

Top 10 Recent Changes in GIS and Remote Sensing... and Why They Matter

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JAMES W. SEWALL COMPANY / *Since 1880*

Criteria

-  Recent: Within the last 10 years or so
-  Utility for Foresters and Forestry
-  A Fundamental Change in the Geospatial Industry
-  Ability to Impact the World
-  Demonstrated Impact on Forestry
-  Potential to Significantly Impact Forestry



10

European Union Copernicus Program

➤ 10. EU Copernicus Program

- Earth Observation Satellites
- Family of 6 types of satellites
- Sentinel-1 (A & B) – Radar
 - 6 Day Revisit Time
 - Cloud Penetrating Capabilities
 - Elevation Measurement
- Sentinel-2 (A & B) - Multispectral
 - 5 Day Revisit Time
 - Increased Spatial Resolution (10m)



Sentinel-2
EU Version of Landsat

➤ 10. EU Copernicus Program

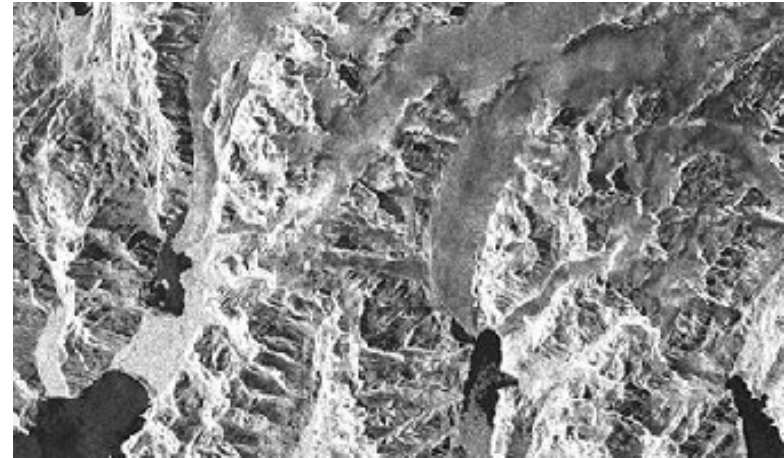
➤ Sentinel-1

- Forest Height and Biomass
- Tropical Forest Monitoring

➤ Sentinel-2

- Increased Data Reliability
- Finer Resolution Change Detection
- Faster Detection, particularly important when monitoring for:
 - Timber Trespass
 - Weather Events
 - Pest and Disease

Sentinel-1 Data From





9

The Cloud / Web Infrastructure

9. The Cloud / Web Infrastructure



9. The Cloud / Web Infrastructure

The screenshot displays a web-based GIS application interface. The top navigation bar includes icons for home, zoom, search, measure, print, and logout. The main map area shows a geographical view with roads (e.g., Burton Rd, Plank Rd, N Garden Ln, Southern Hills Ct) and several land parcels highlighted in green and yellow. One parcel is labeled 'OP 778 / 21 Other - O', another 'Other - O LOB 7 / 26', and a third 'Third - C PH 1 / 223'. A scale bar is visible on the left side of the map.

The left sidebar contains a 'Layers' panel with the following items:

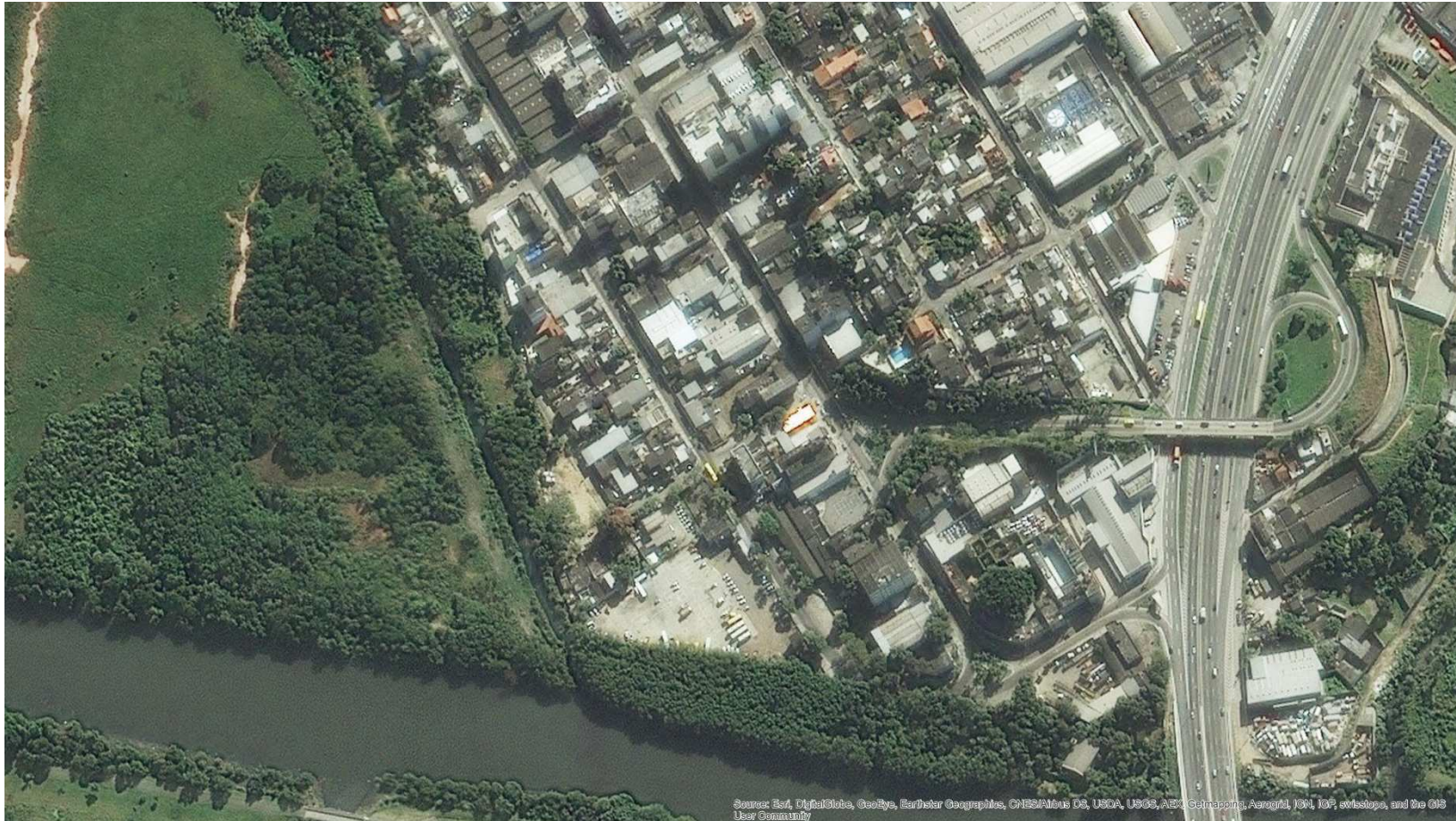
- Mills
- MWV Locations
- Interstate Highways
- State Highways
- Other Roads
- NC DOT Roads
- VA DOT Roads
- WV DOT Roads
- Stands
- Tracts
- Landownership
- Soils
- NOAA Rainfall
- North Carolina WMTS basemap

Below the layers panel is an 'Edit stands' section with the following tools:

- Select stands: Select, Deselect
- Edit selected stand: Move, Rotate, Scale
- Create a new stand: Polygon, Rectangle
- Merge selected stands: Merge
- Remove stand(s): Delete
- Undo: Undo

