectral and LIDAR-derived metrics at scale parameter 250.

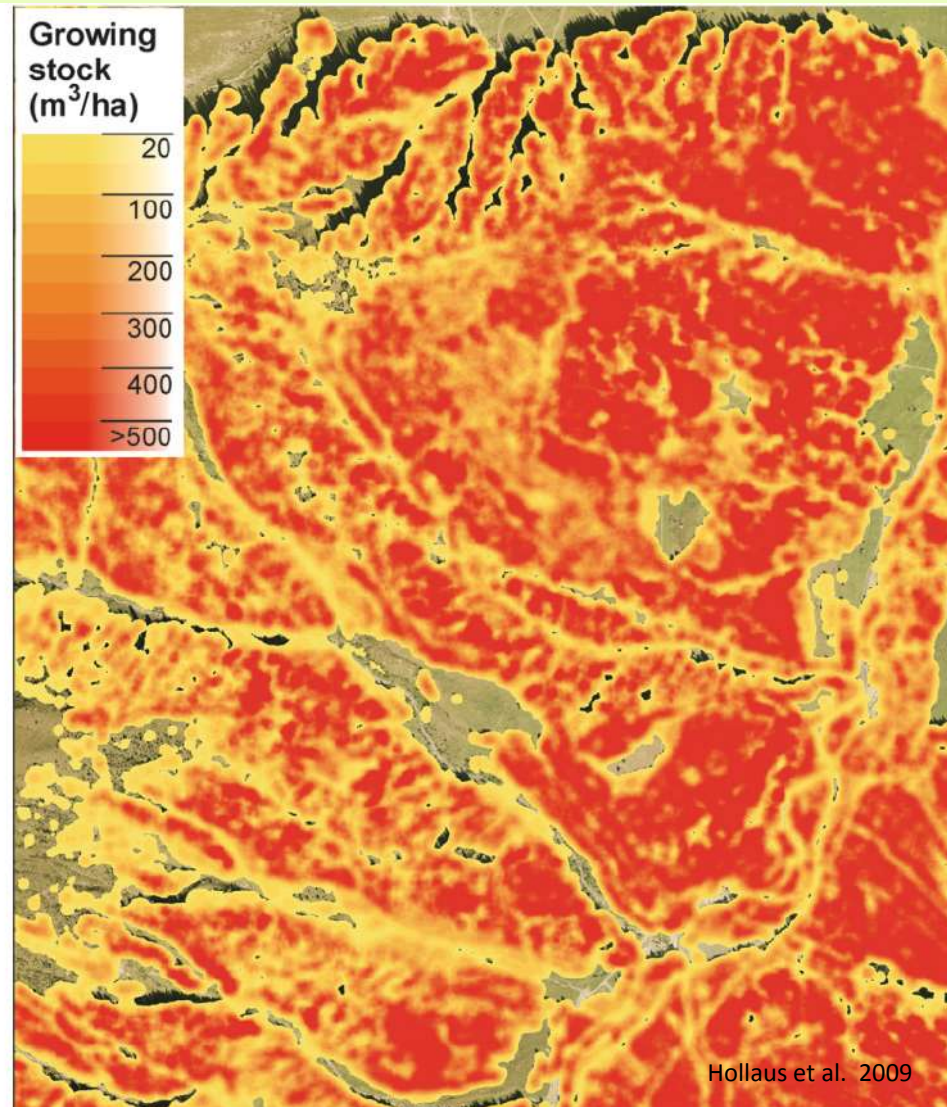
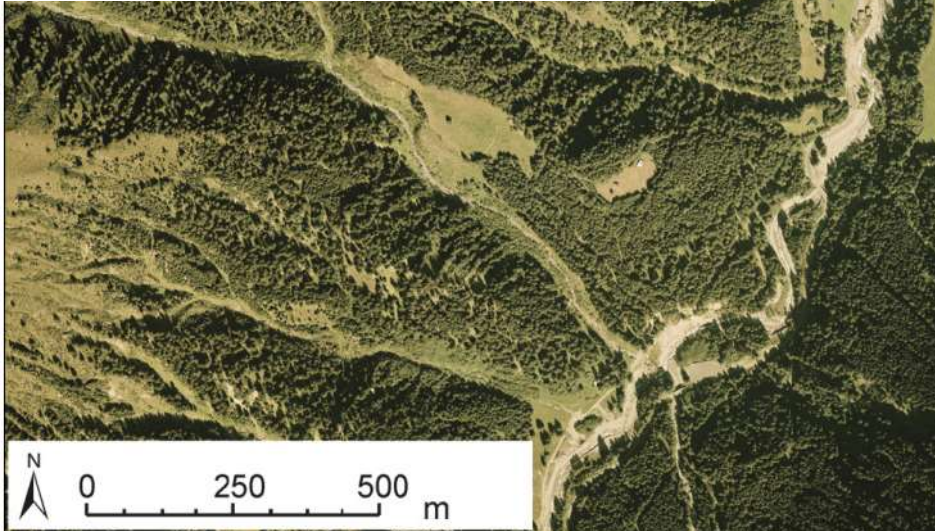
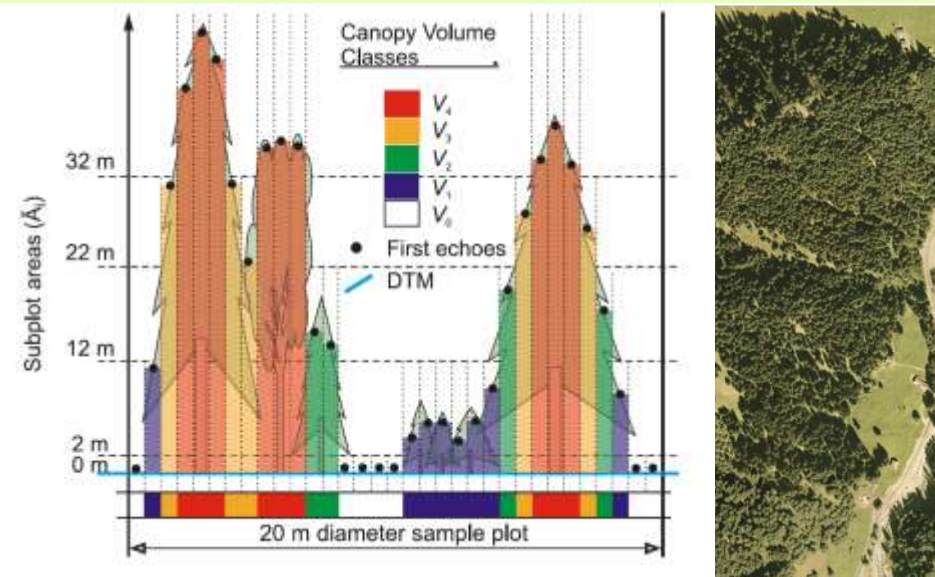
Forest Structure and Biomass



