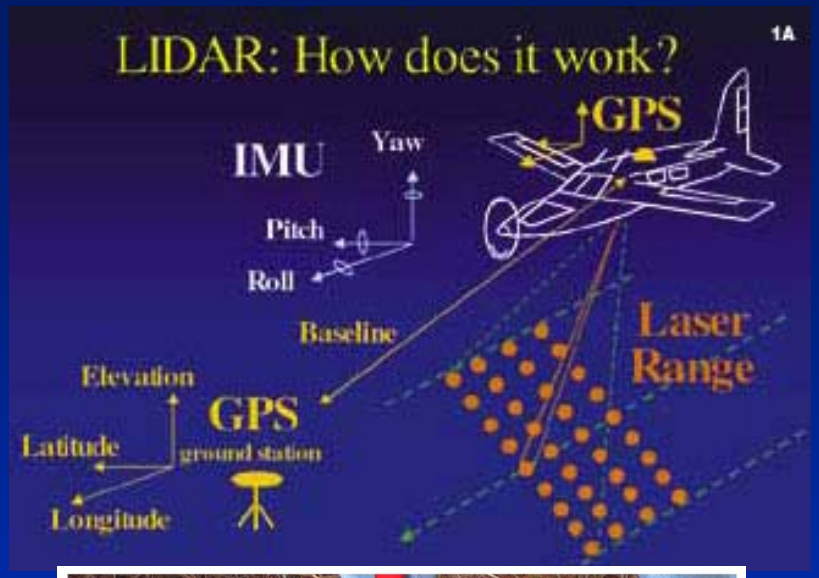
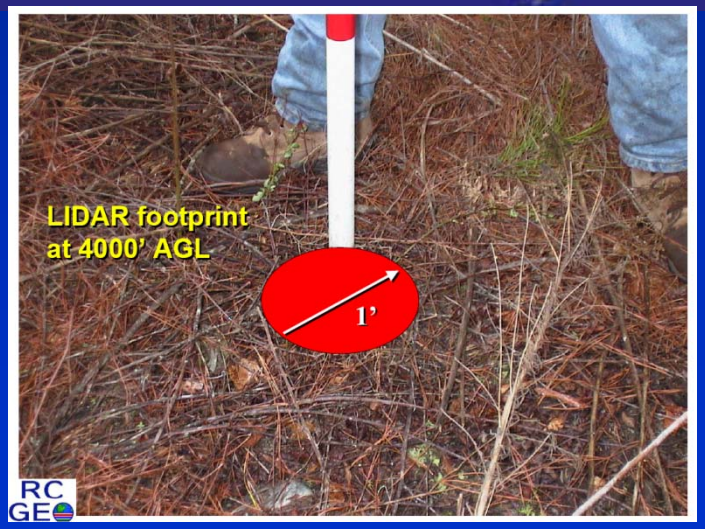
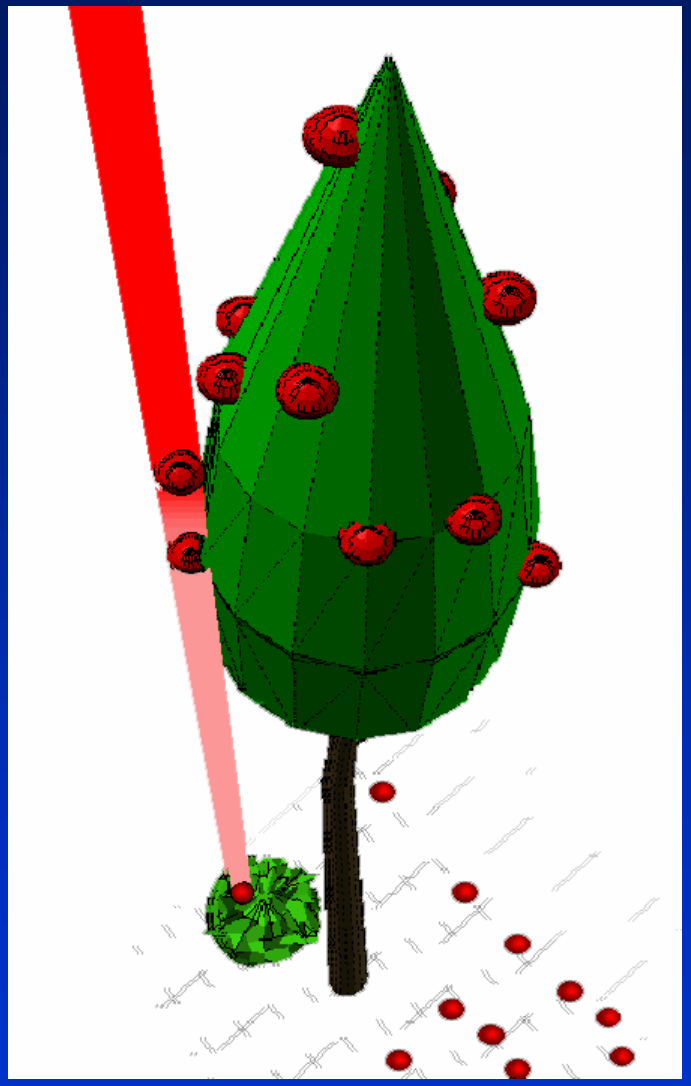
LIDAR – Light Detection And Ranging