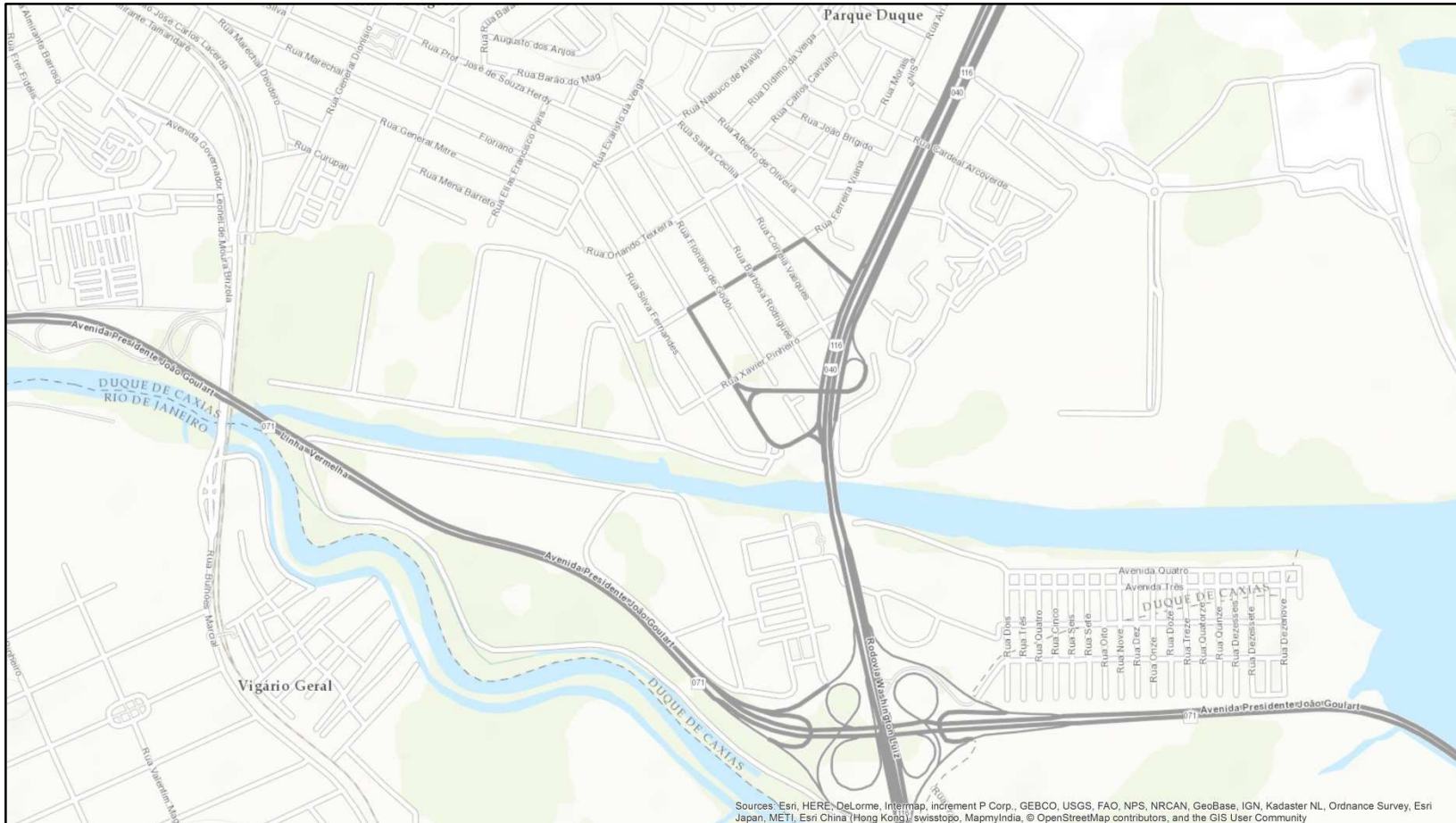


9. The Cloud / Web Infrastructure





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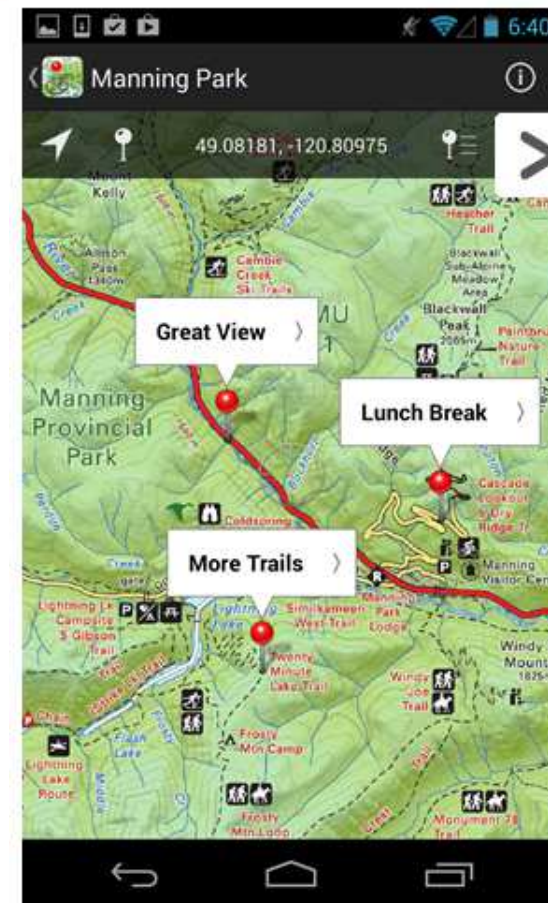


8

Geospatial PDFs and Mobile PDF Maps

8. Geospatial PDFs and Mobile PDF Maps

- Standardized format significantly simplifies the process of getting a georeferenced map into the field
- Modern apps effectively turn smartphones into mini mobile GIS systems:
 - Collect Data



Avenza Maps Android app - Drop placemarks at locations

8. Geospatial PDFs and Mobile PDF Maps

- Standardized format significantly simplifies the process of getting a georeferenced map into the field
- Modern apps effectively turn smartphones into mini mobile GIS systems:
 - Collect Data
 - Make Measurements
 - Supporting Navigation