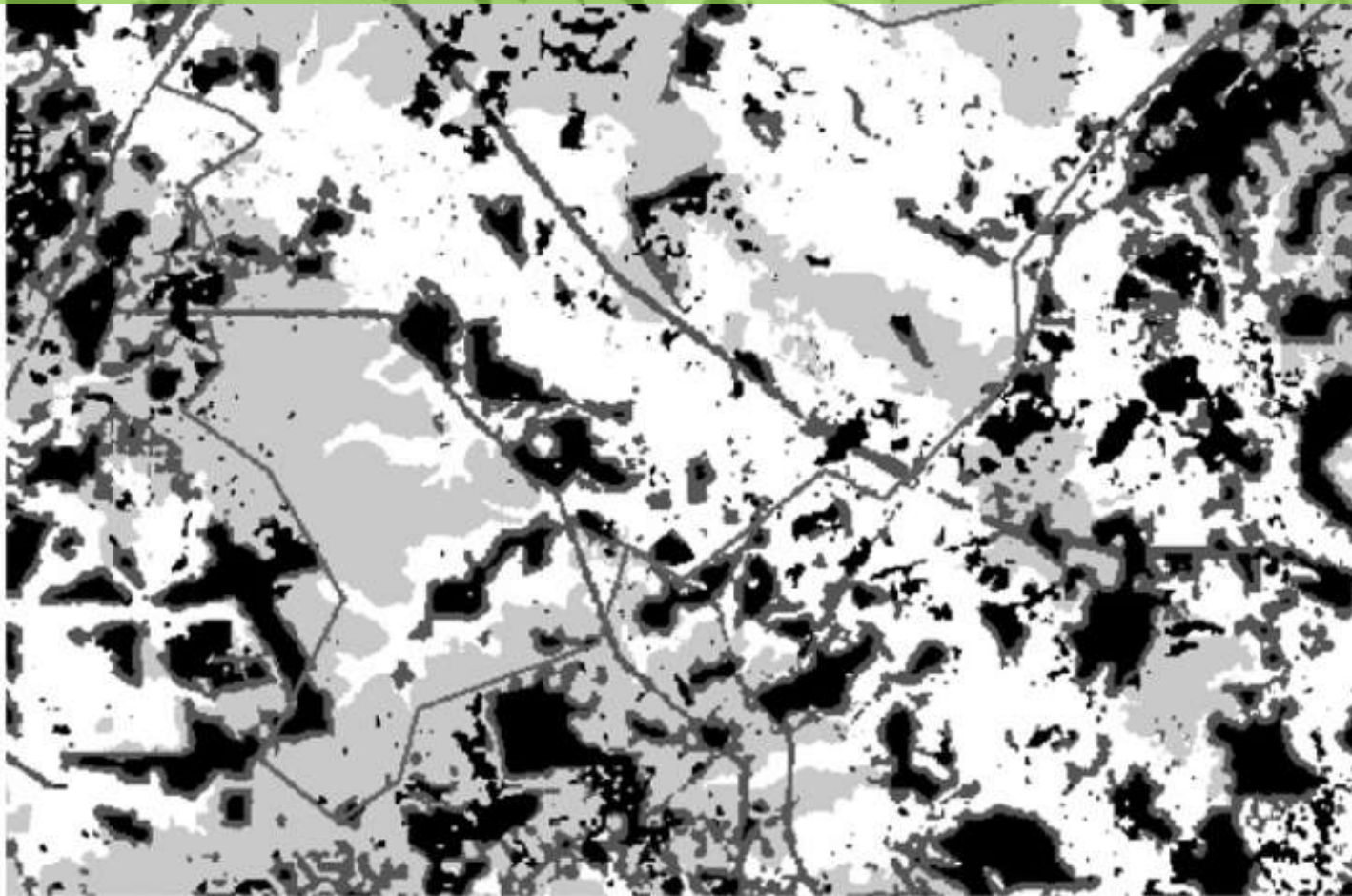
Height (m)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30

Growing Stock Estimation



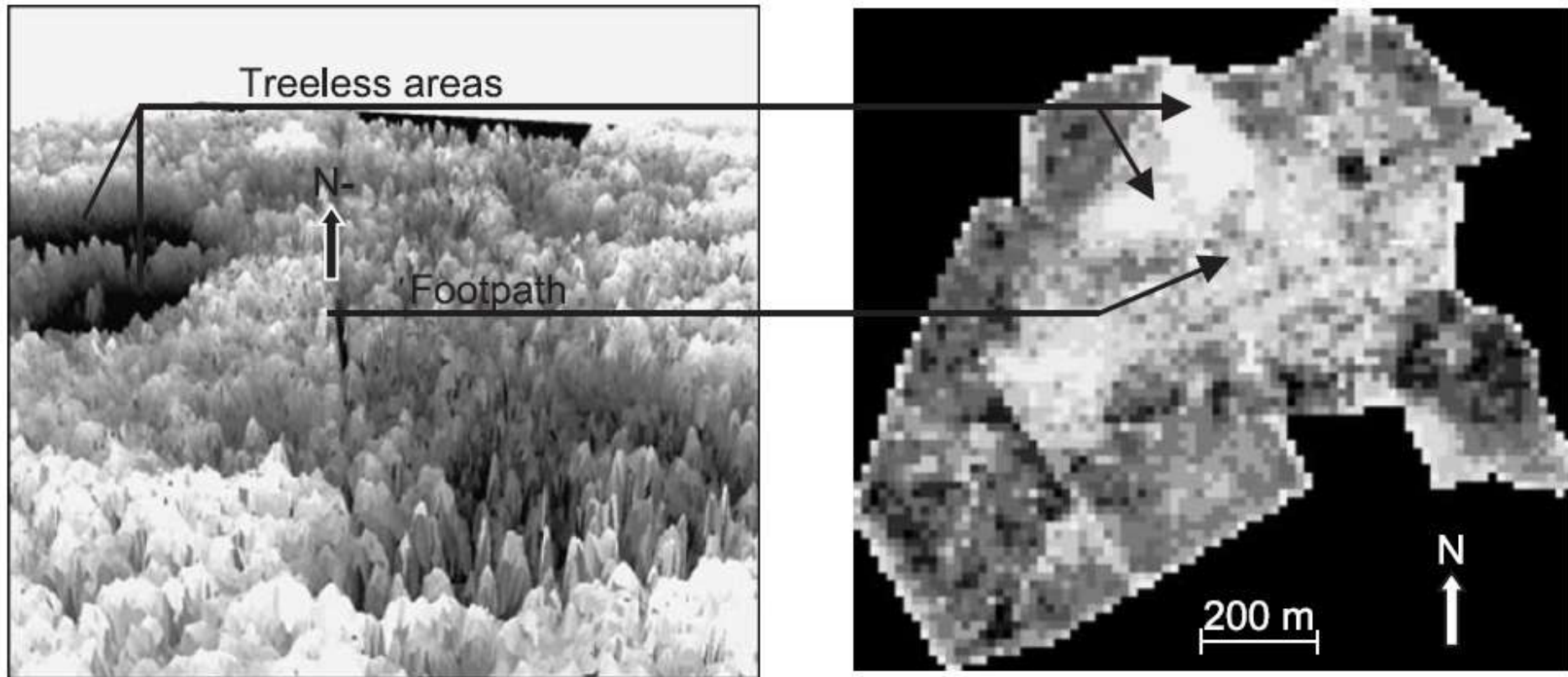
Bird Species Richness



0 1 2 4 6 8 Kilometers

Richness 3.6 6.1 7.2 9.5

Above Ground Carbon Content





-  Tree Canopy
-  Grass/Shrub
-  Bare Earth
-  Water
-  Buildings
-  Roads
-  Other Paved Surface