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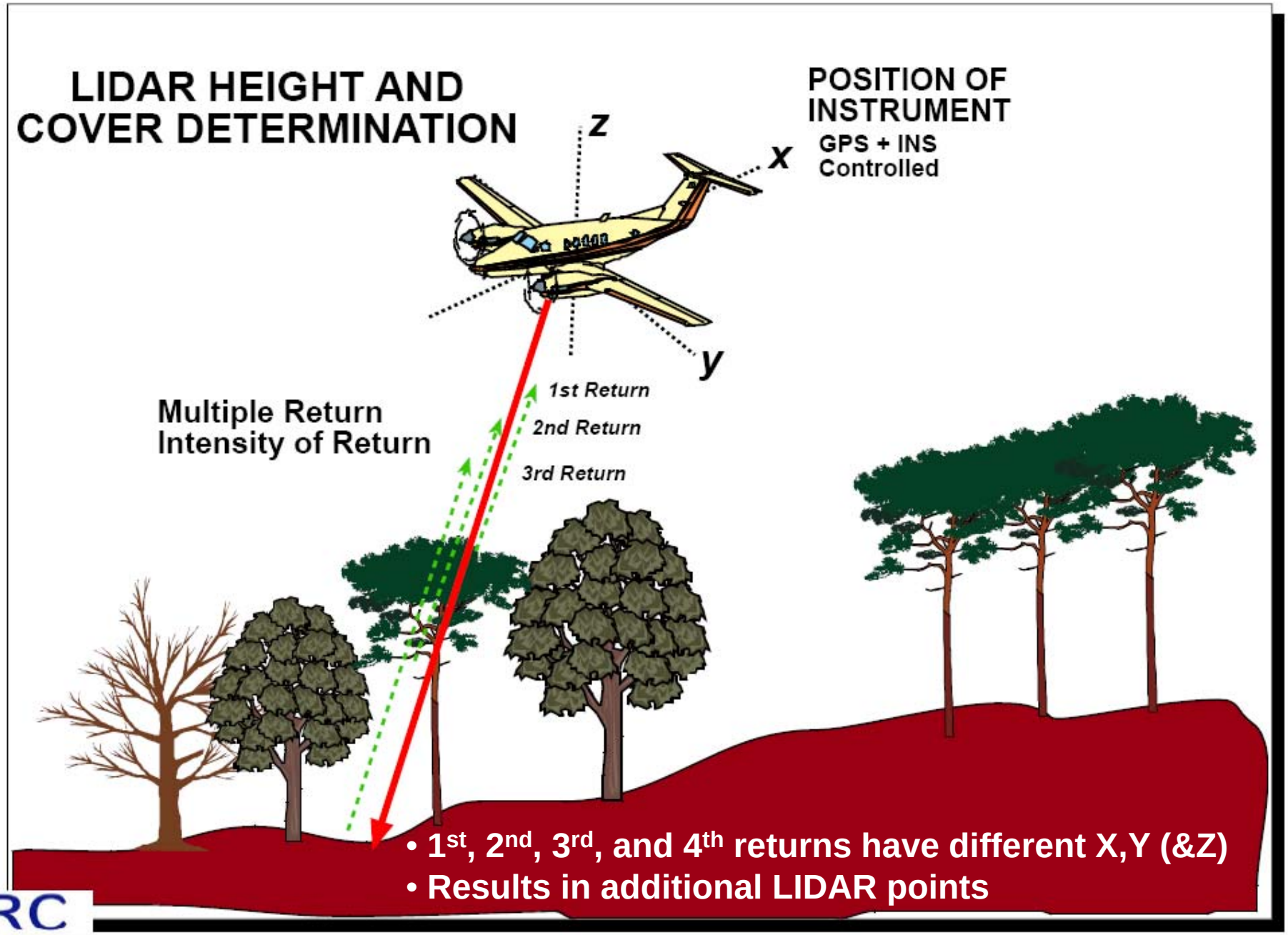
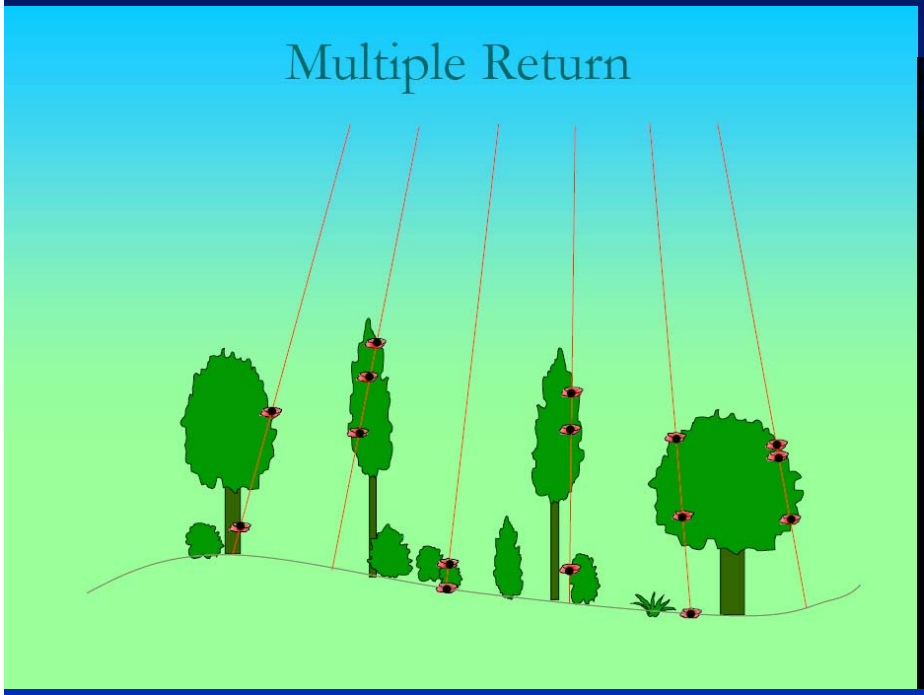
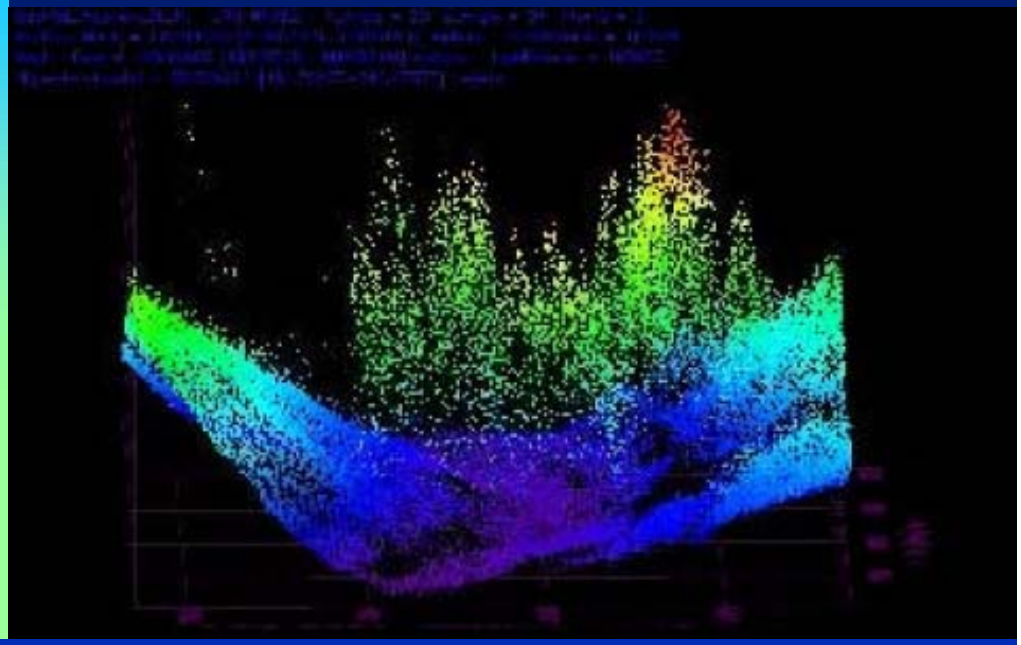

LIDAR HEIGHT AND
COVER DETERMINATION
POSITION OF
INSTRUMENT
GPS + INS
Controlled
z
x
y
Multiple Return
Intensity of Return
1st Return
2nd Return
3rd Return
• 1st, 2nd, 3rd, and 4th returns have different X,Y (&Z)
• Results in additional LIDAR points

LIDAR – Light Detection And Ranging





- **Multiple returns**
  - **Provide additional LIDAR points (X,Y,Z)**
  - **Indicate vegetation canopy (or edge of tall feature)**
  - **Reveal structural detail within the canopy**

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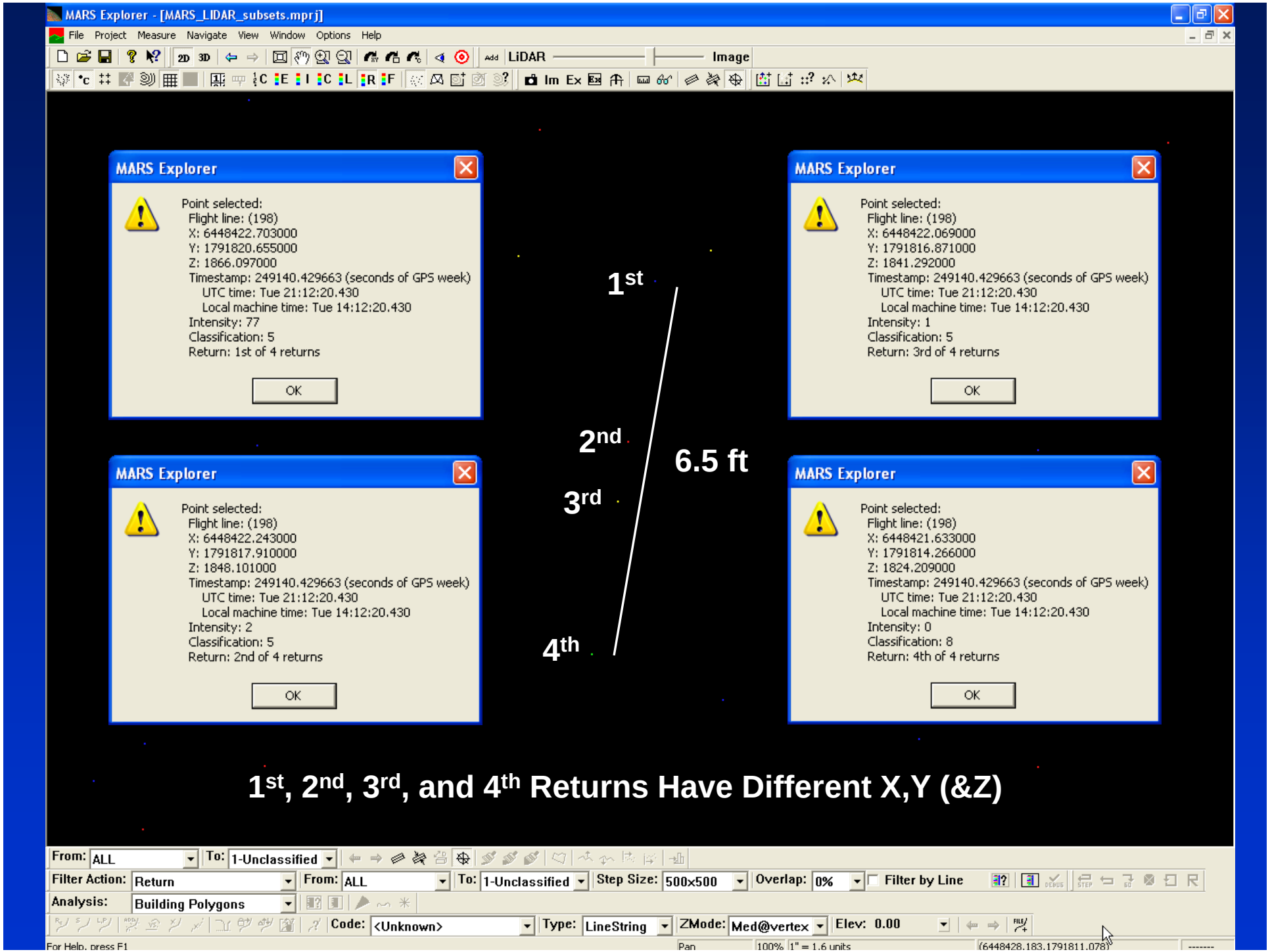
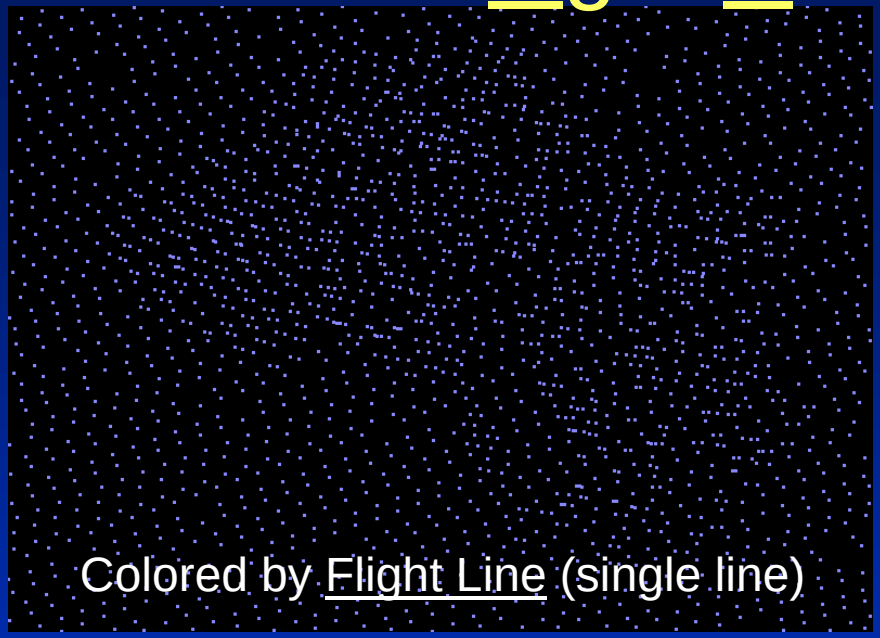
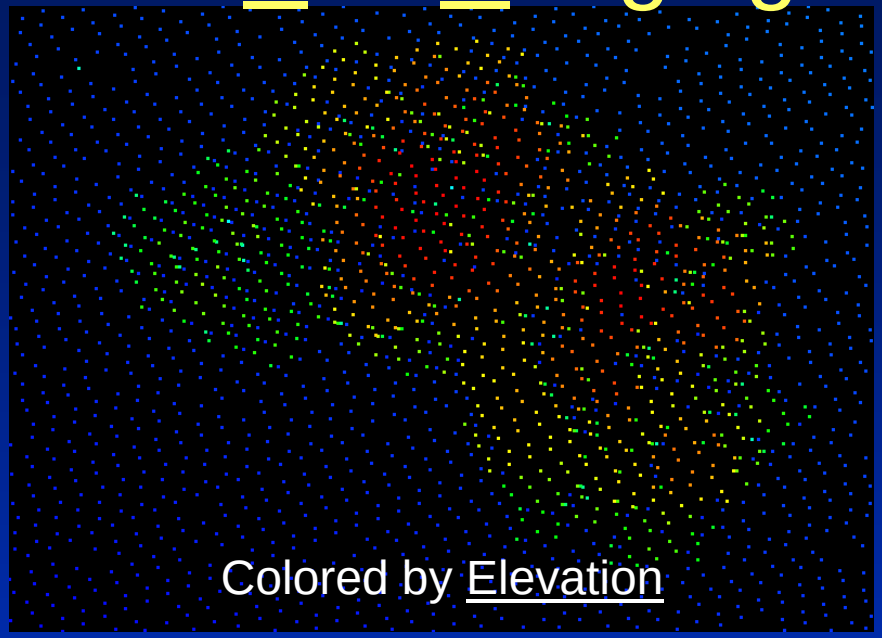