Avenza Maps Android app - Use tools to measure area/distance



7

UAVs / UAS

7. UAVs / UAS

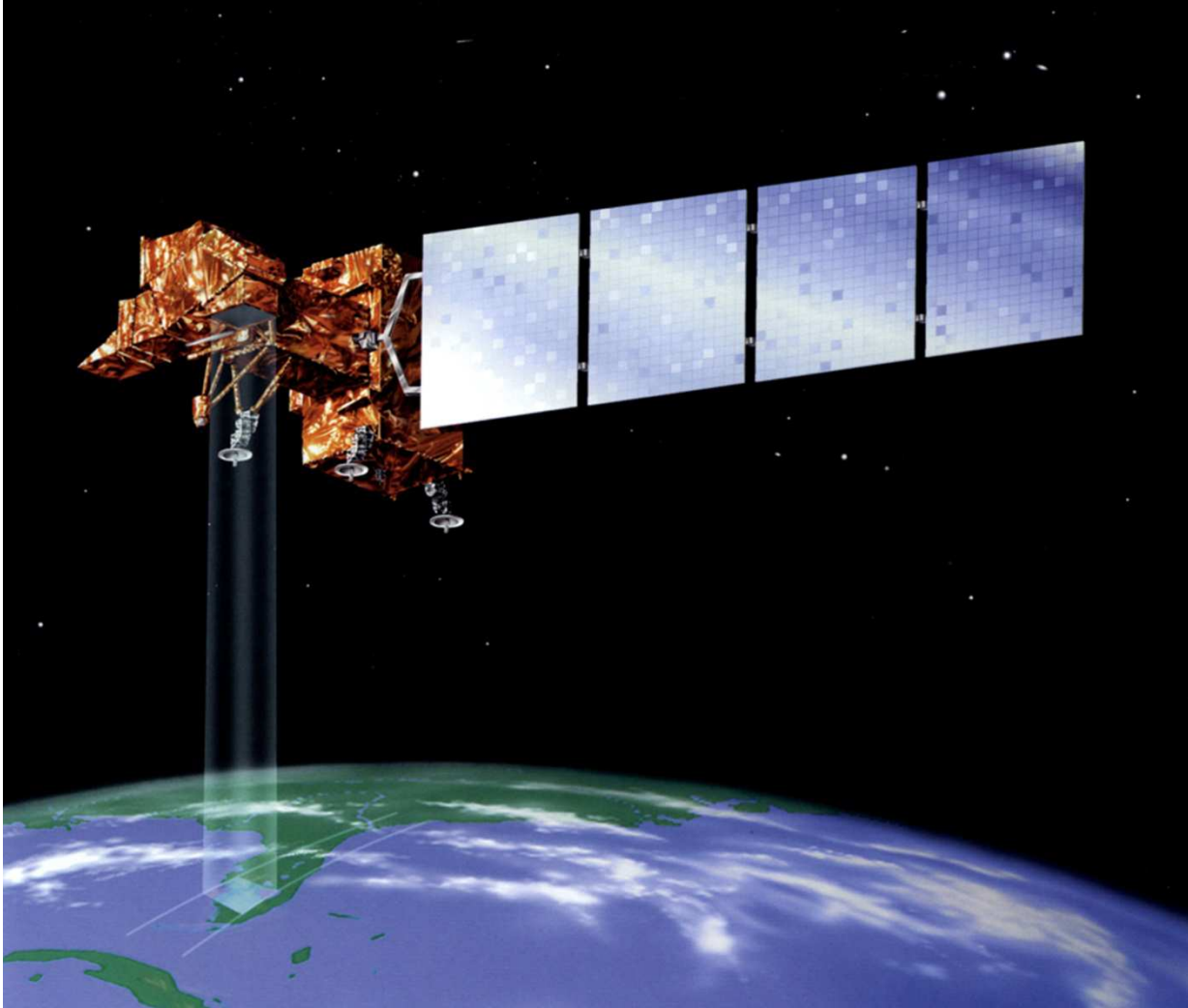




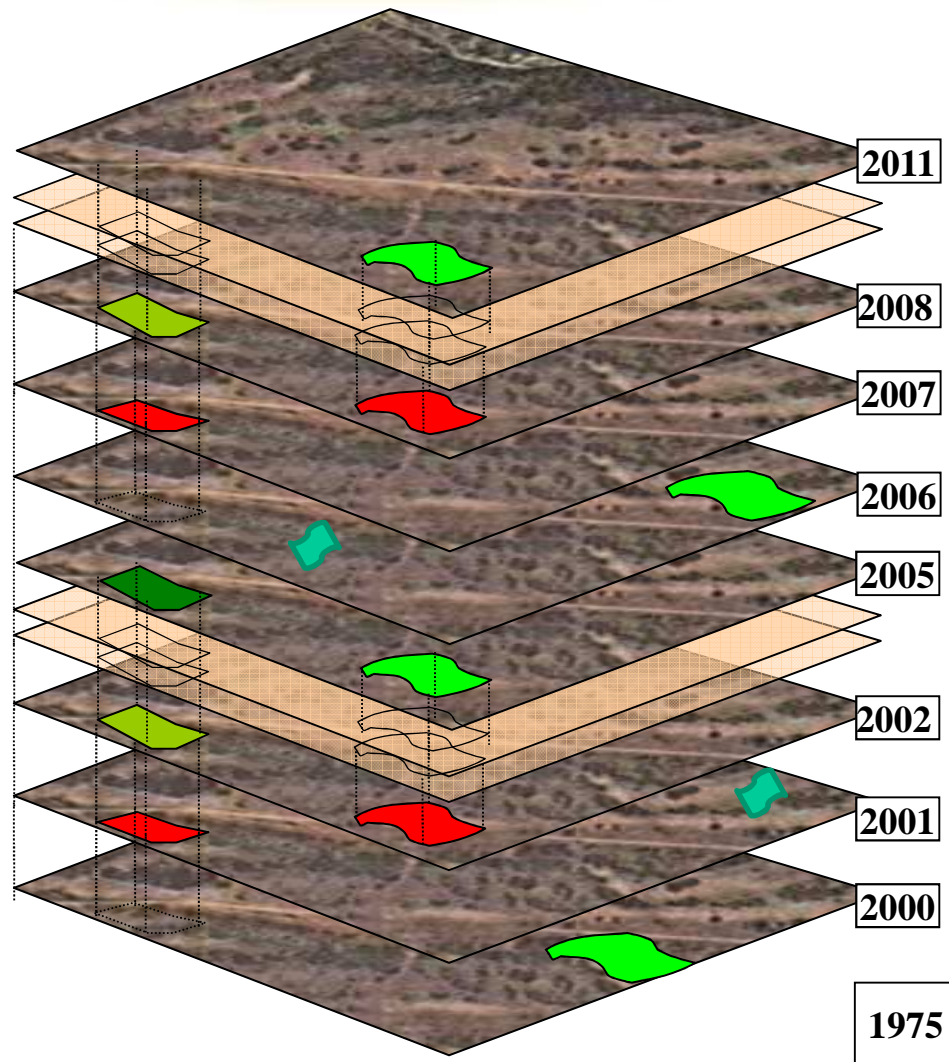
6

Release of the Landsat Archive

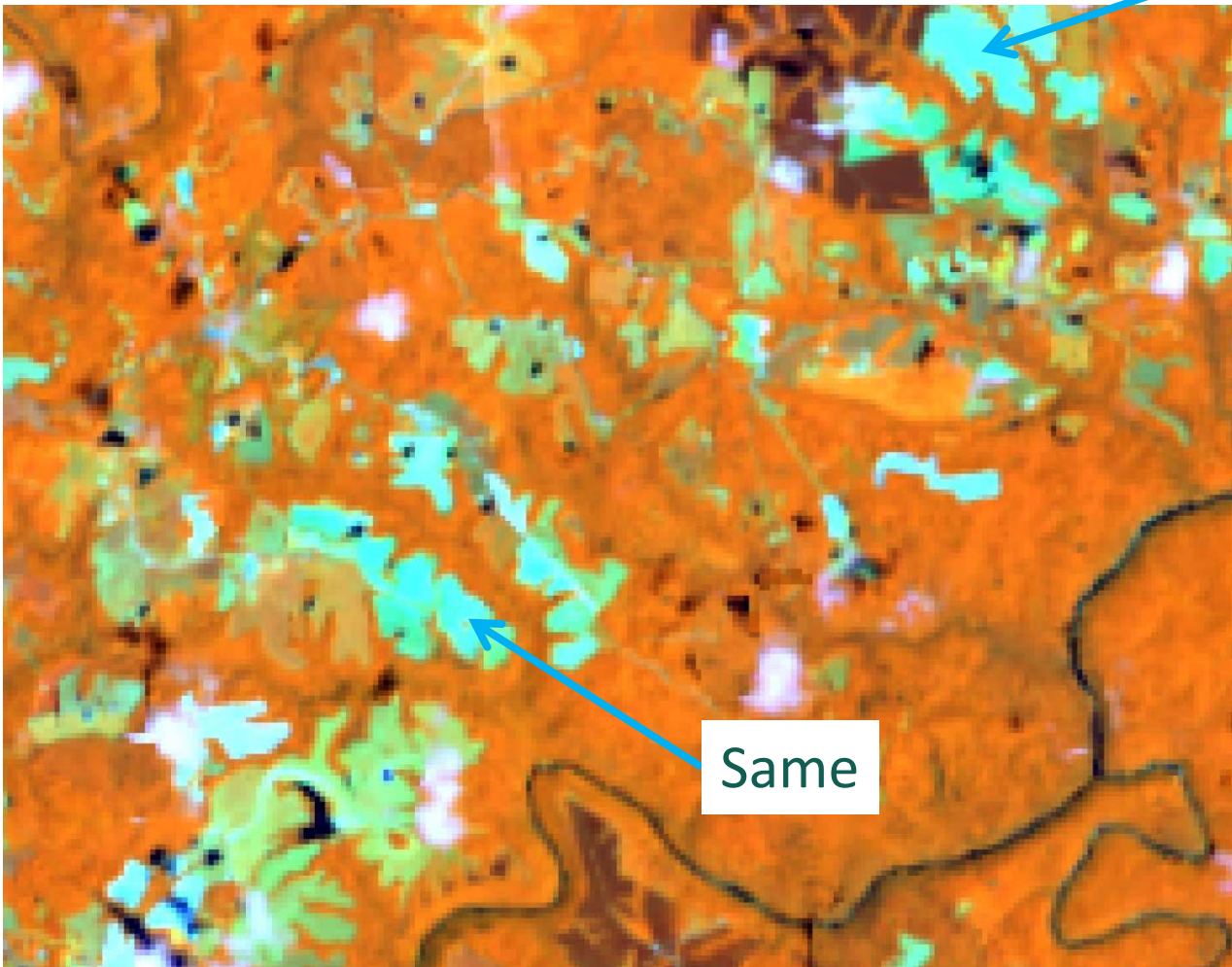
6. Release of the Landsat Archive



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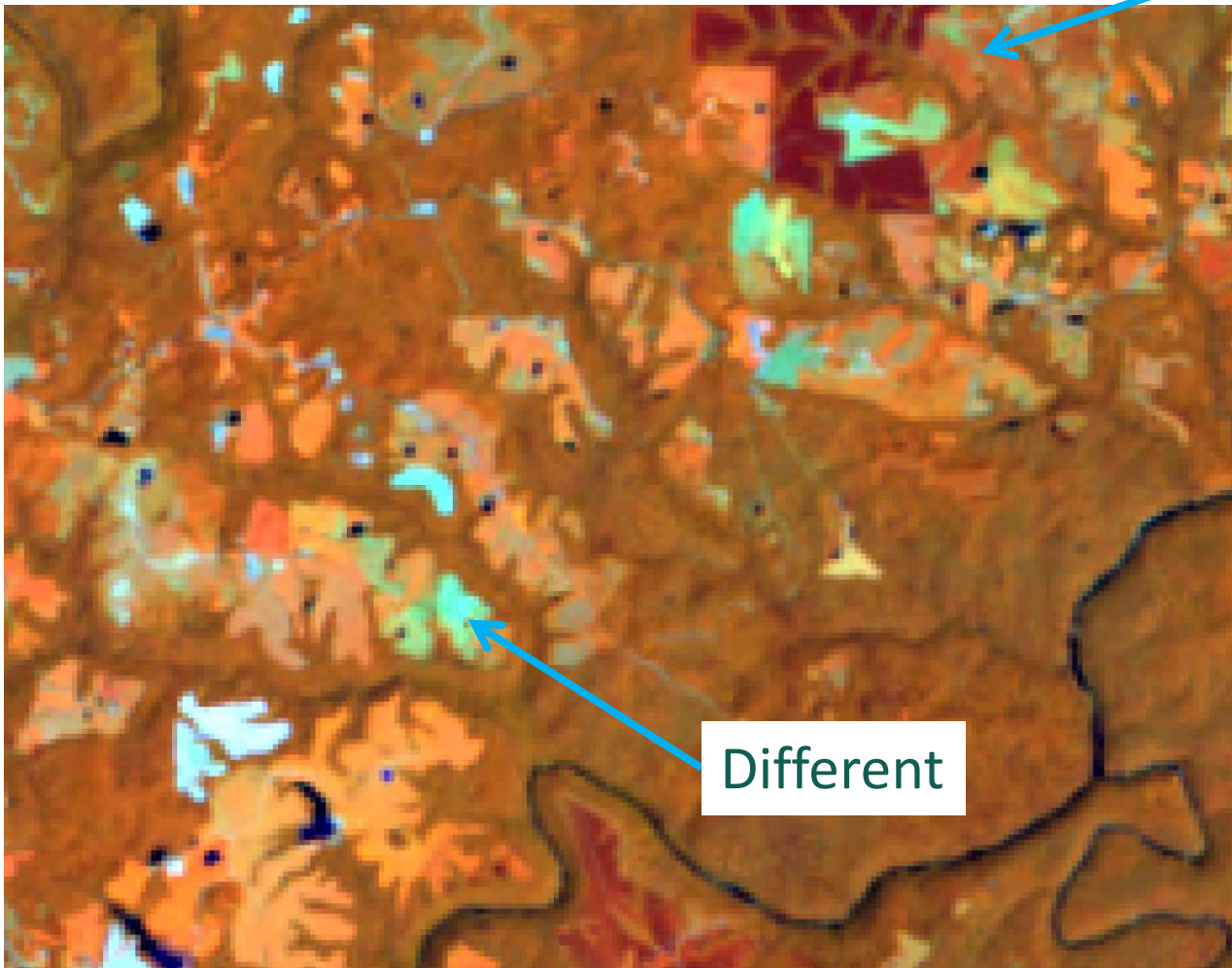