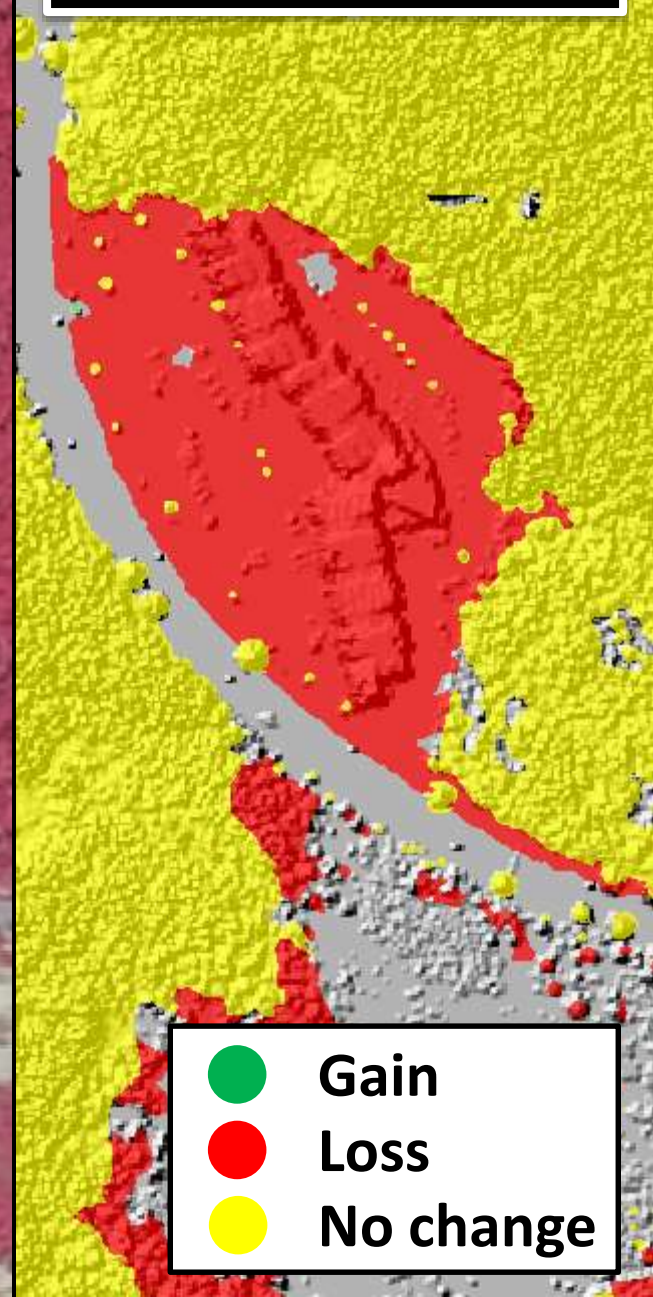
2006



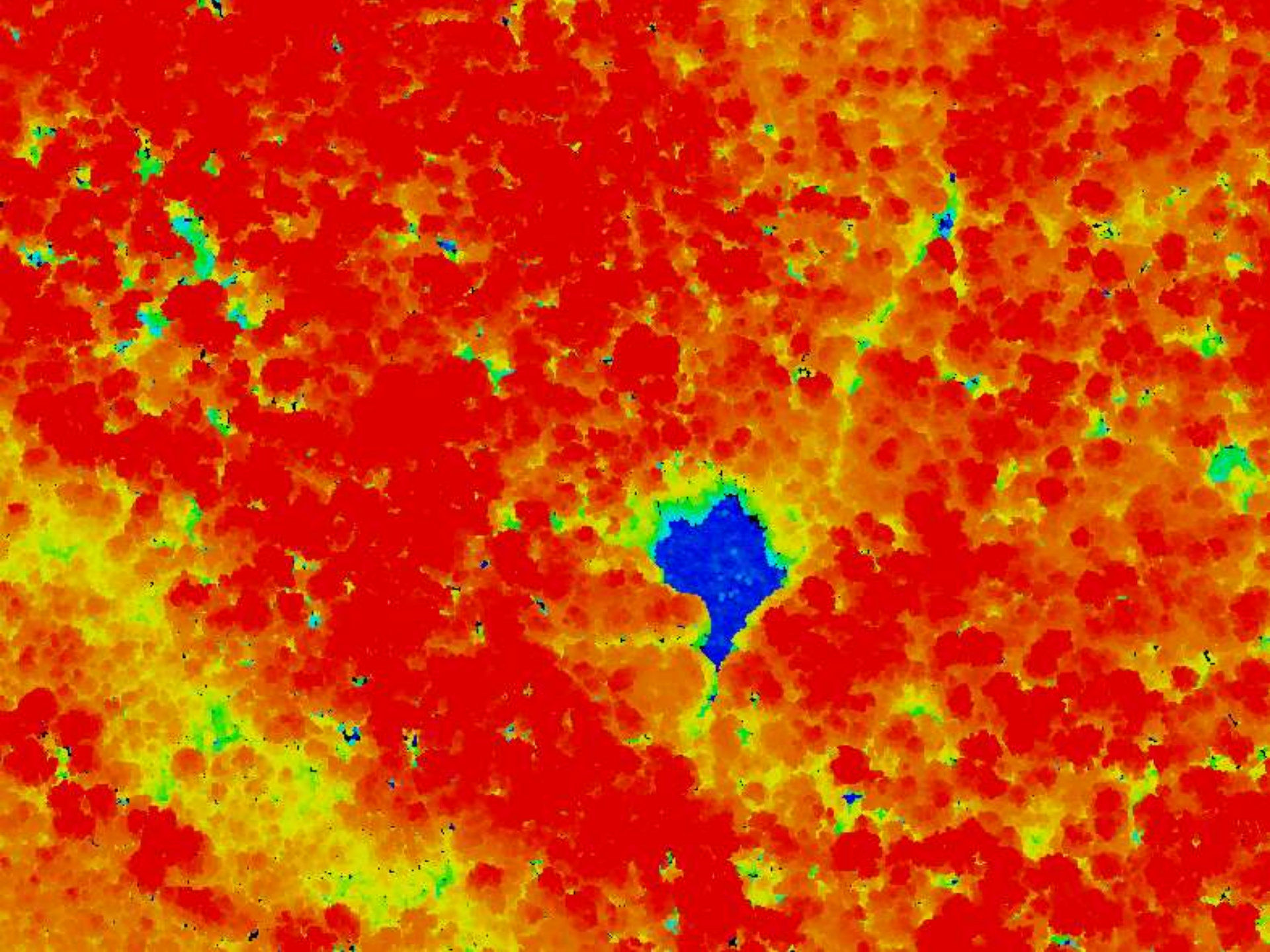
2011

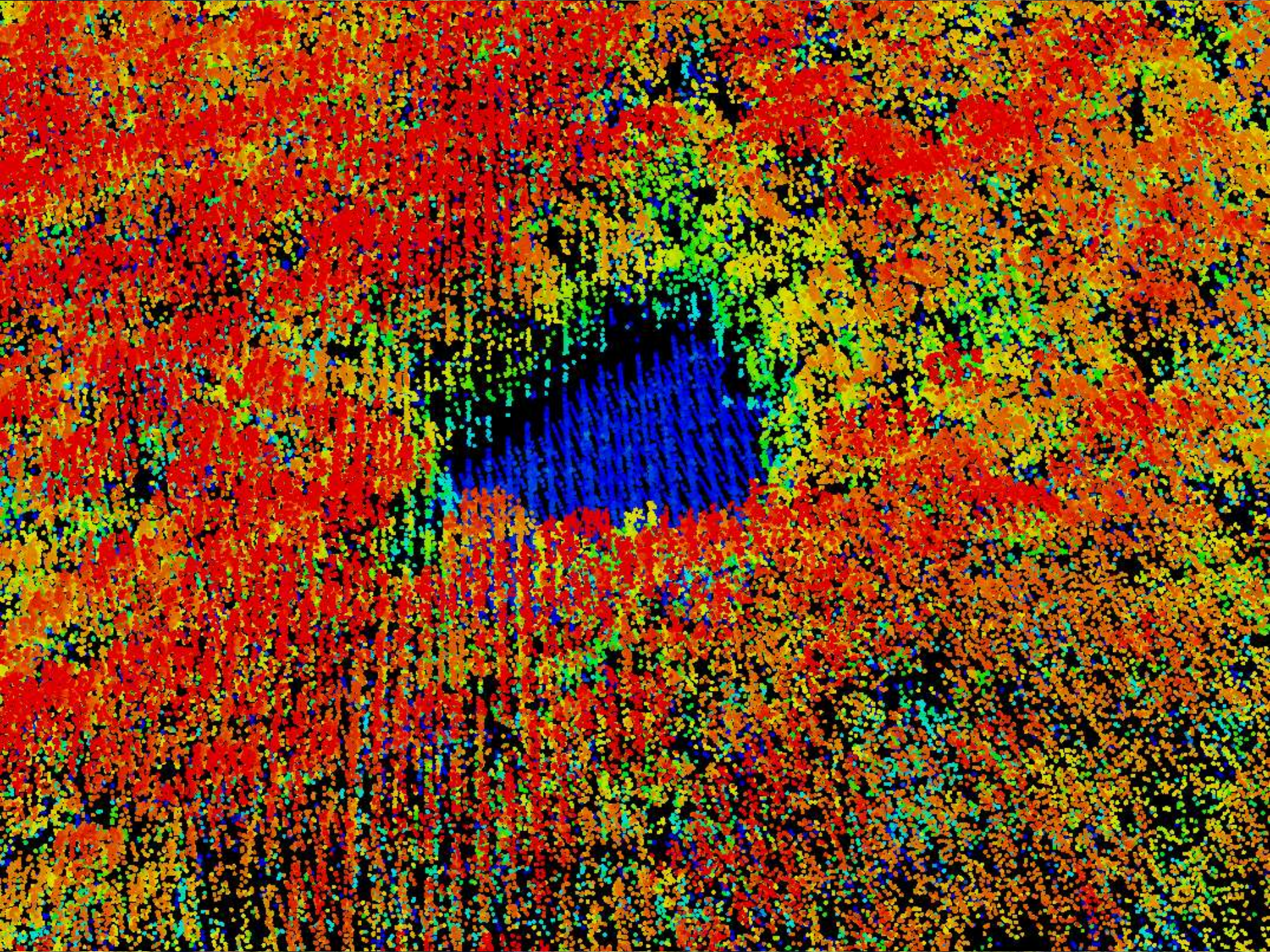


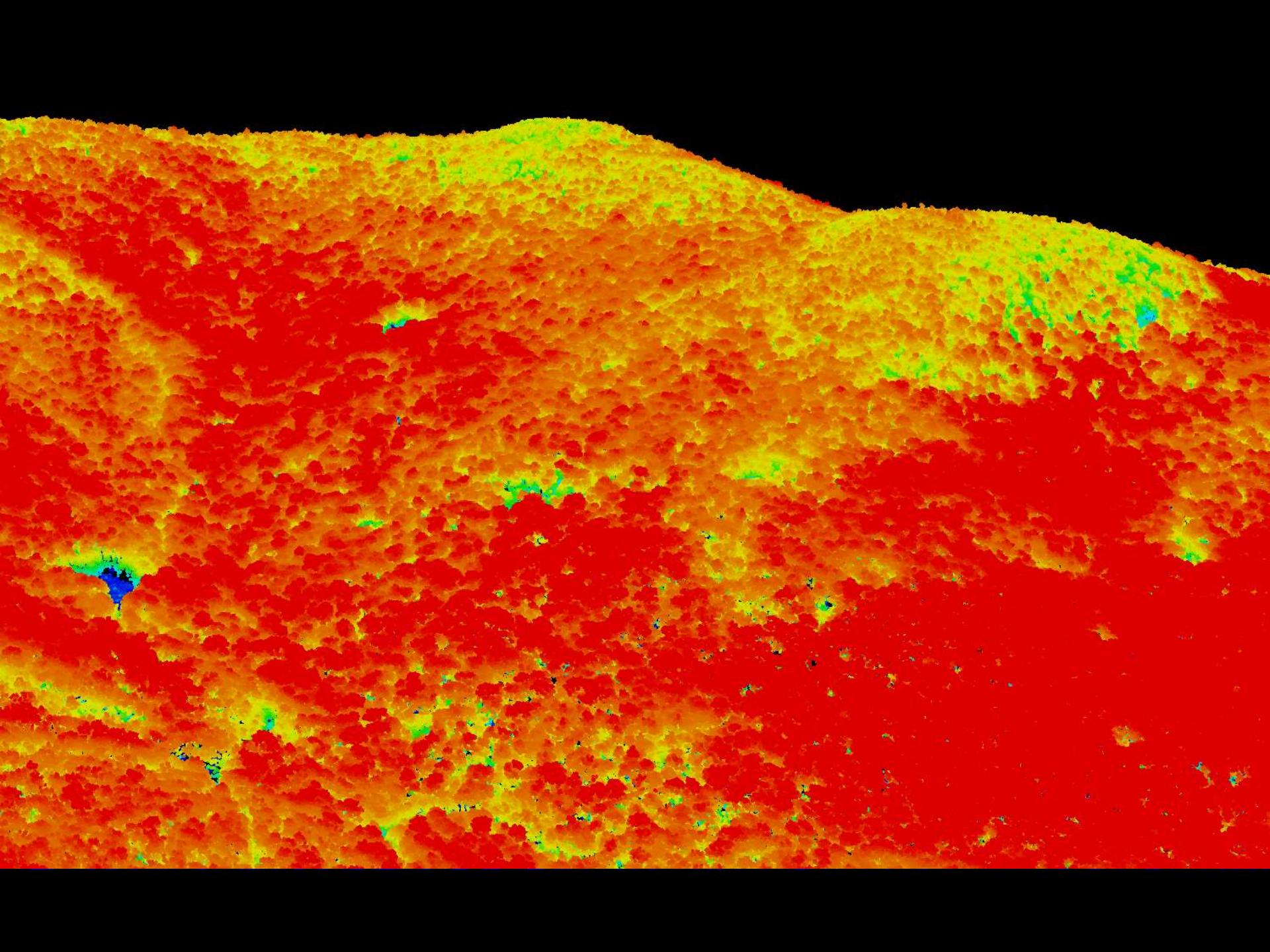
Change



- Gain
- Loss
- No change







Forest Characterization

The screenshot displays the Pix4D LIDAR software interface for forest characterization. The main view is divided into four panels showing different stages of the point cloud processing:

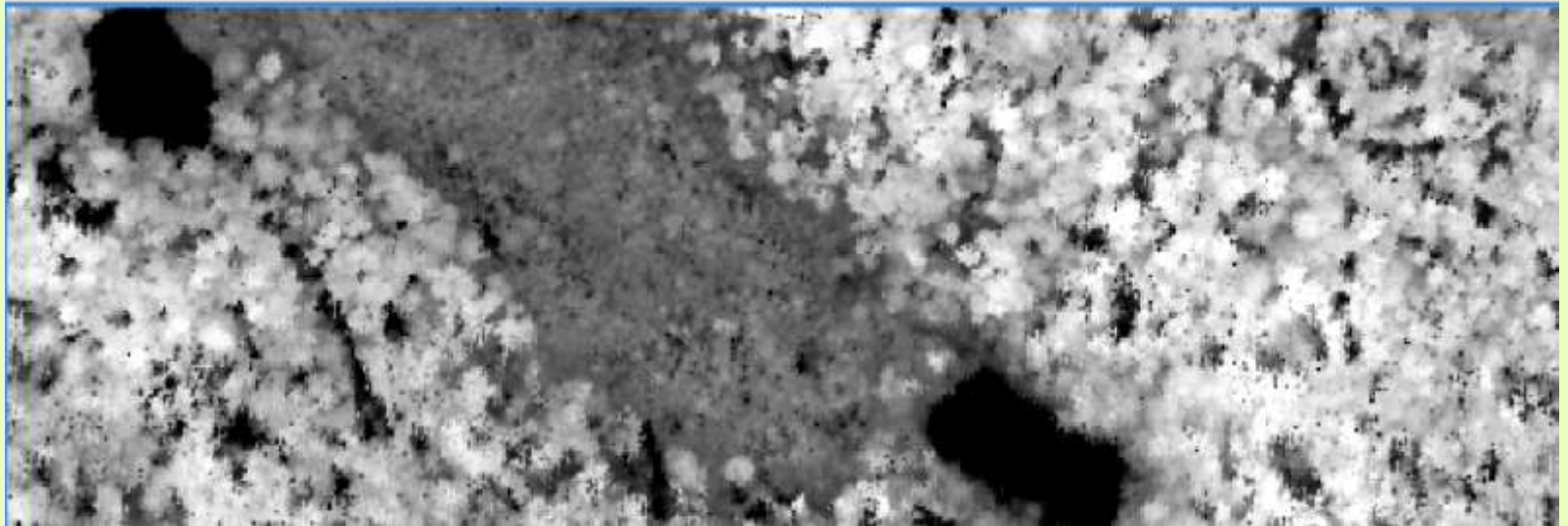
- Top-left: Colorized point cloud visualization.
- Top-right: Grayscale intensity map of the point cloud.
- Bottom-left: Darker grayscale map, possibly representing canopy density or a specific filter.
- Bottom-right: Filtered point cloud visualization.

The right-hand side of the interface contains several panels:

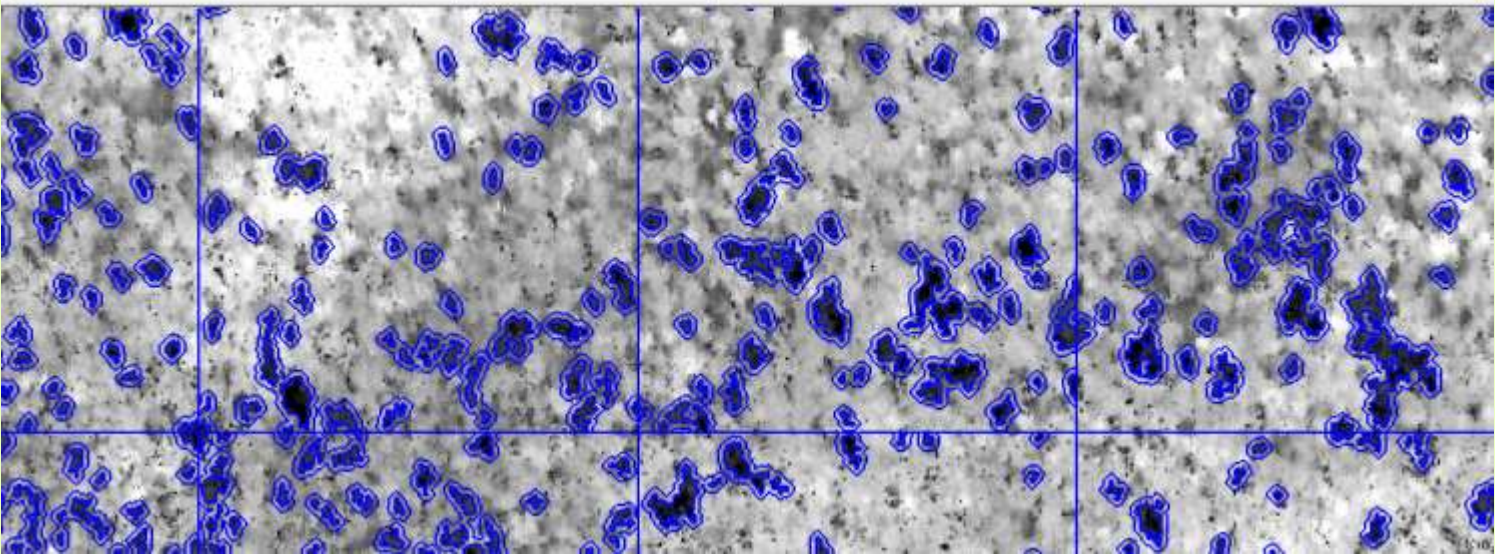
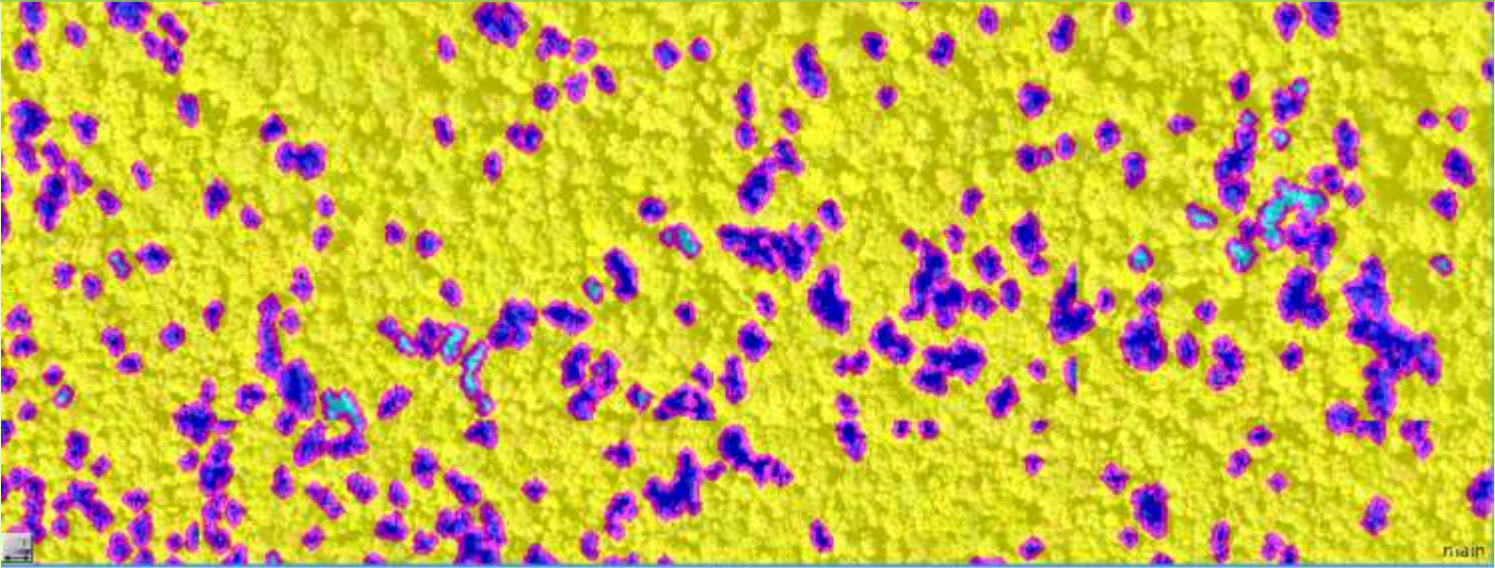
- Process Tree:** A list of processing steps, including classification rules and area calculations.
- Class Hierarchy:** A tree structure showing the classification classes, such as `_Bright`, `_Dark`, `_Large Openings`, `_Tall`, `_Dominant`, `_Temp1`, `_Temp2`, `Background`, `Full Crown with Sparse Understory`, `Full Crown with Understory`, `Partial Gap with Sparse Understory`, `Partial Gap with Understory`, `Thin Crown with Sparse Understory`, and `Thin Crown with Understory`.
- Feature View:** A list of features and variables used in the classification process.

The bottom status bar indicates the current processing mode: `RGB Intensity Linear (0.00% 11%)` and the total number of points: `102,344,904 Points (4,206x7164)`.