MARS Explorer - [MARS_LIDAR_subsets.mprj]
File Project Measure Navigate View Window Options Help
LiDAR
Image
MARS Explorer
Point selected:
Flight line: (198)
X: 6448422.703000
Y: 1791820.655000
Z: 1866.097000
Timestamp: 249140.429663 (seconds of GPS week)
UTC time: Tue 21:12:20.430
Local machine time: Tue 14:12:20.430
Intensity: 77
Classification: 5
Return: 1st of 4 returns
OK
MARS Explorer
Point selected:
Flight line: (198)
X: 6448422.069000
Y: 1791816.871000
Z: 1841.292000
Timestamp: 249140.429663 (seconds of GPS week)
UTC time: Tue 21:12:20.430
Local machine time: Tue 14:12:20.430
Intensity: 1
Classification: 5
Return: 3rd of 4 returns
OK
1st
2nd
3rd
4th
6.5 ft
MARS Explorer
Point selected:
Flight line: (198)
X: 6448422.243000
Y: 1791817.910000
Z: 1848.101000
Timestamp: 249140.429663 (seconds of GPS week)
UTC time: Tue 21:12:20.430
Local machine time: Tue 14:12:20.430
Intensity: 2
Classification: 5
Return: 2nd of 4 returns
OK
MARS Explorer
Point selected:
Flight line: (198)
X: 6448421.633000
Y: 1791814.266000
Z: 1824.209000
Timestamp: 249140.429663 (seconds of GPS week)
UTC time: Tue 21:12:20.430
Local machine time: Tue 14:12:20.430
Intensity: 0
Classification: 8
Return: 4th of 4 returns
OK
1st, 2nd, 3rd, and 4th Returns Have Different X,Y (&Z)
From: ALL
To: 1-Unclassified
Filter Action: Return
From: ALL
To: 1-Unclassified
Step Size: 500x500
Overlap: 0%
Filter by Line
Analysis: Building Polygons
Code: <Unknown>
Type: LineString
ZMode: Med@vertex
Elev: 0.00
For Help, press F1
Pan
100%
1" = 1.6 units
(6448428.183,1791811.078)

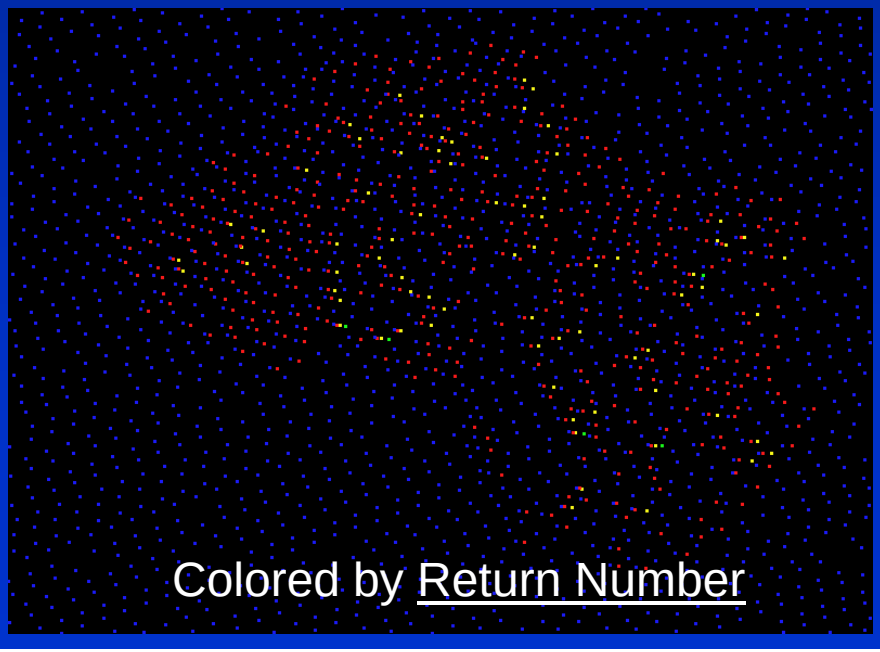
LIDAR – Light Detection And Ranging



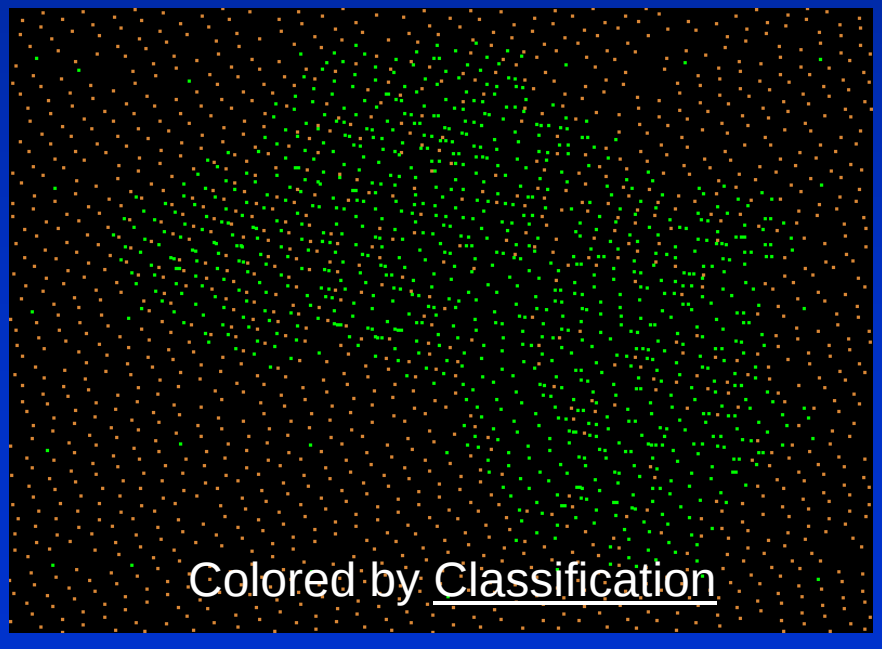
Colored by Flight Line (single line)