6. Release of the Landsat Archive



Same

Same

6. Release of the Landsat Archive



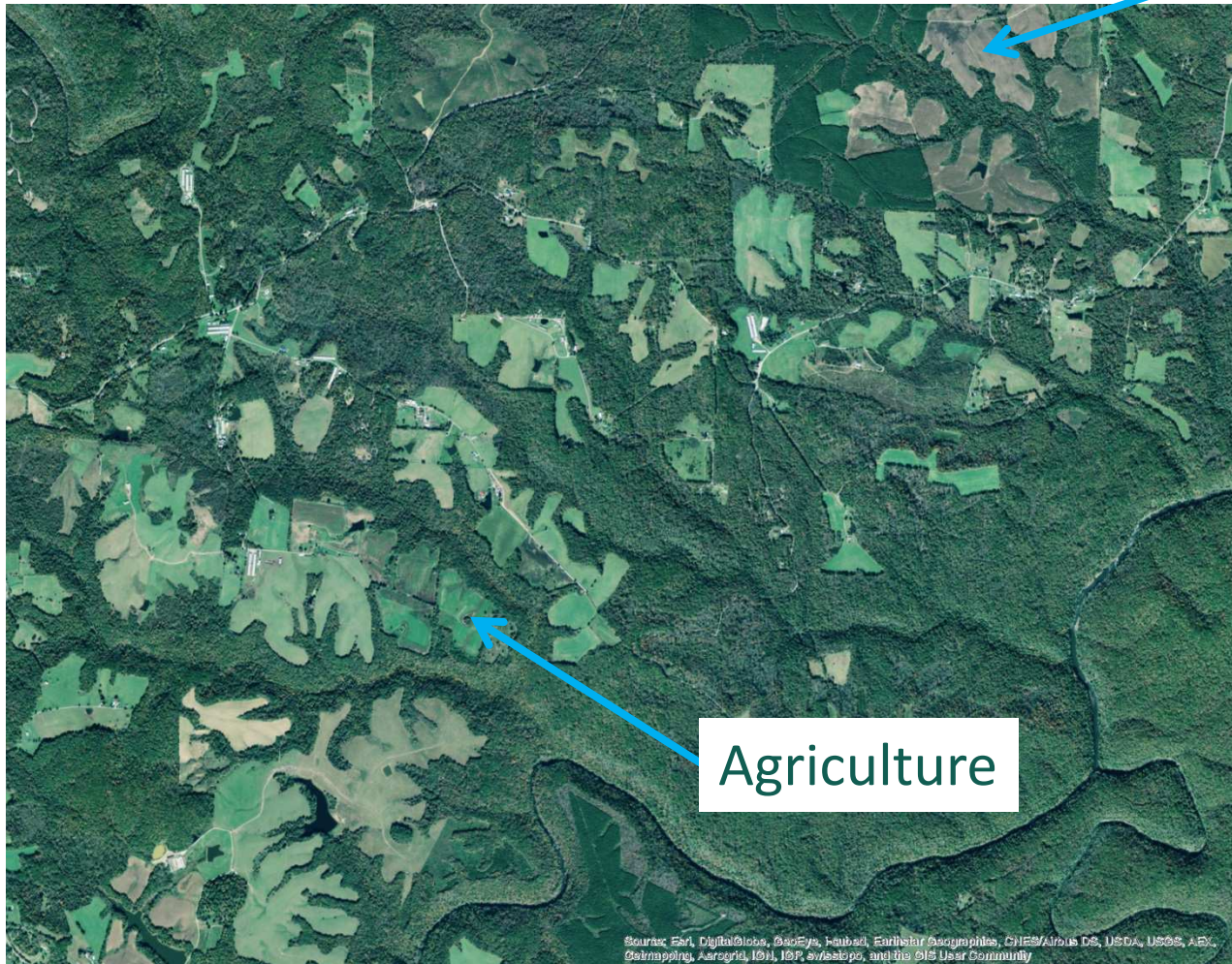
Different

Different



6. Release of the Landsat Archive

Forestry



Agriculture

Source: ESA, DigitalGlobe, GeoEye, IGN, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, Aero, Calmapping, AeroGRID, IGN, IGP, swisstopo, and the GIS User Community