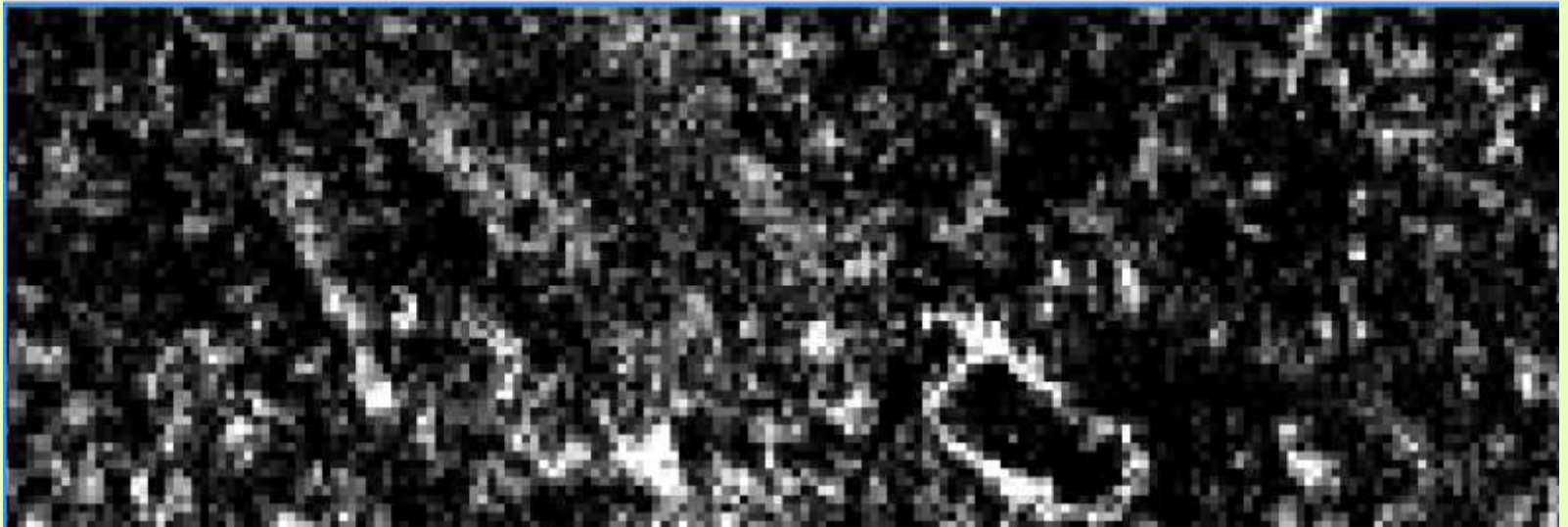
Canopy Gaps



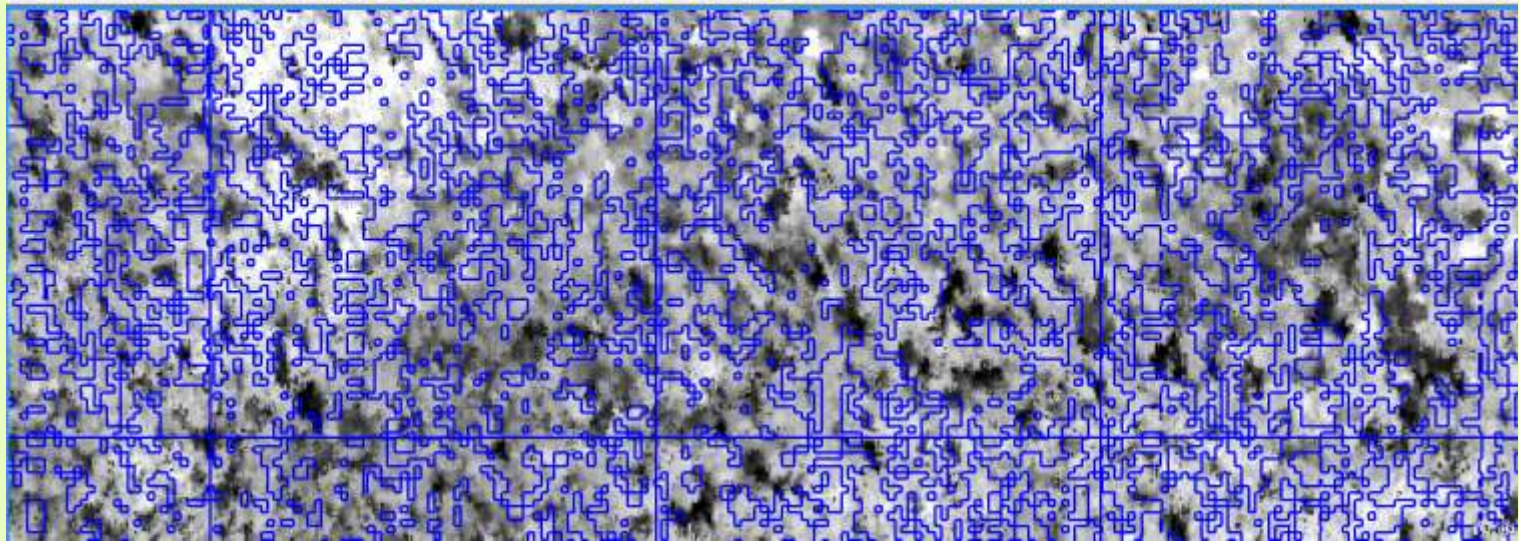
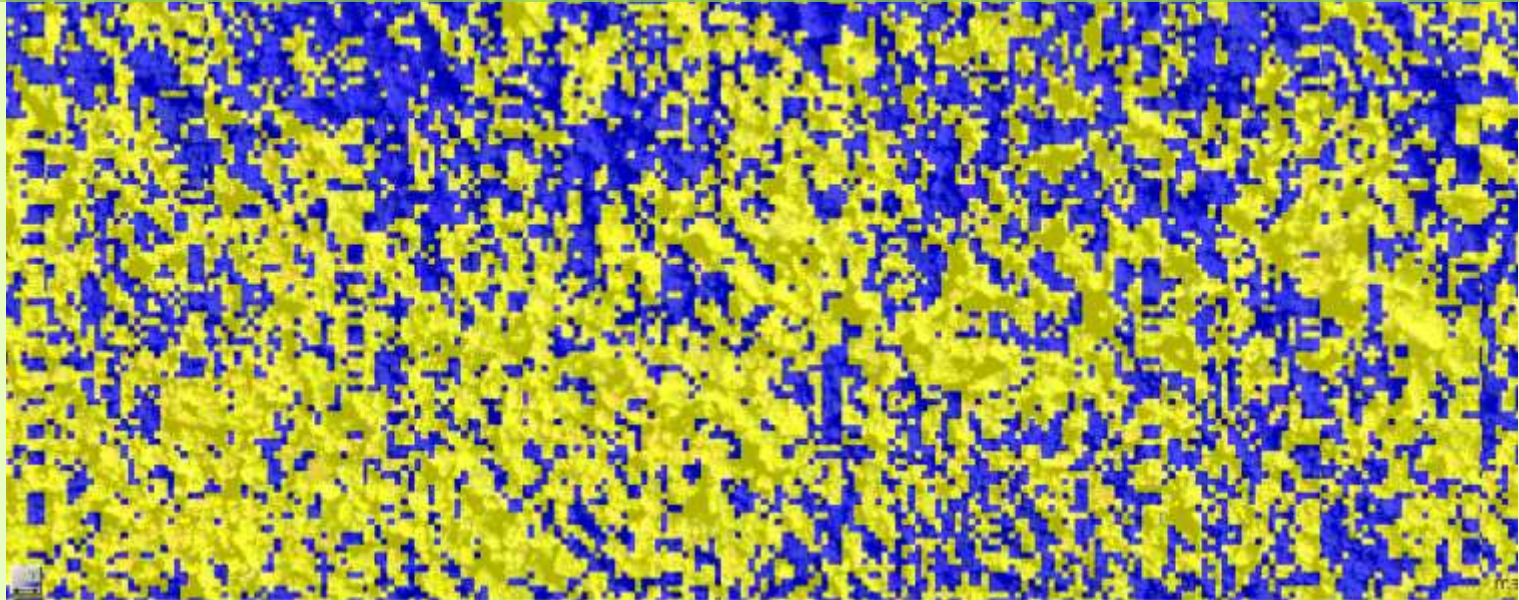
Canopy Gaps