Colored by Elevation

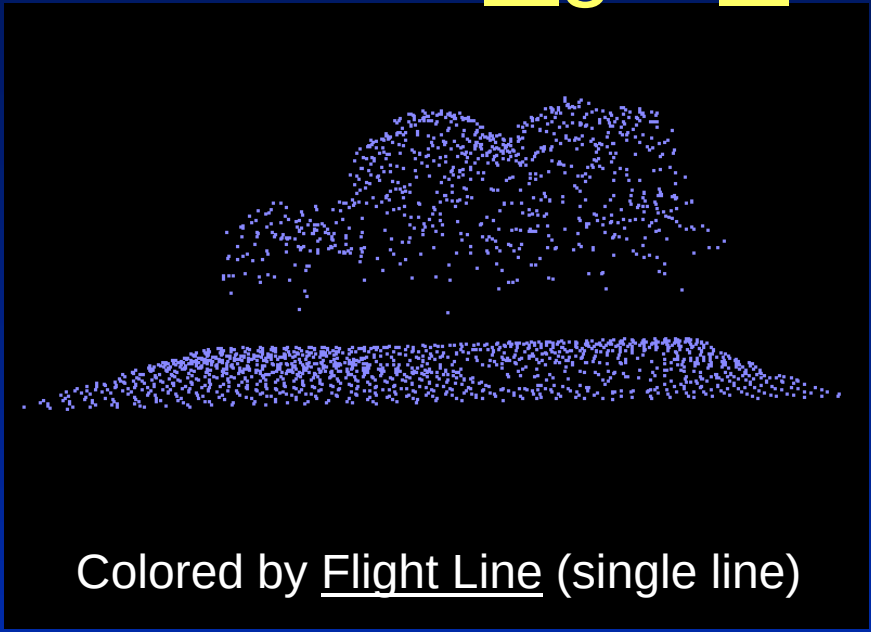


Colored by Return Number

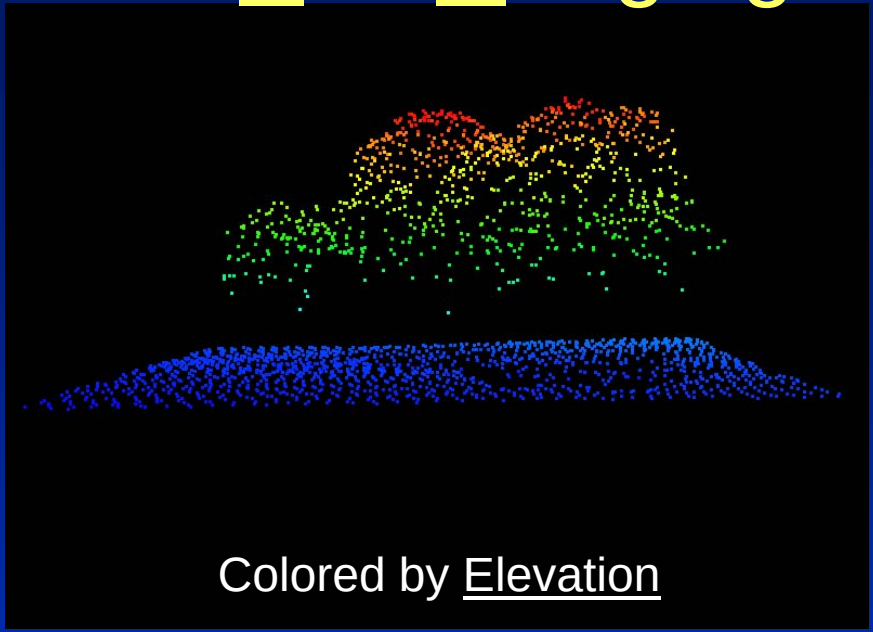


Colored by Classification

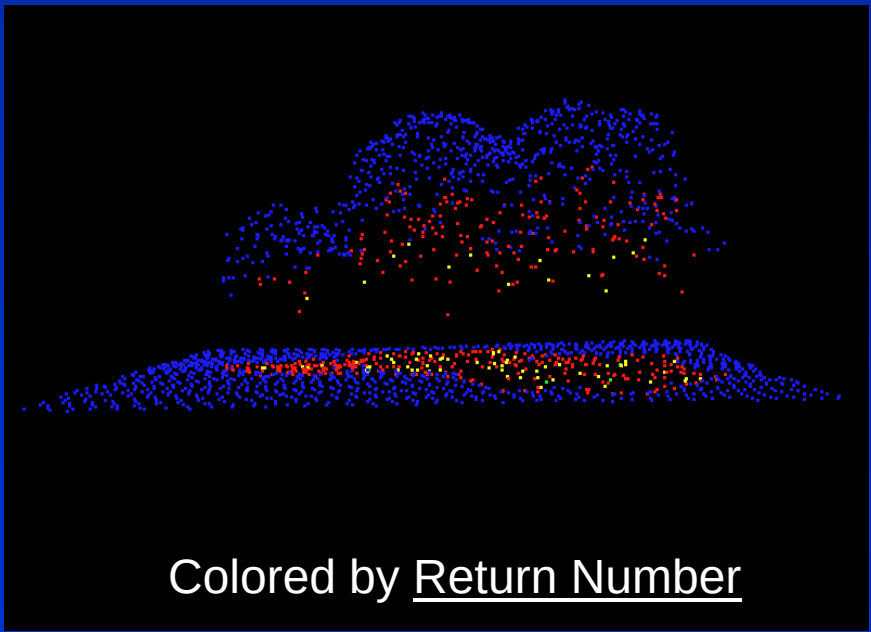
LIDAR – Light Detection And Ranging



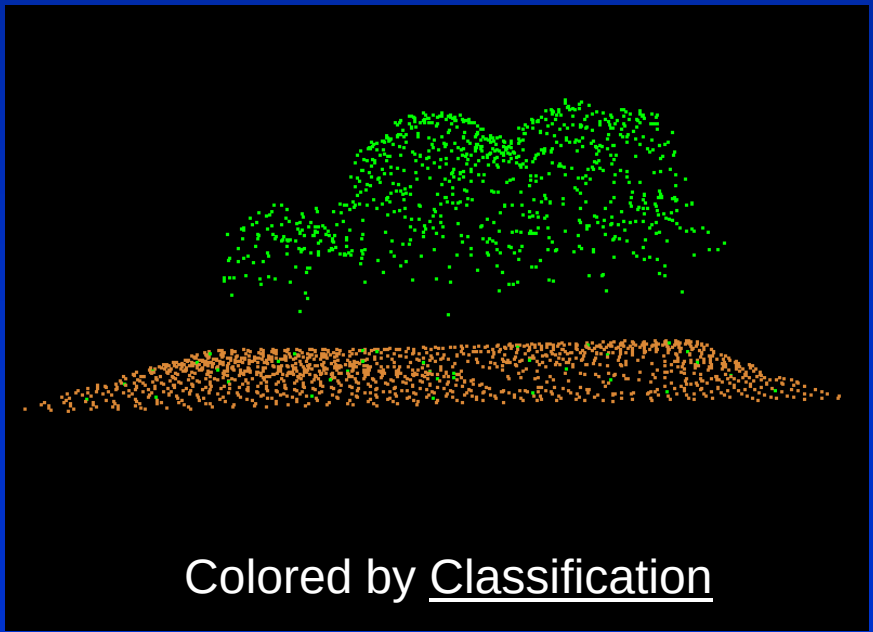
Colored by Flight Line (single line)