6. Release of the Landsat Archive



Harvests By Year

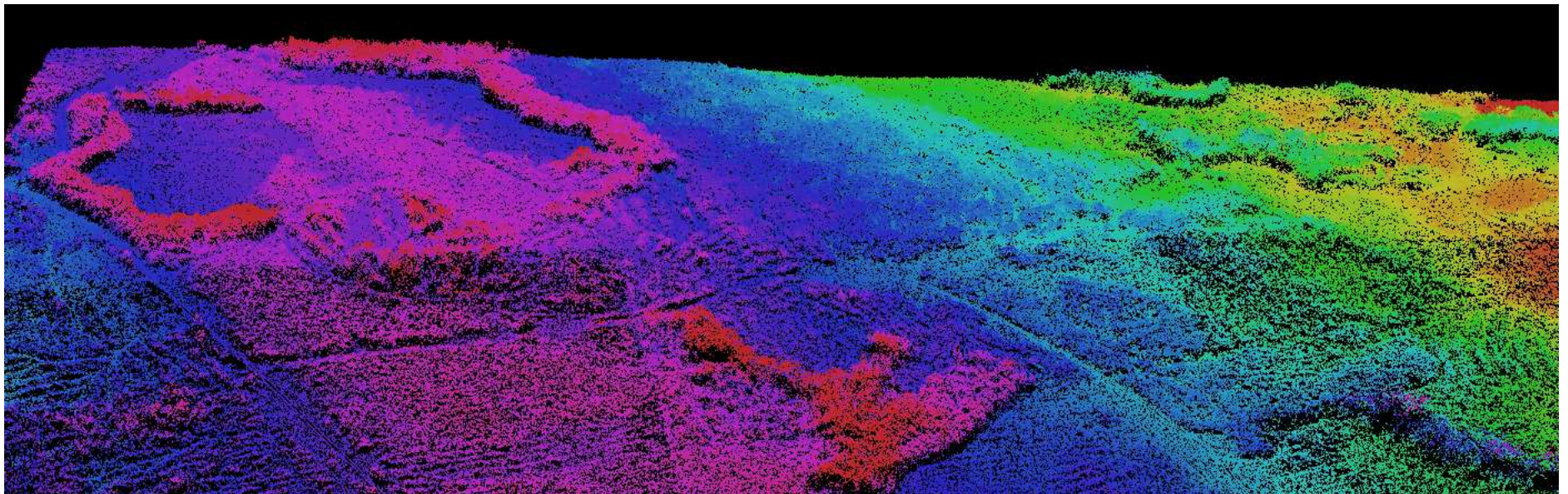


5

Image-Based Point Clouds

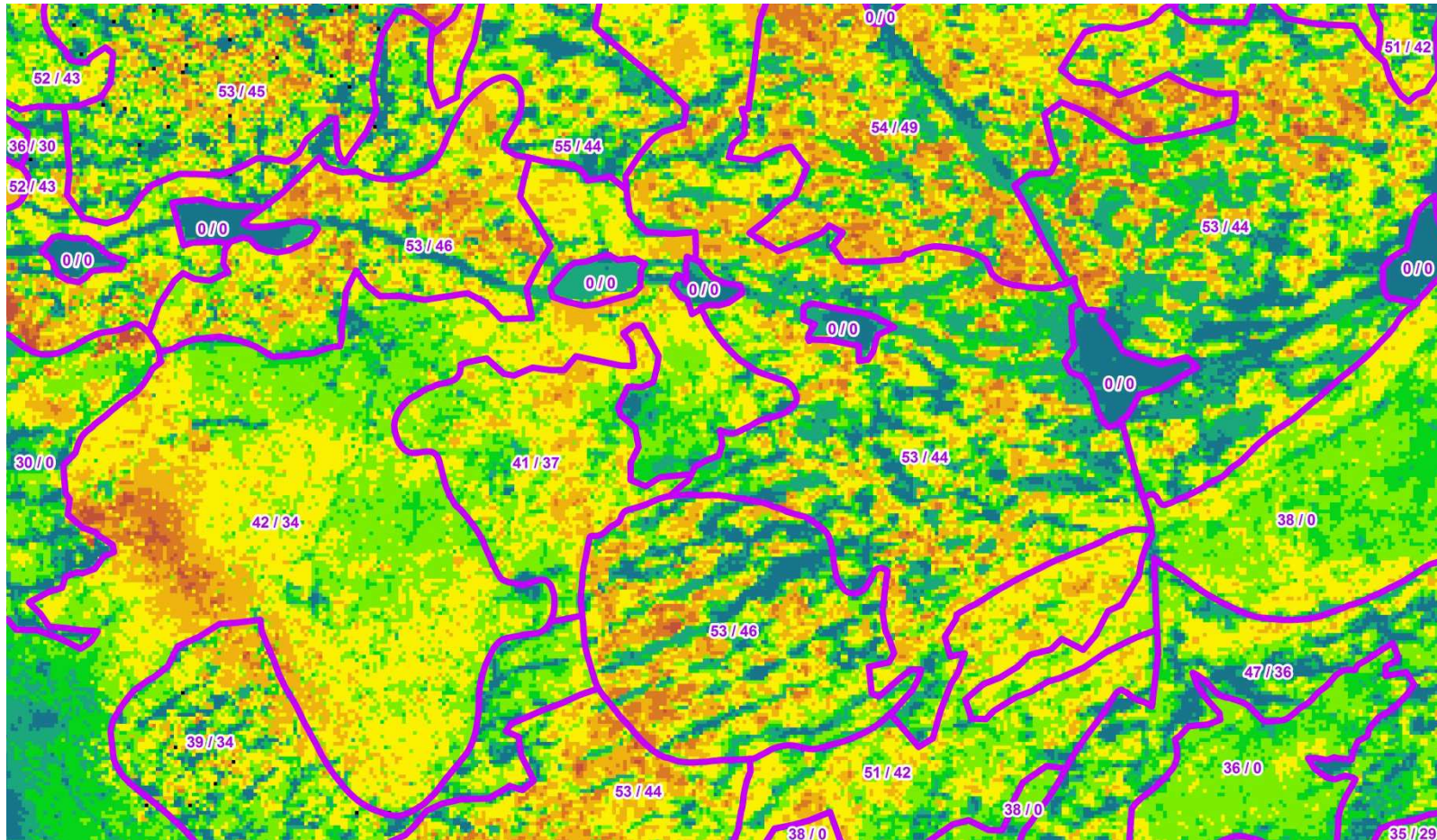


5. Image-Based Point Clouds



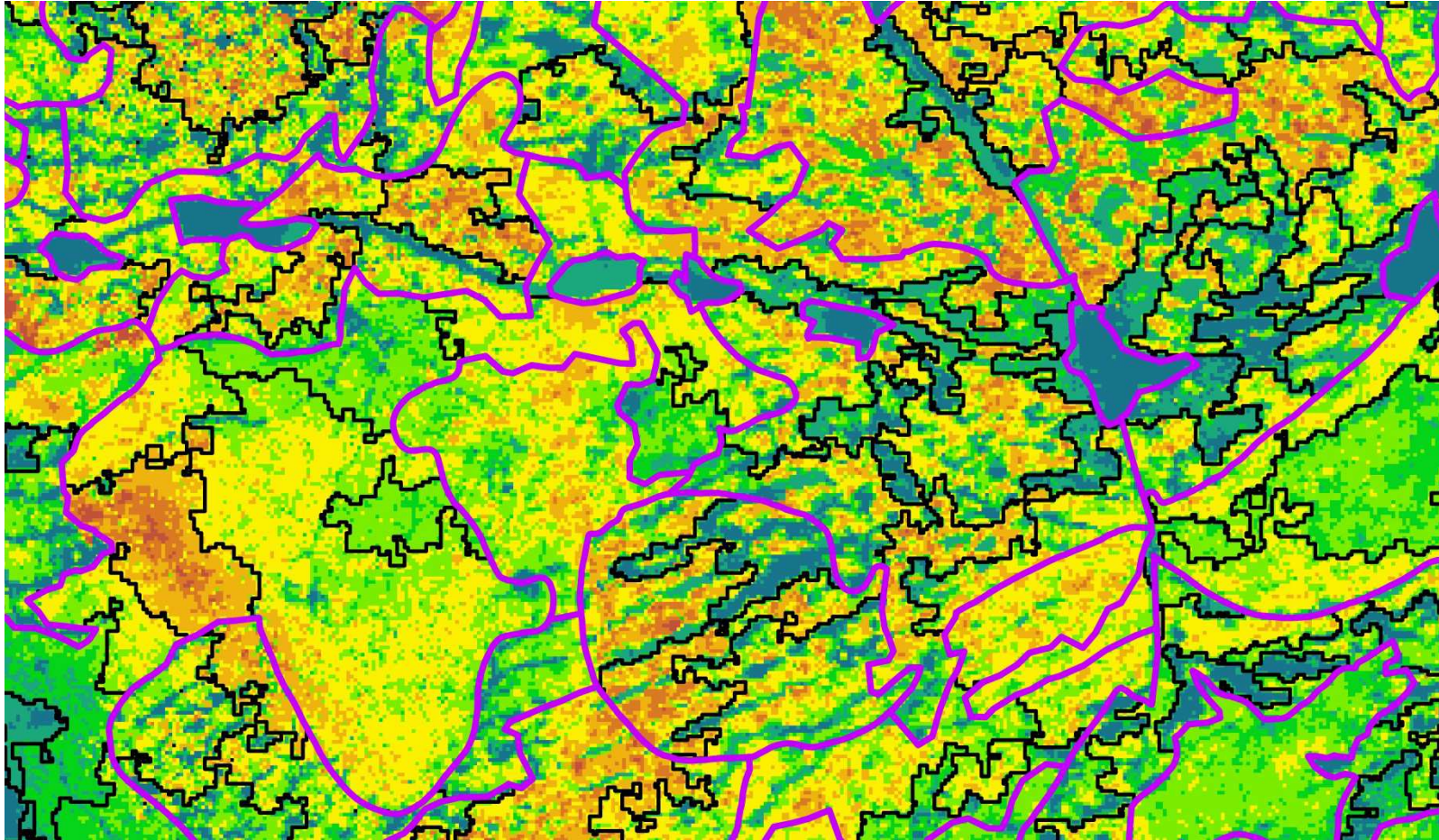


5. Image-Based Point Clouds



Traditional stand map with point cloud heights

5. Image-Based Point Clouds



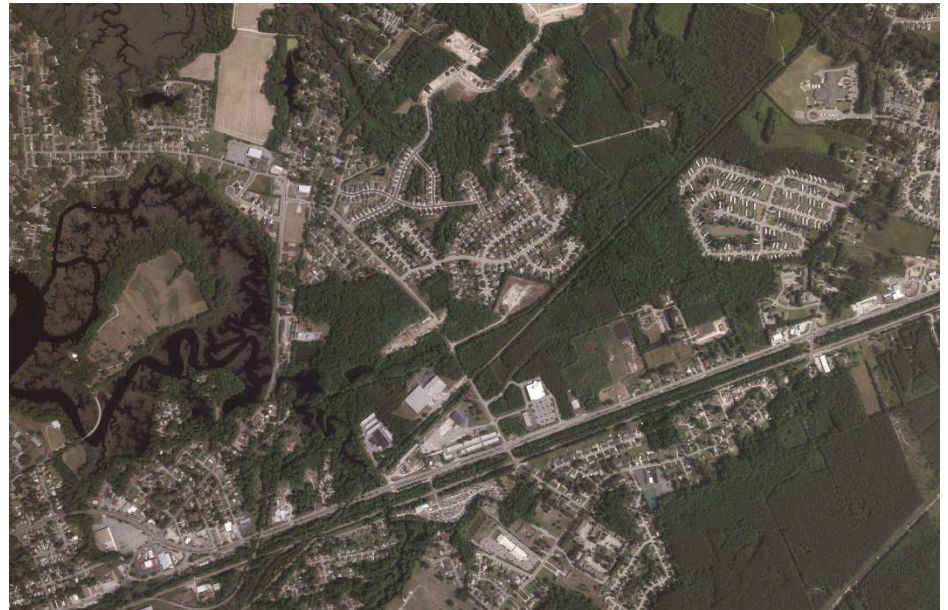
Sub-stand polygons derived from height rasters