Understory Gaps, 0.5-10m



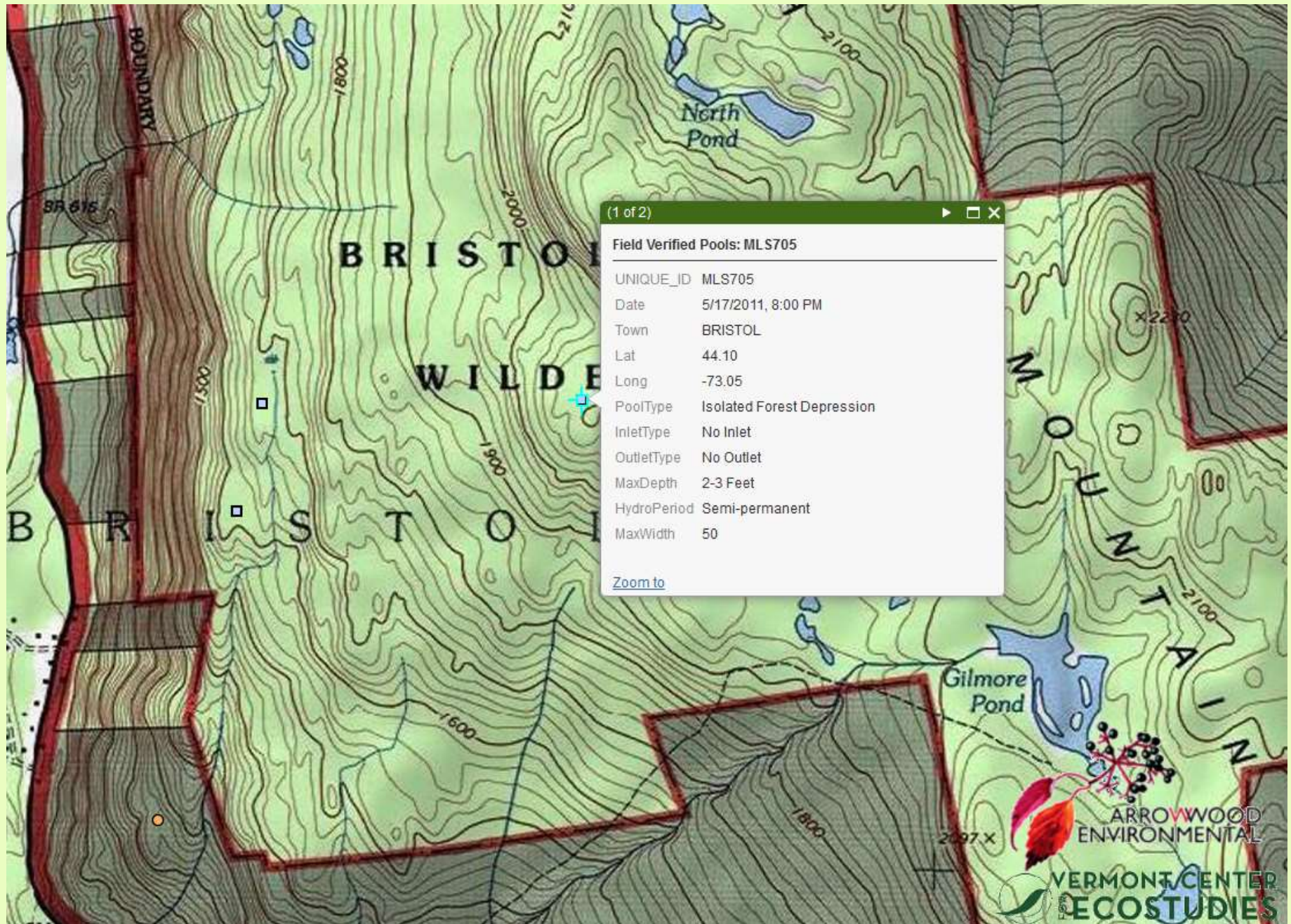
Understory Gaps, 0.5-10m

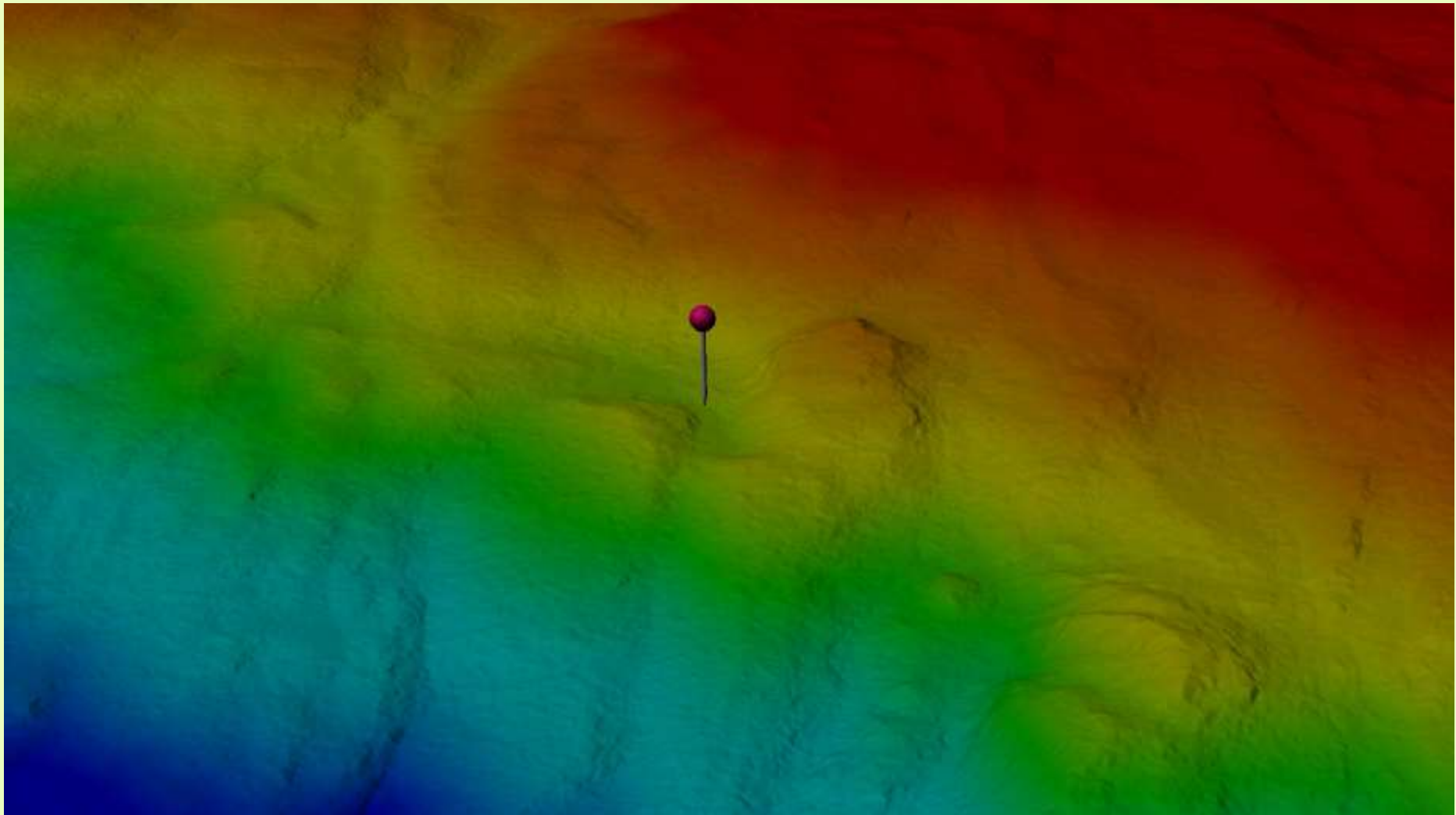


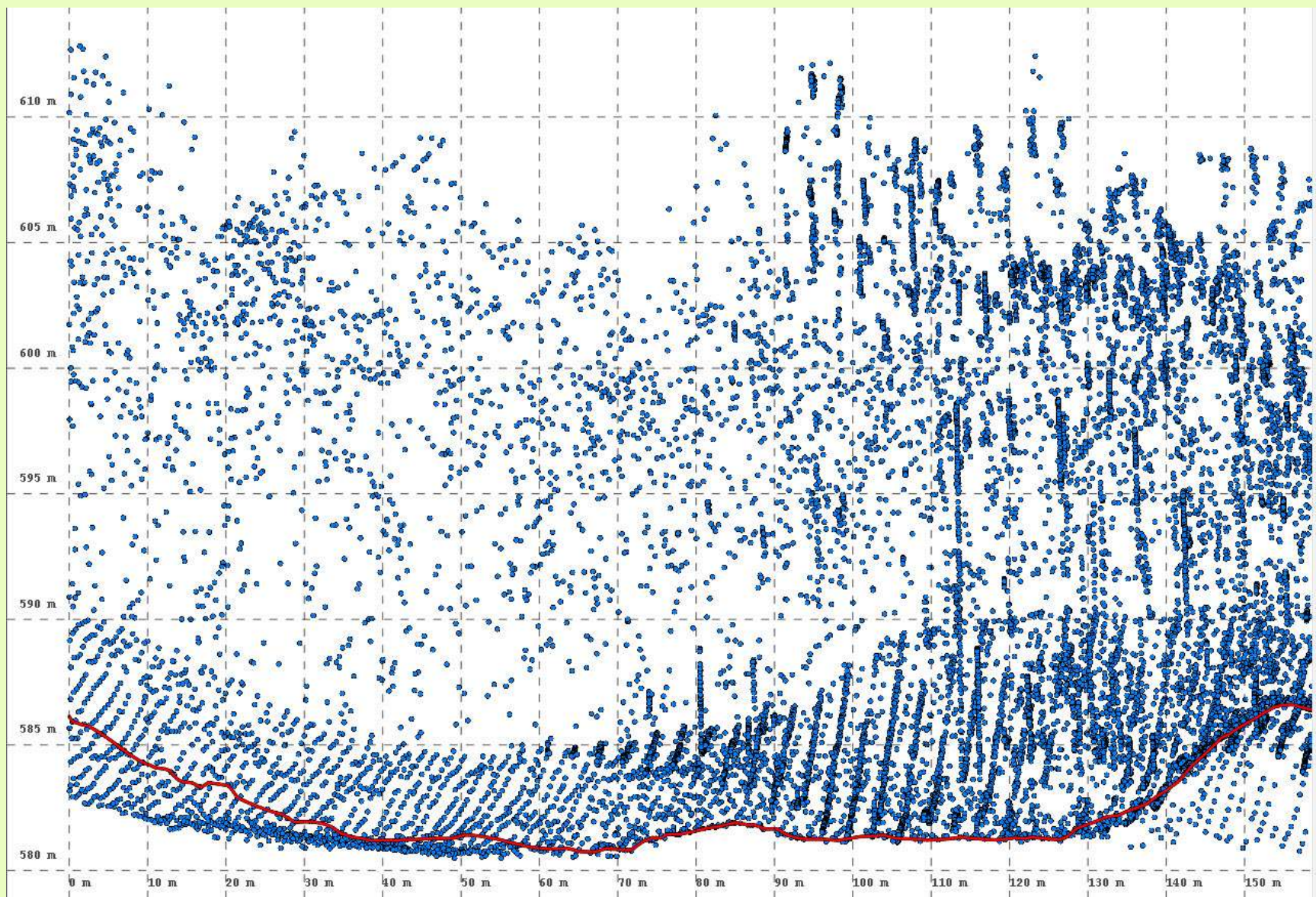
Vernal Pools

Vt Vernal Pool Mapping Project

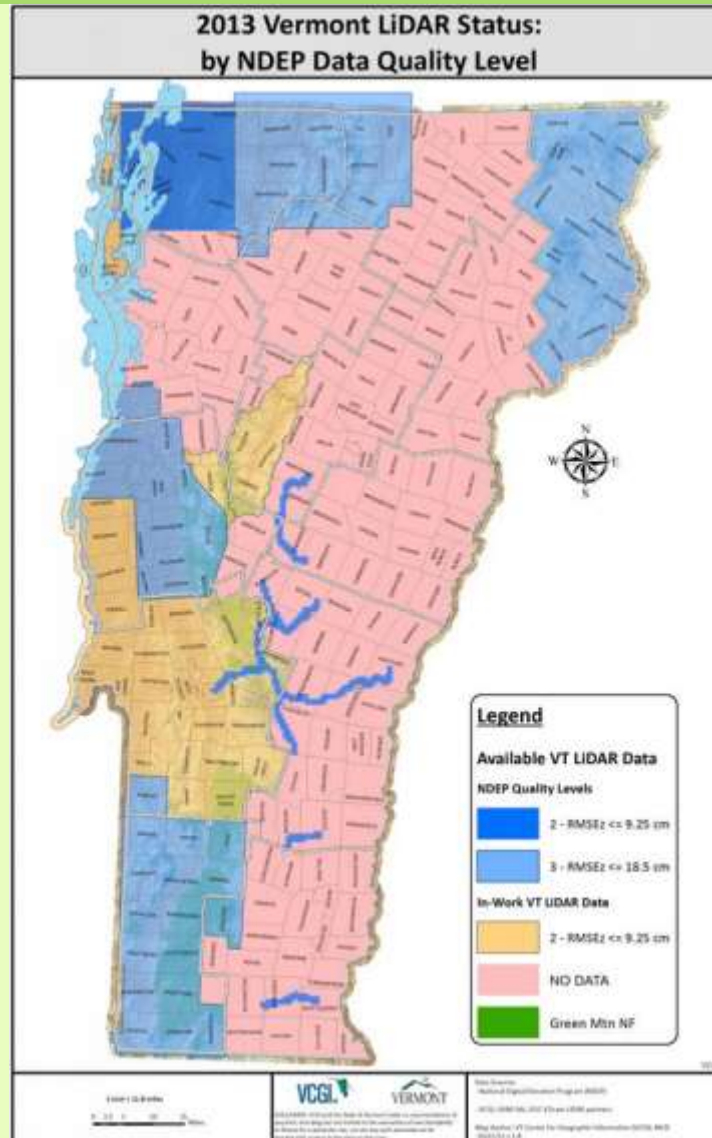








Vermont LiDAR Collections



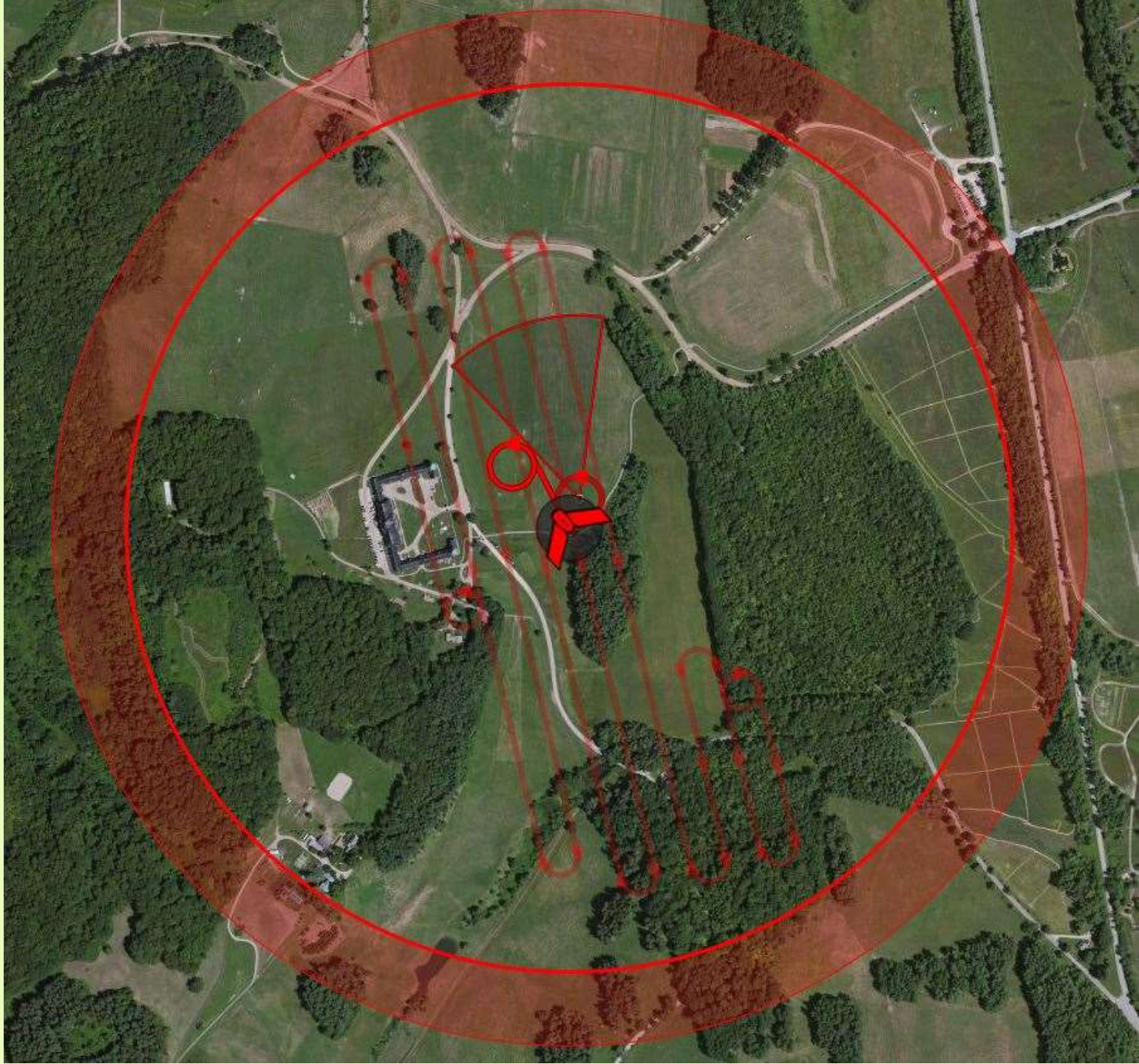
An aerial photograph of a forest with a mix of green, yellow, and orange trees. A solid green horizontal banner is overlaid across the center of the