Colored by Elevation

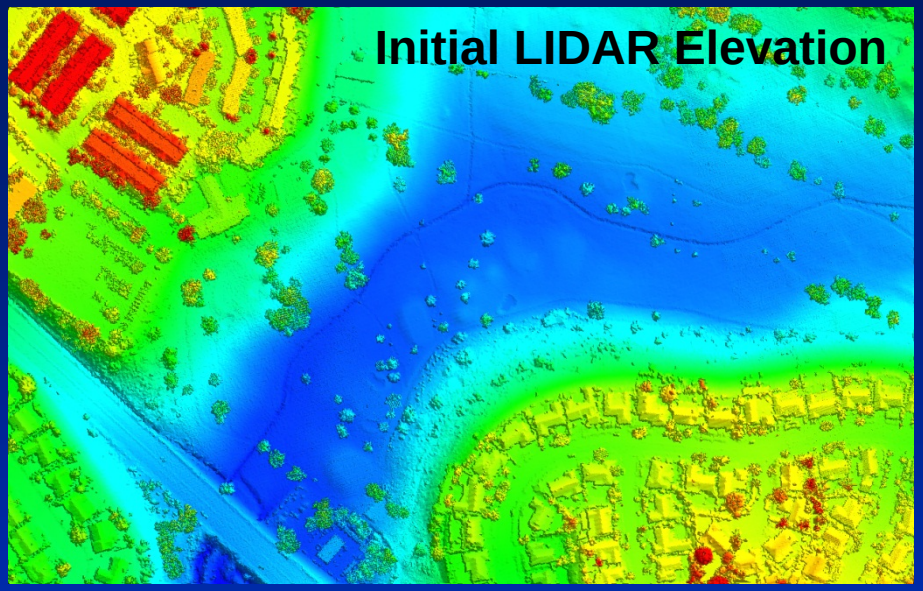


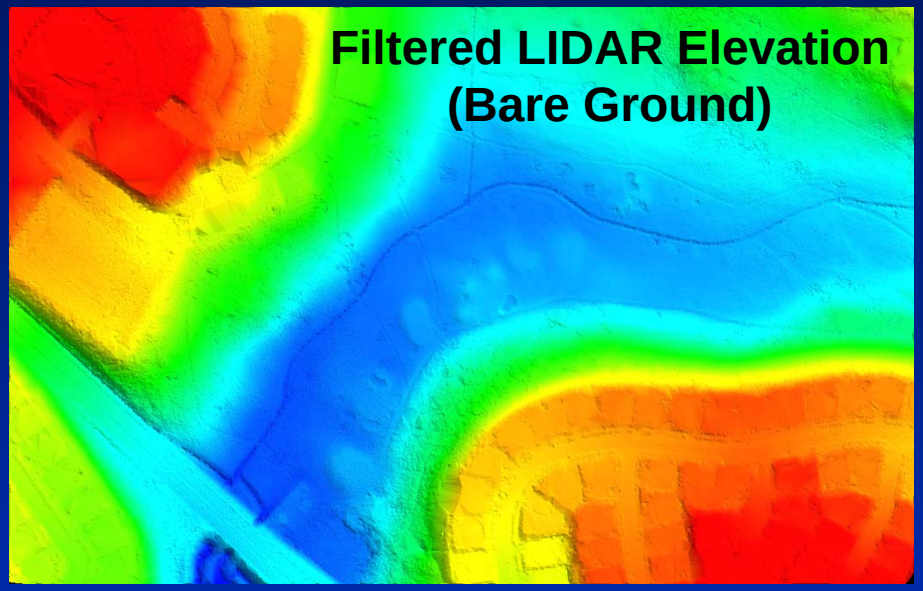
Colored by Return Number

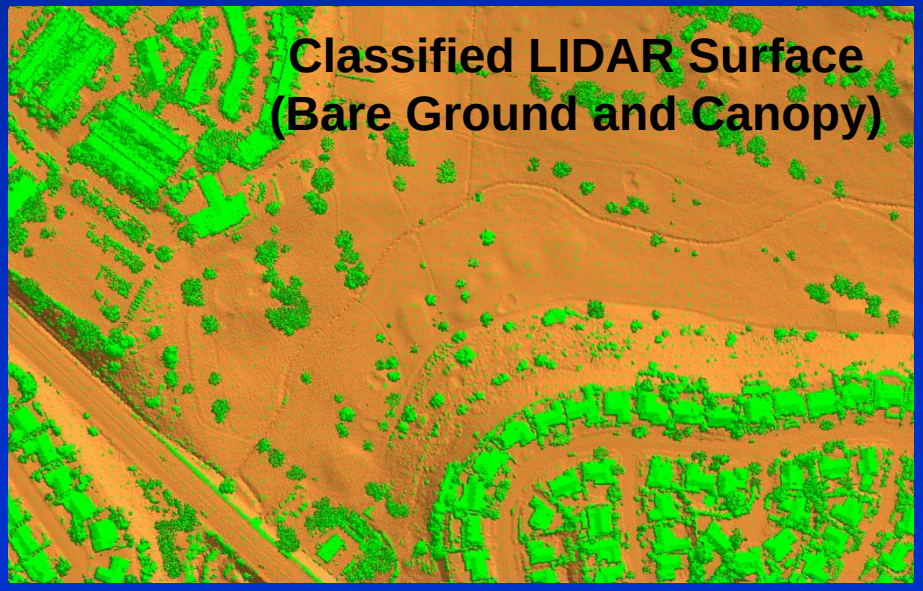


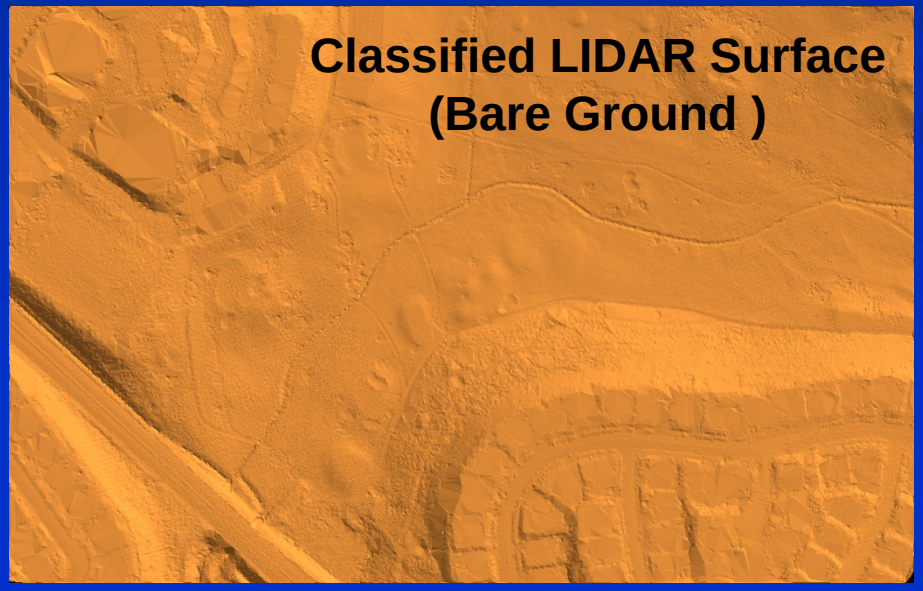
Colored by Classification

LIDAR – Light Detection And Ranging





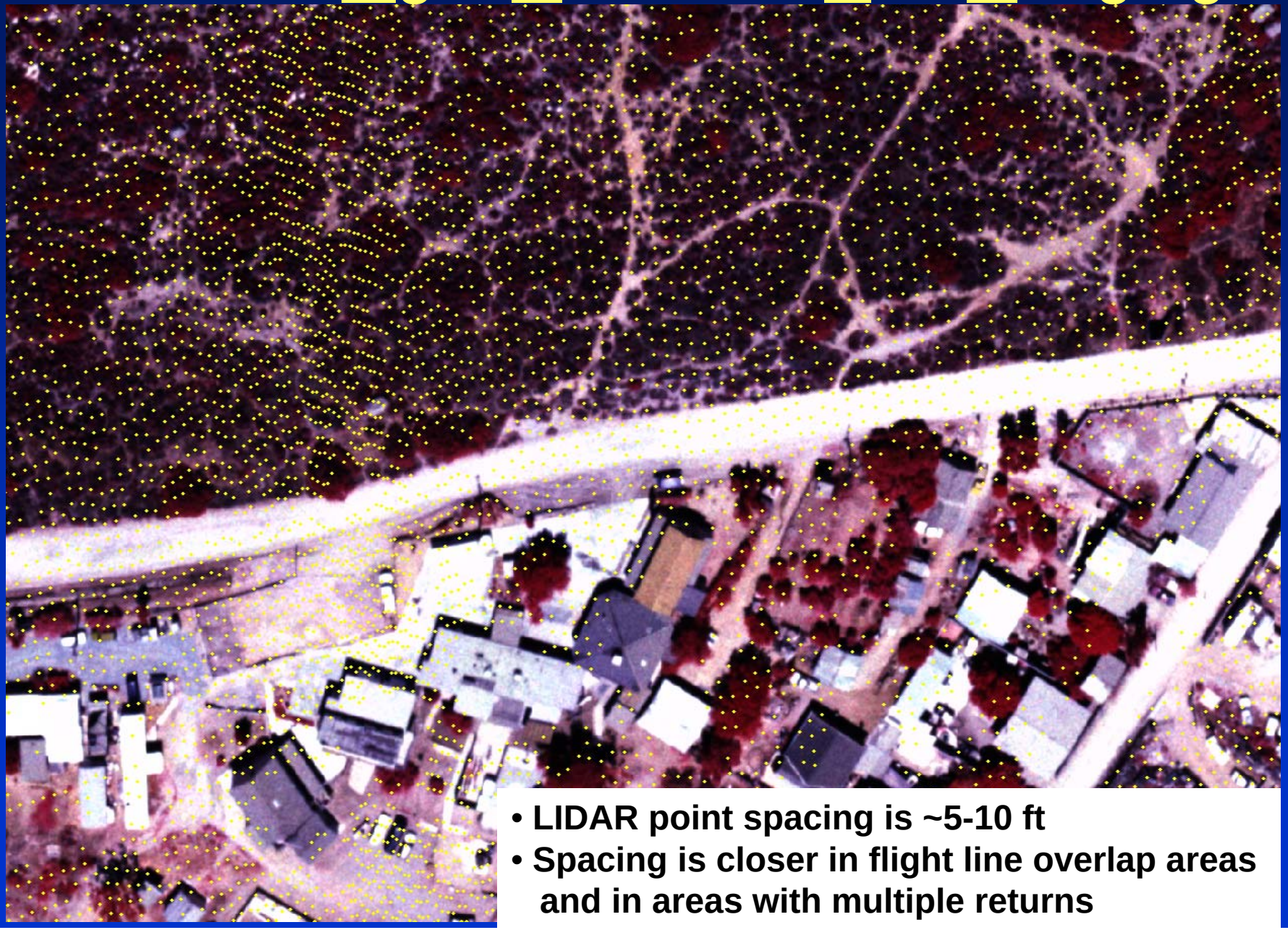




LIDAR – Light Detection And Ranging

Border color infrared photography

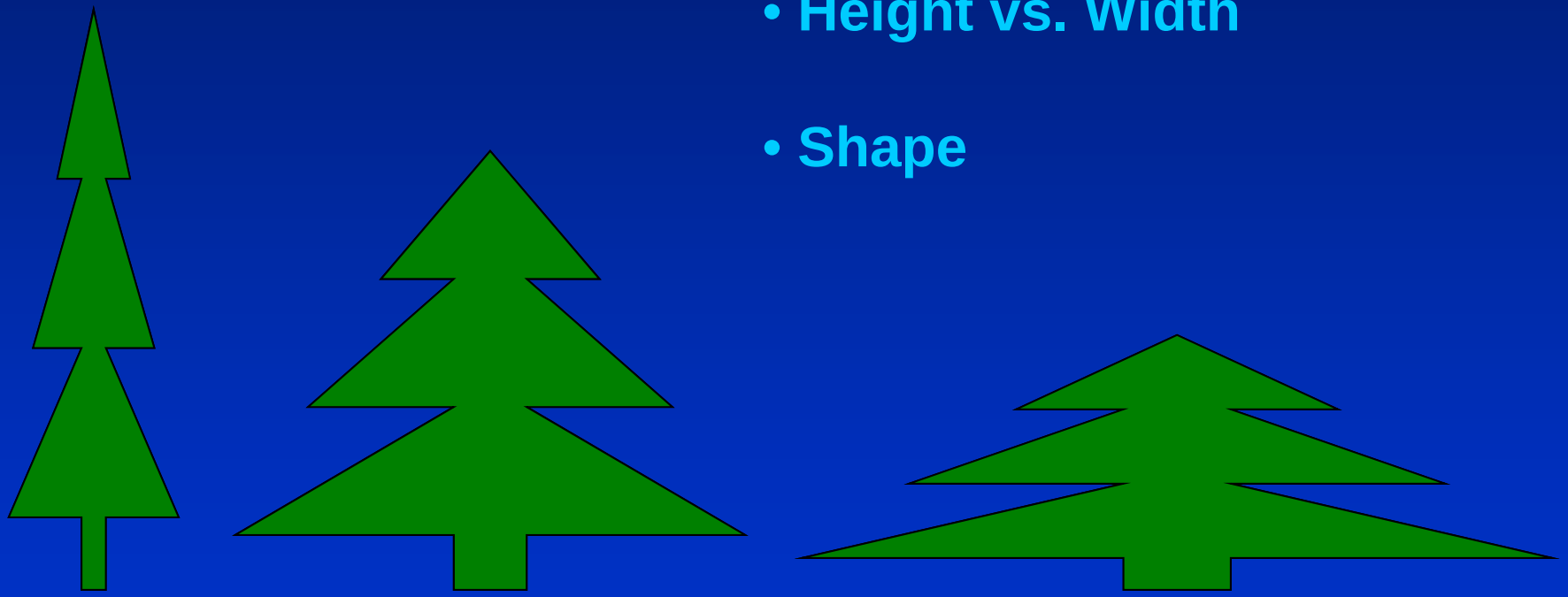