4

Digital Sensors / Imagery

4. Digital Sensors / Imagery

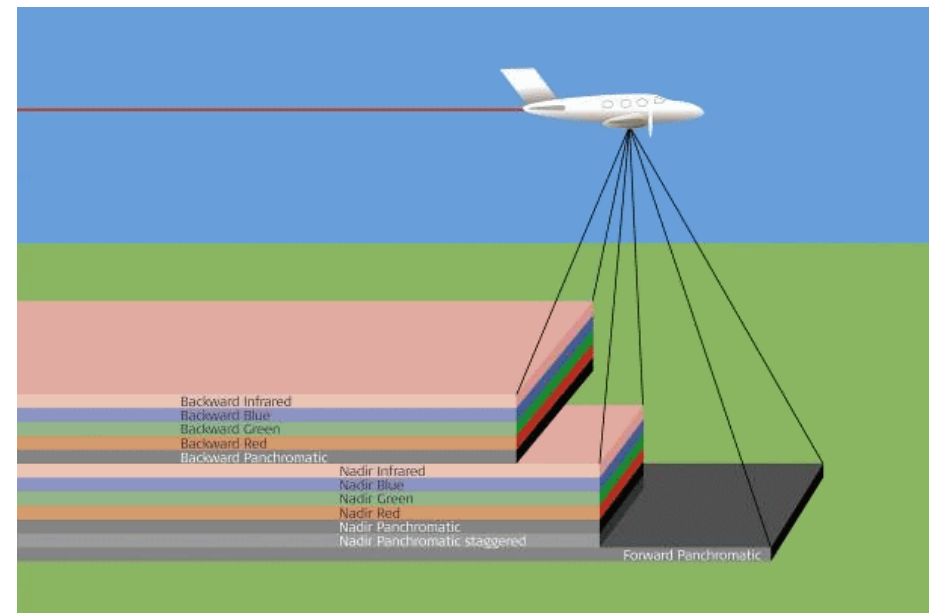


4. Digital Sensors / Imagery



4. Digital Sensors / Imagery

- GSD (Ground Sample Distance) has replaced scale
 - 30cm GSD typical for forest cover type mapping
- Cost Structures for Acquisition Have Changed
 - Idea that lower resolution reduces price no longer really holds above 30cm
 - Monoscopic no longer saves