image, containing the text 'UAV-based Remote Sensing' in white, bold, sans-serif font with a thin black outline.

UAV-based Remote Sensing

UAV Imagery

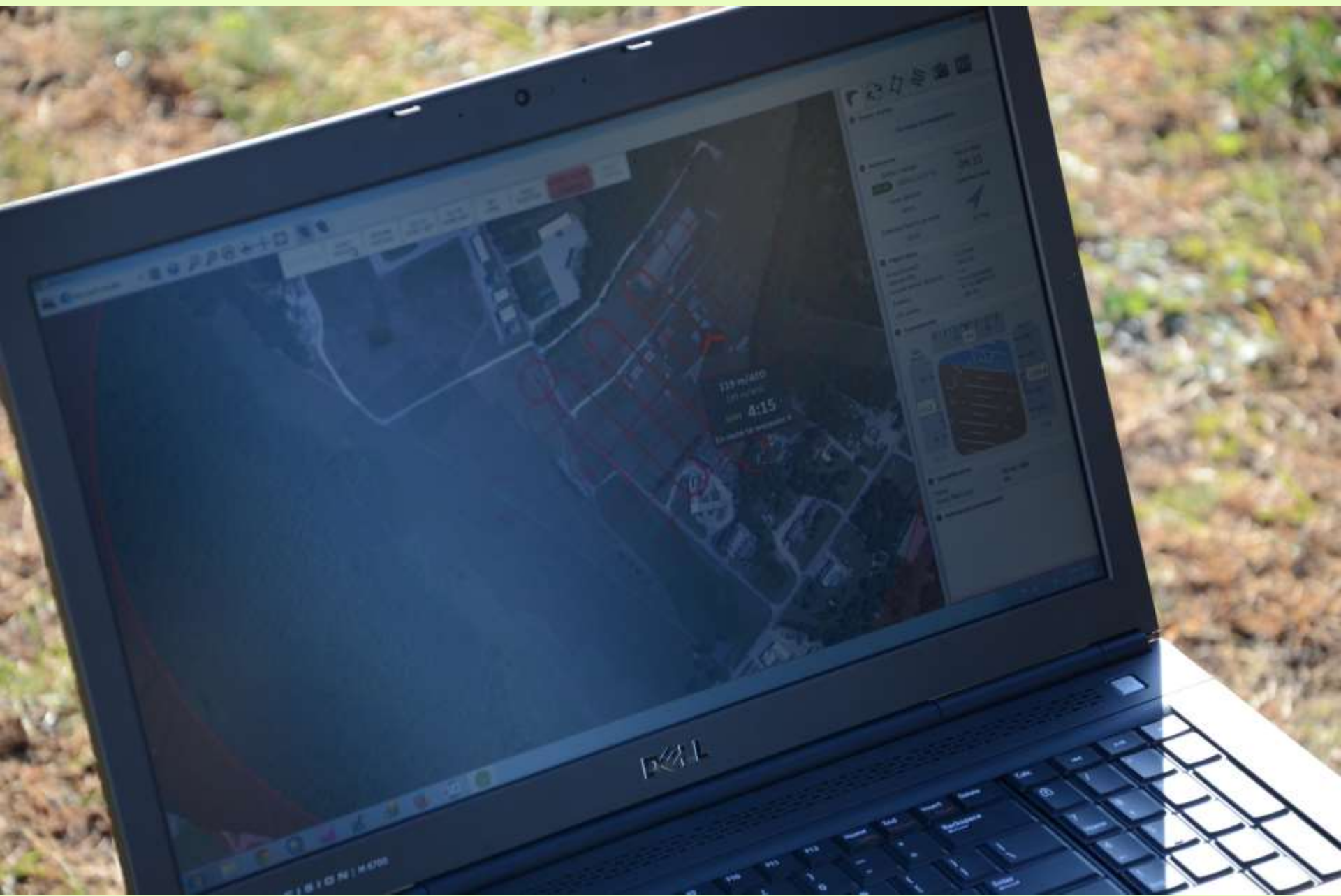
- ✓ Color Orthophotography (and possibly color infrared)
- ✓ 3D Representations
- ✓ Near Real-time Data Acquisition



















Applications

- ✓ Land-cover Mapping (forest types, wetlands, streams, etc.)
- ✓ Monitoring
- ✓ Disaster Response

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