LIDAR – Light Detection And Ranging



- **LIDAR point spacing is ~5-10 ft**
- **Spacing is closer in flight line overlap areas and in areas with multiple returns**

LIDAR – Light Detection And Ranging

- Vegetation Structure
  - **Height vs. Width**
  - **Shape**



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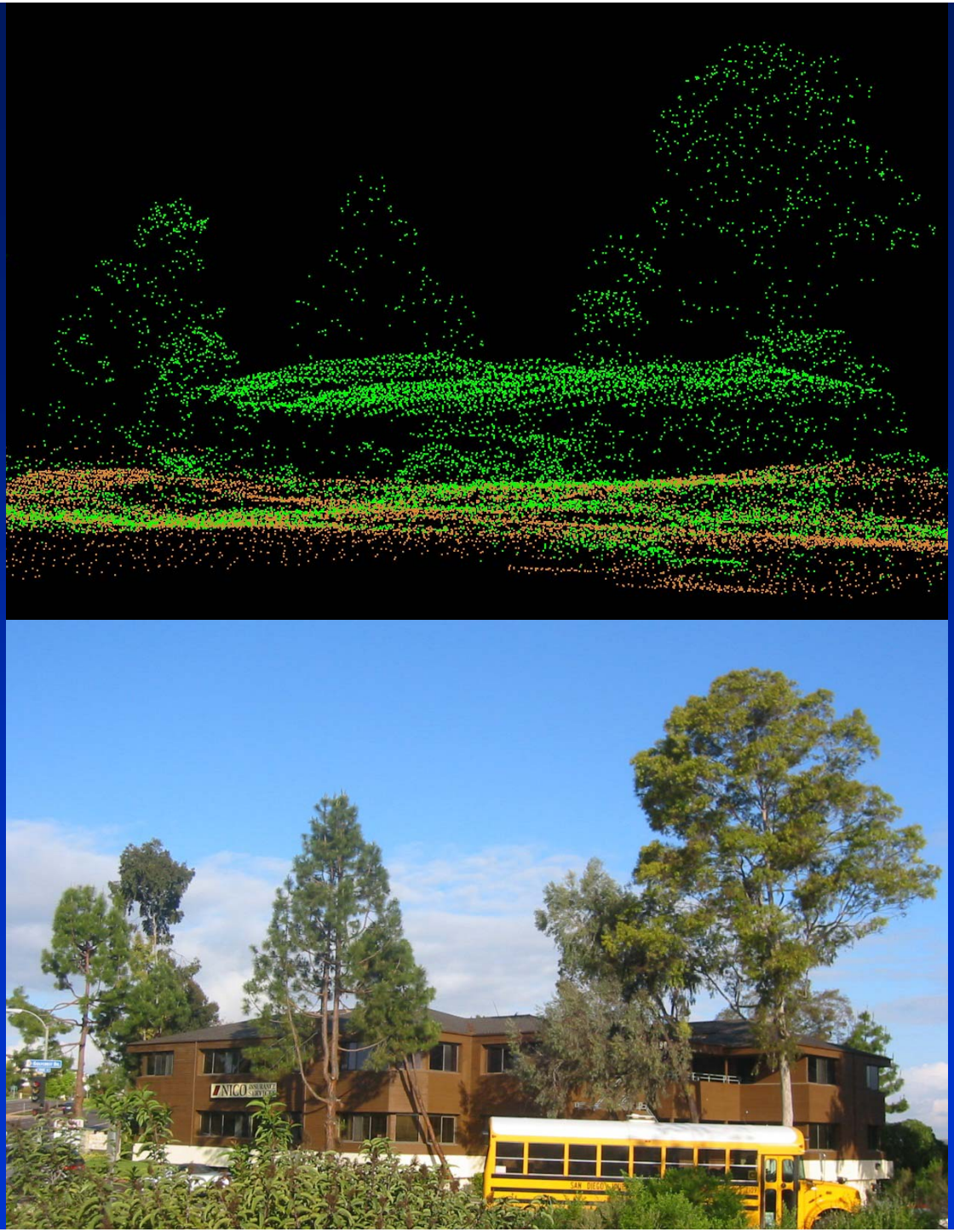
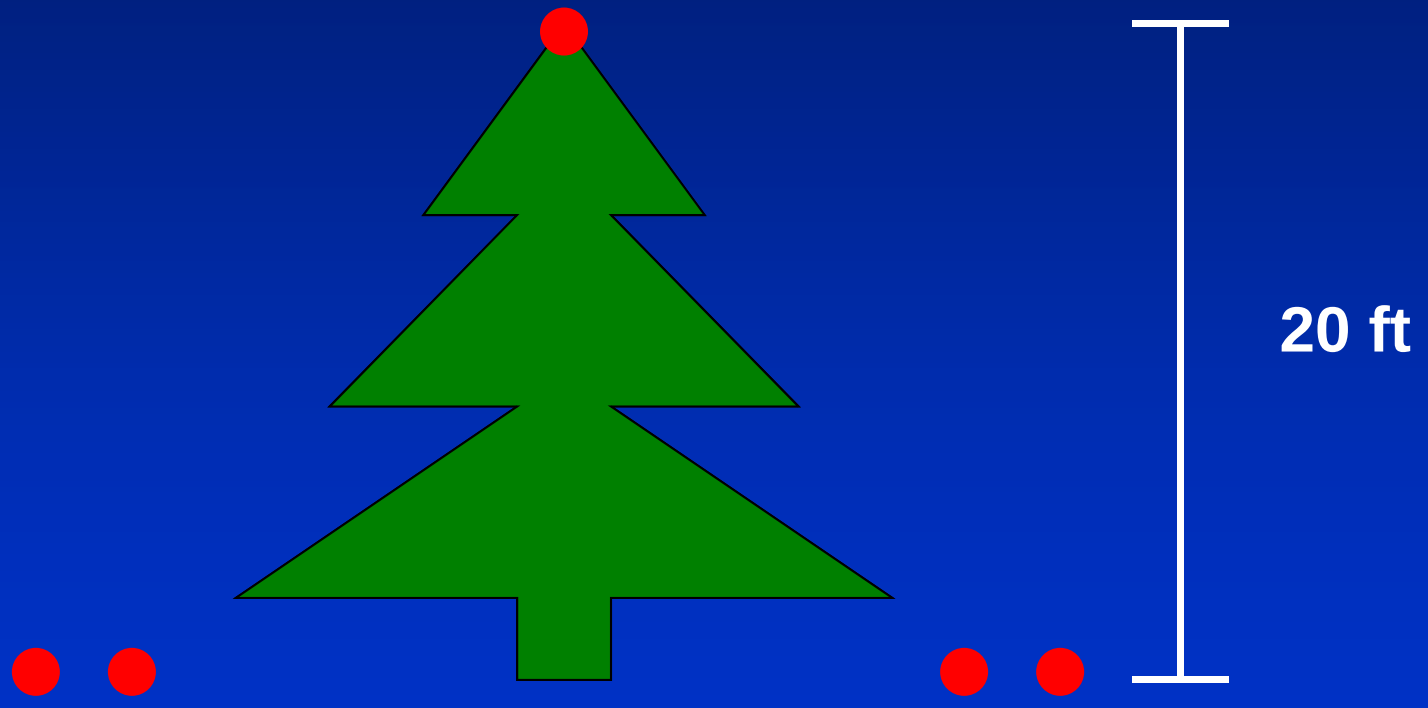