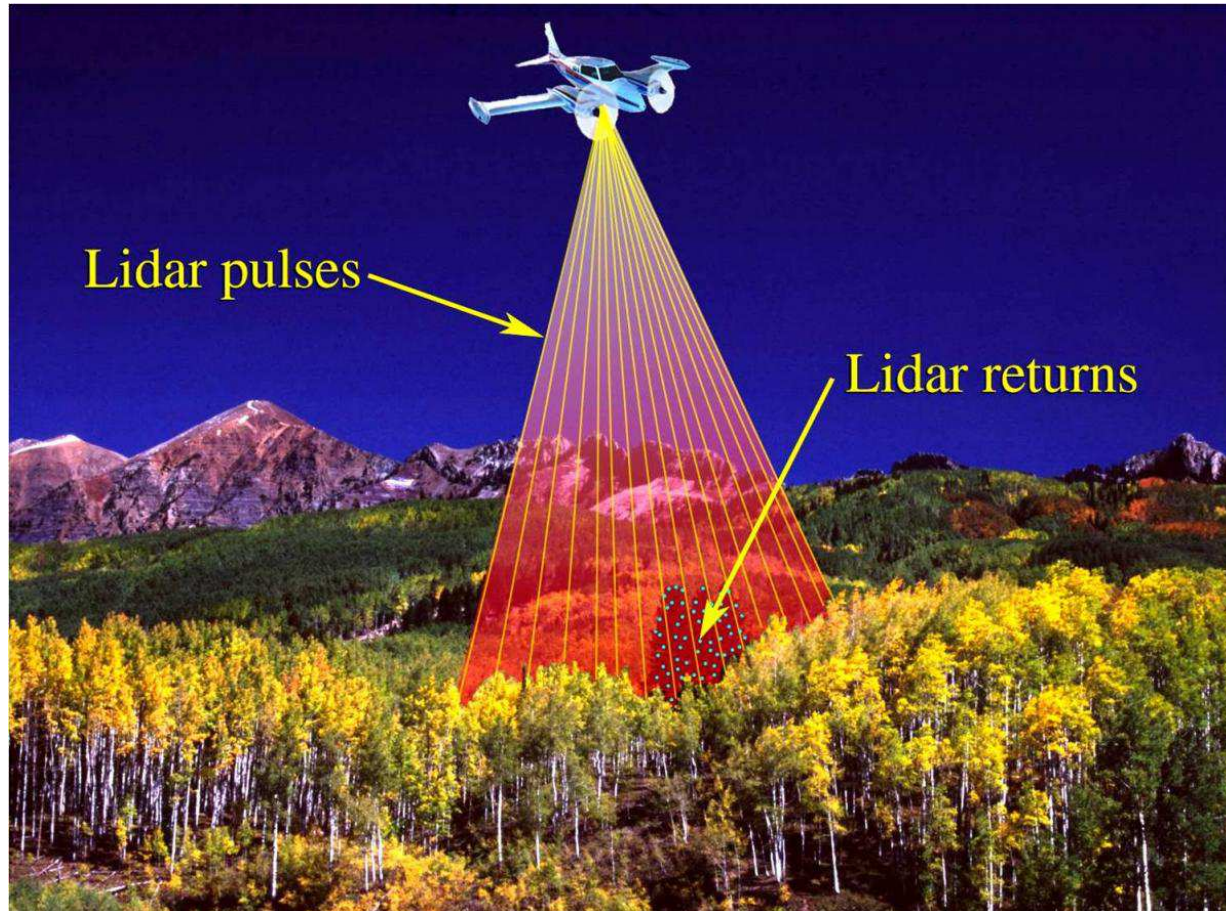
Source: Leica Geosystems



3

LiDAR

3. LiDAR





3. LiDAR

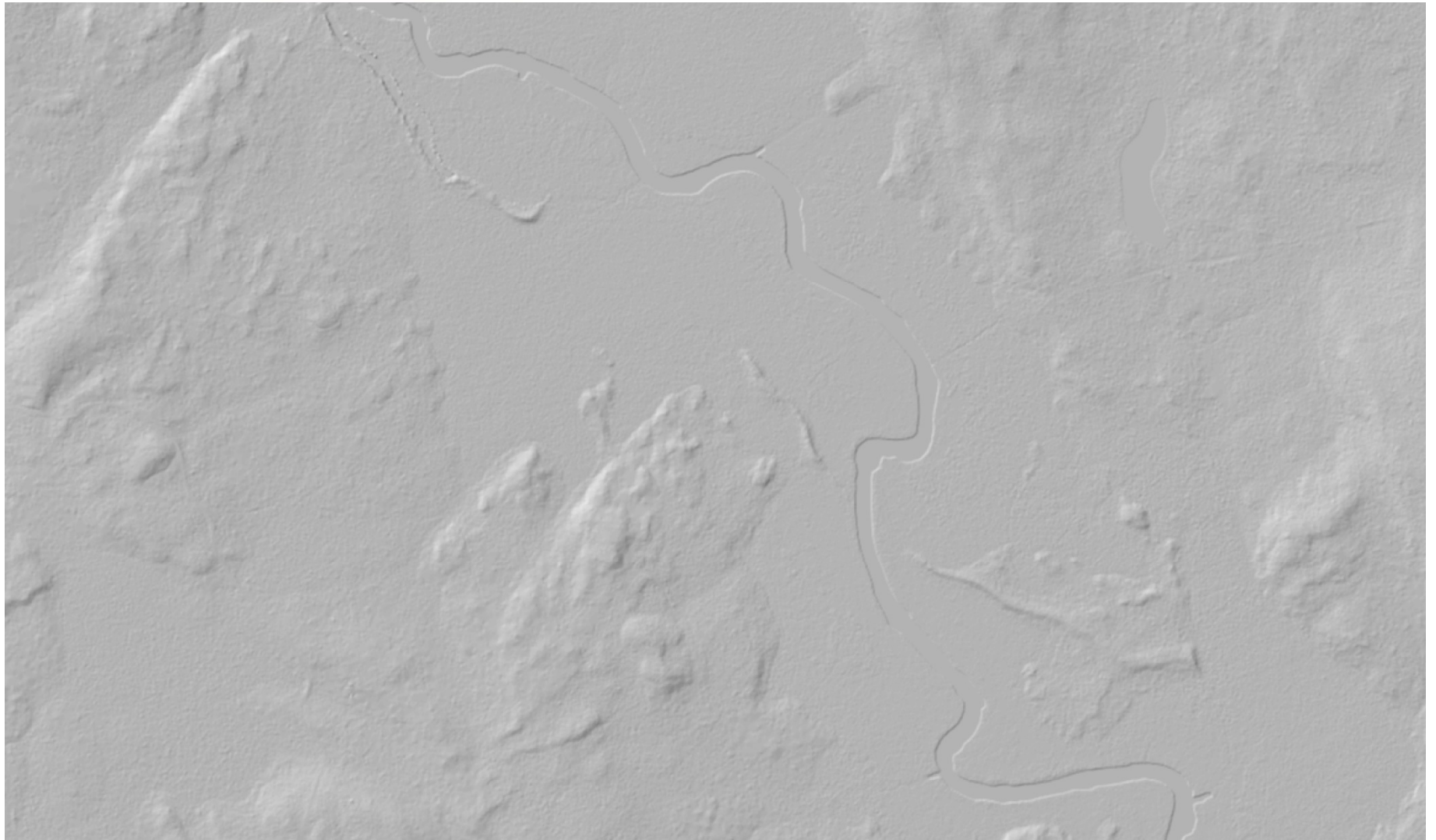
10m USGS DEM





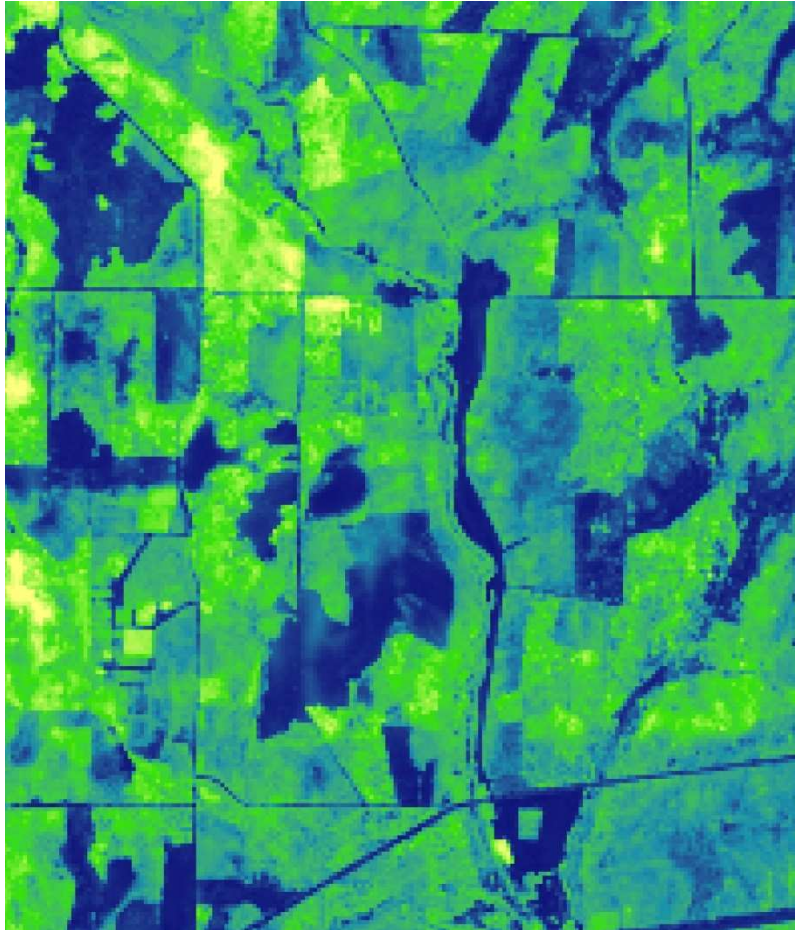
3. LiDAR

2m LiDAR DEM





3. LiDAR



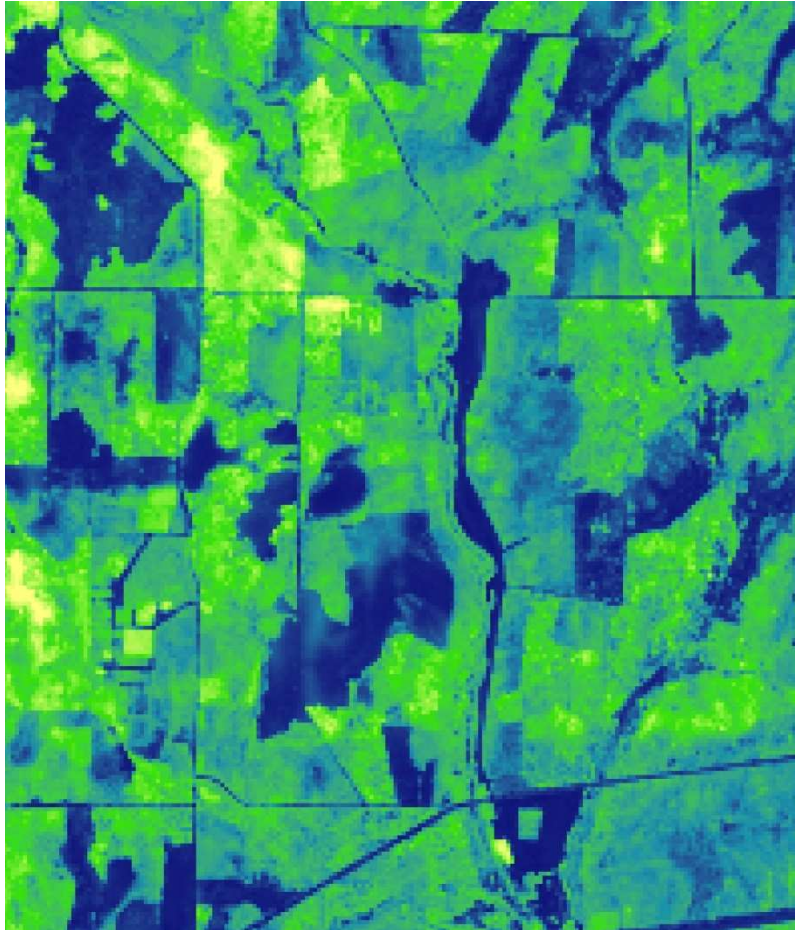
Basal area for mixedwoods