UNICO

LIDAR – Light Detection And Ranging

- Vegetation Height



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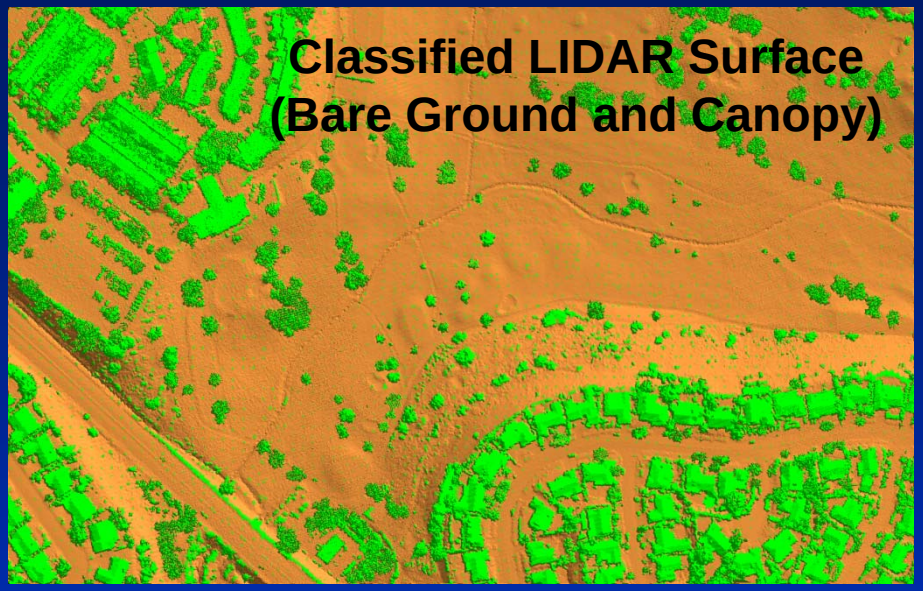
LIDAR – Light Detection And Ranging



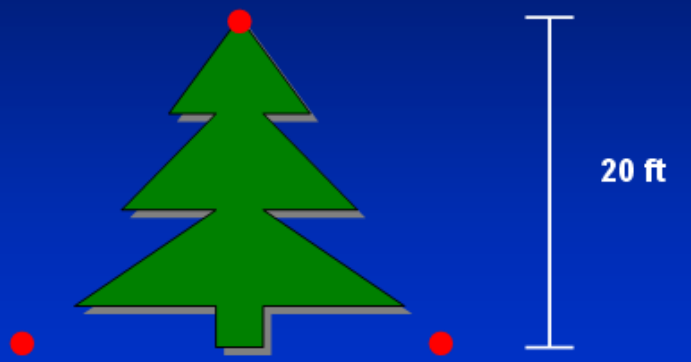
Yellow – Green = 1-40 ft Height

LIDAR – Light Detection And Ranging

- Vegetation Density (% Canopy, % Not 1st Return)

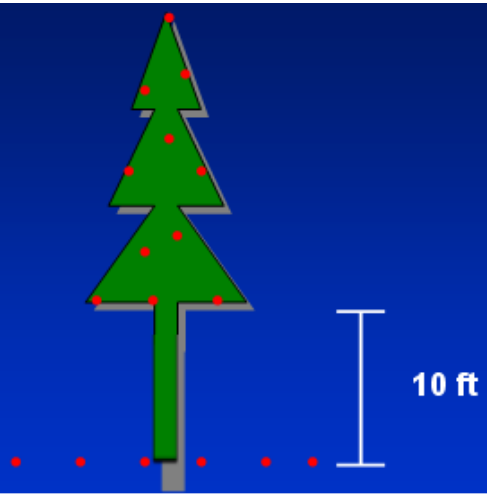
LIDAR – Light Detection And Ranging

- Vegetation Height

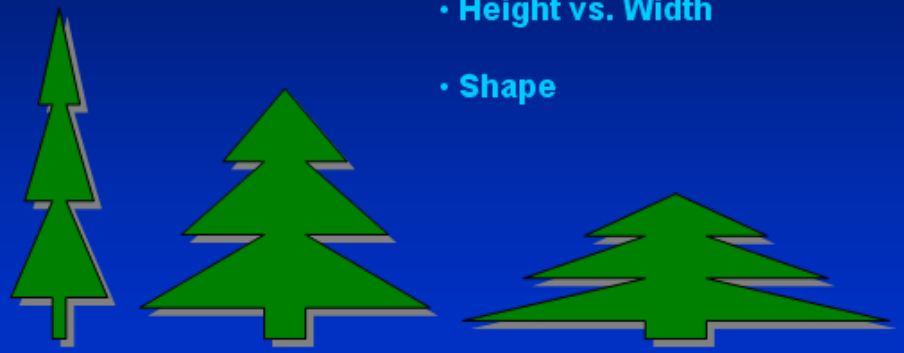


- Vegetation Density

- Understory Gap



- Vegetation Structure
  - Height vs. Width
  - Shape



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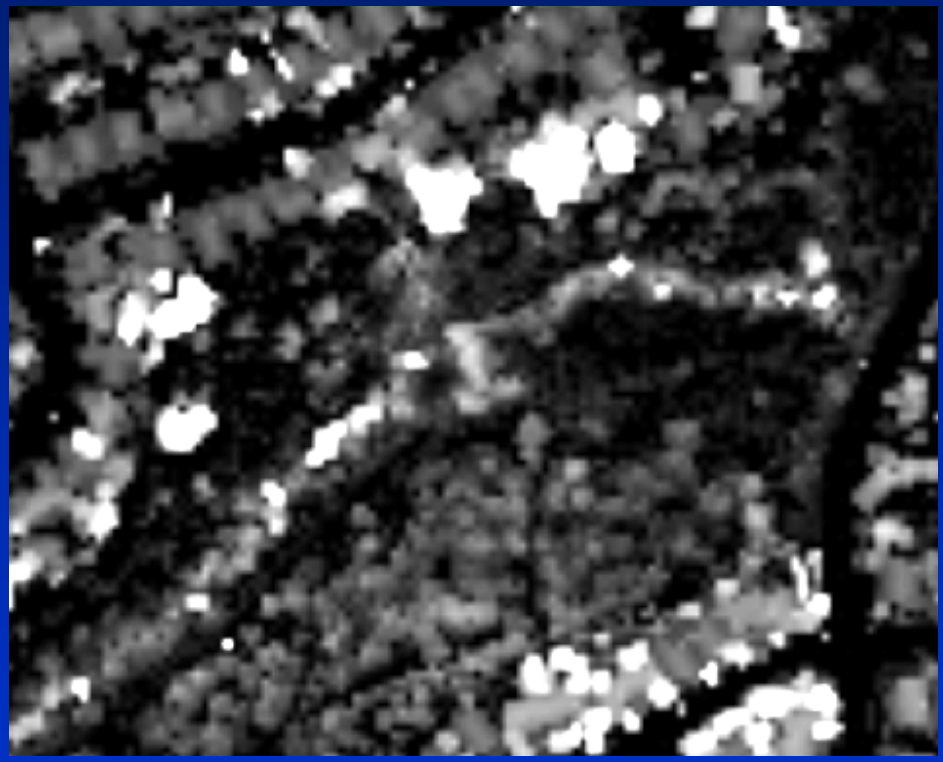
LIDAR Rasterized Point Summary Products

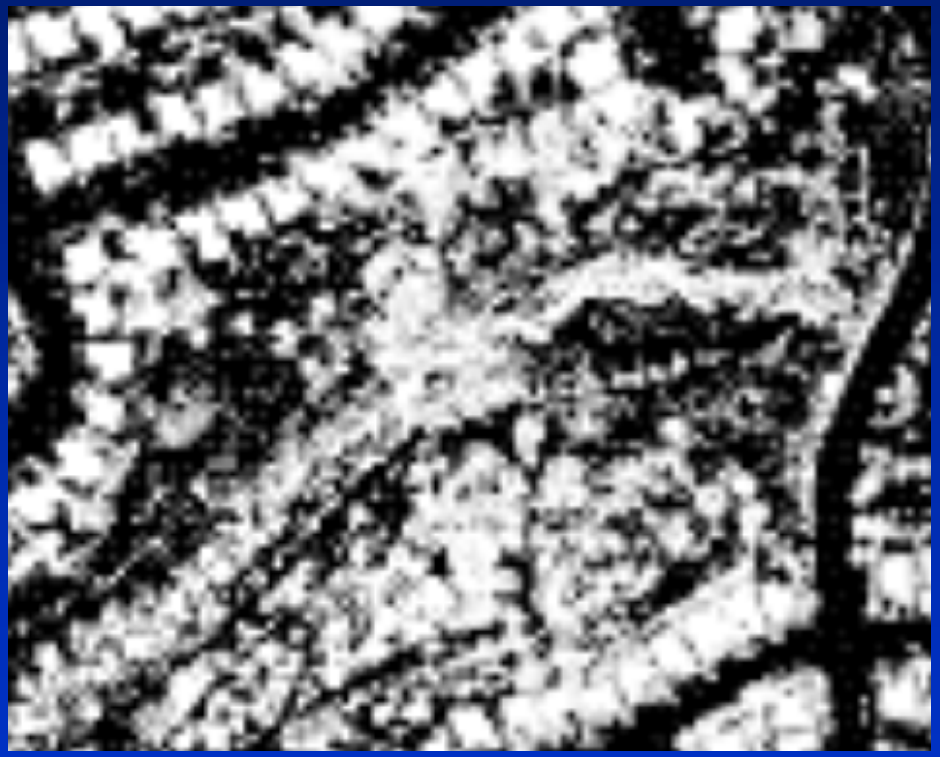
ADS40 Image



Maximum Height

LIDAR Rasterized Point Summary Products

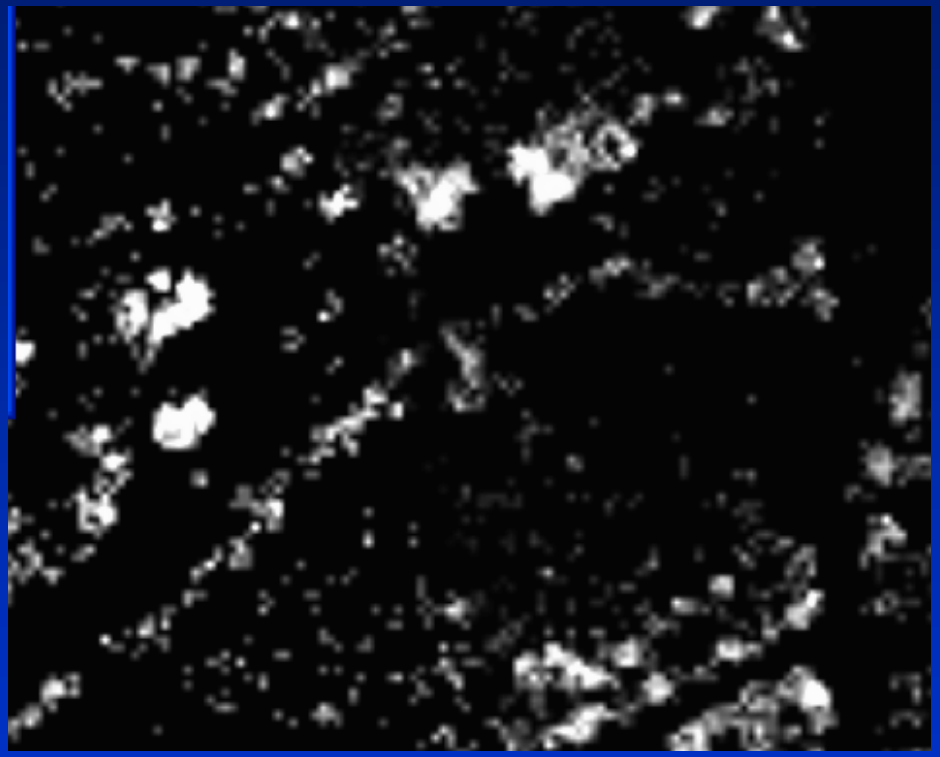
ADS40 Image



% Canopy

LIDAR Rasterized Point Summary Products

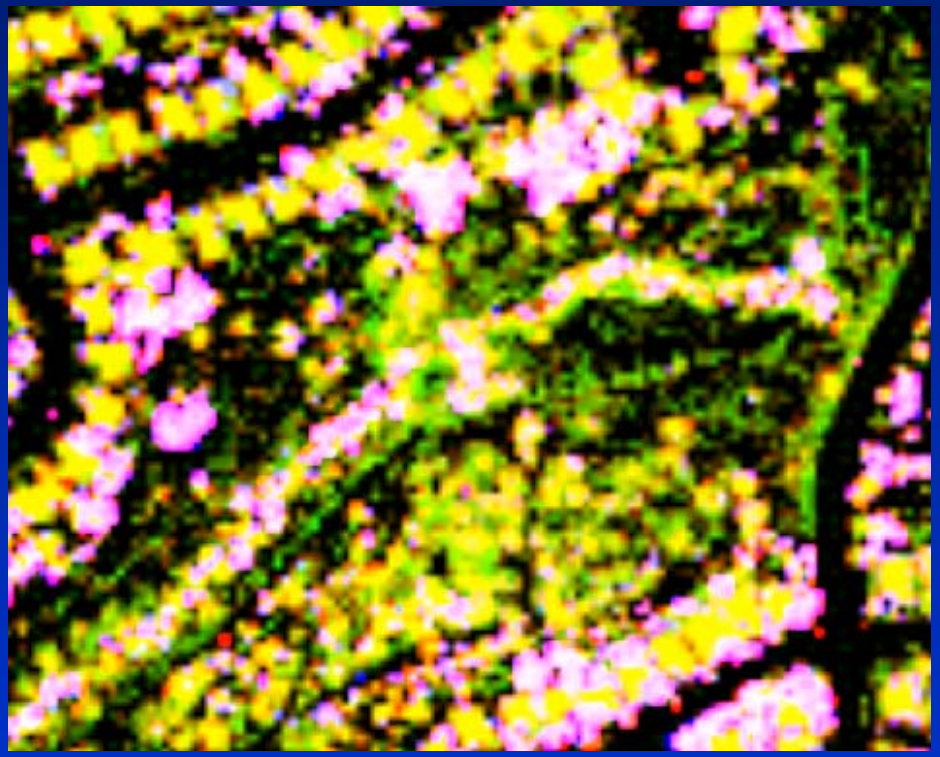
ADS40 Image



% Not 1st Return

LIDAR Rasterized Point Summary Products

ADS40 Image



Red: Maximum Height

Green: % Canopy

Blue: % Not 1st Return

LIDAR Intensity - Applications

- GIS systems
  - Backdrop imagery
  - Verify planimetric accuracy of existing images and GIS data
  - Updating GIS layers
- Natural resource management
  - Presence/absence of vegetation
  - Vegetation condition
  - Recent soil disturbance