 **Forest Inventory Metrics**

 **Individual Tree Analysis**



3. LiDAR



Basal area for mixedwoods

- **Forest Inventory Metrics**
- **Individual Tree Analysis**
- **Inspired a significant change in how we think about and use forest data**

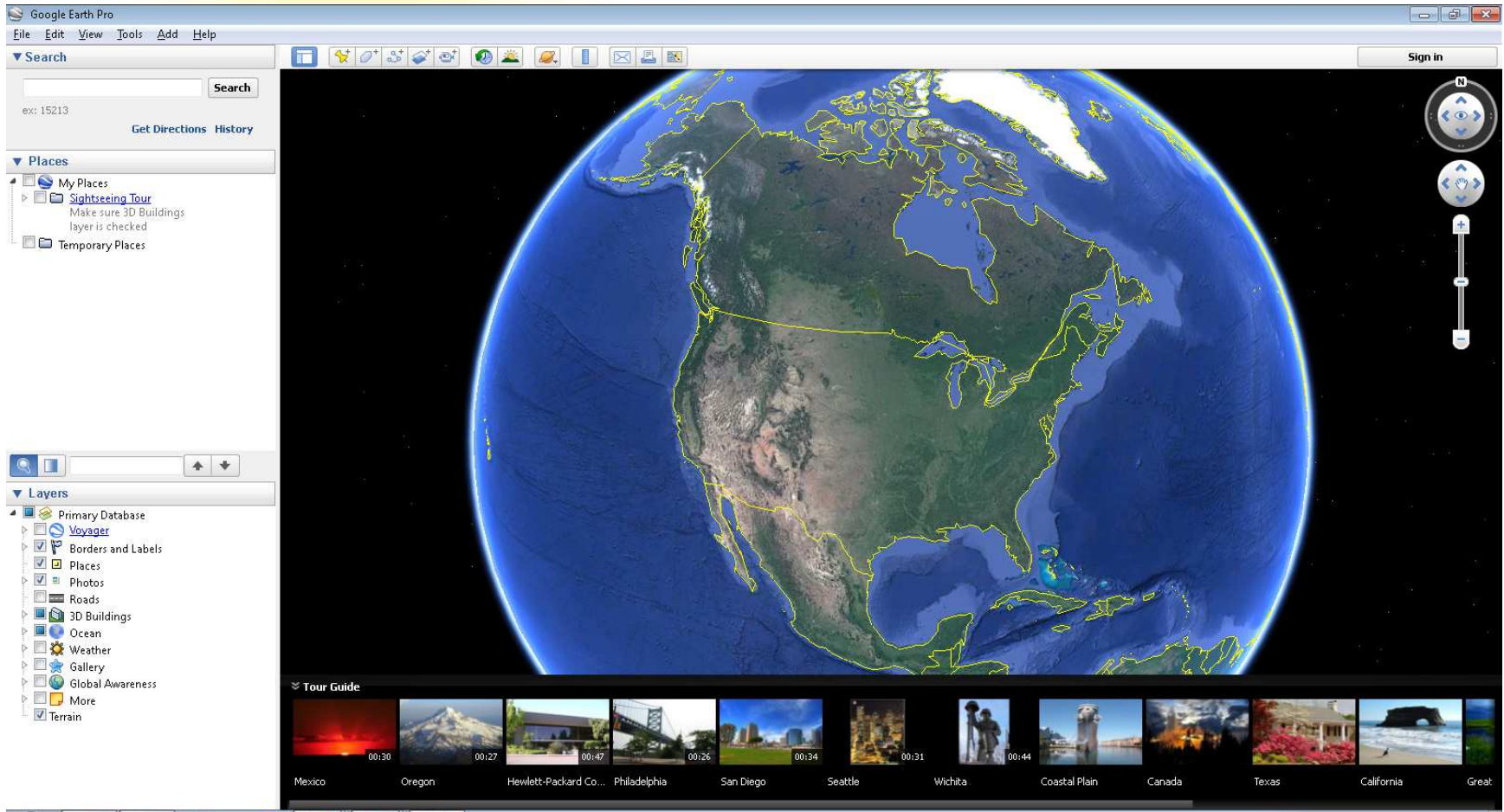


2

Google Earth

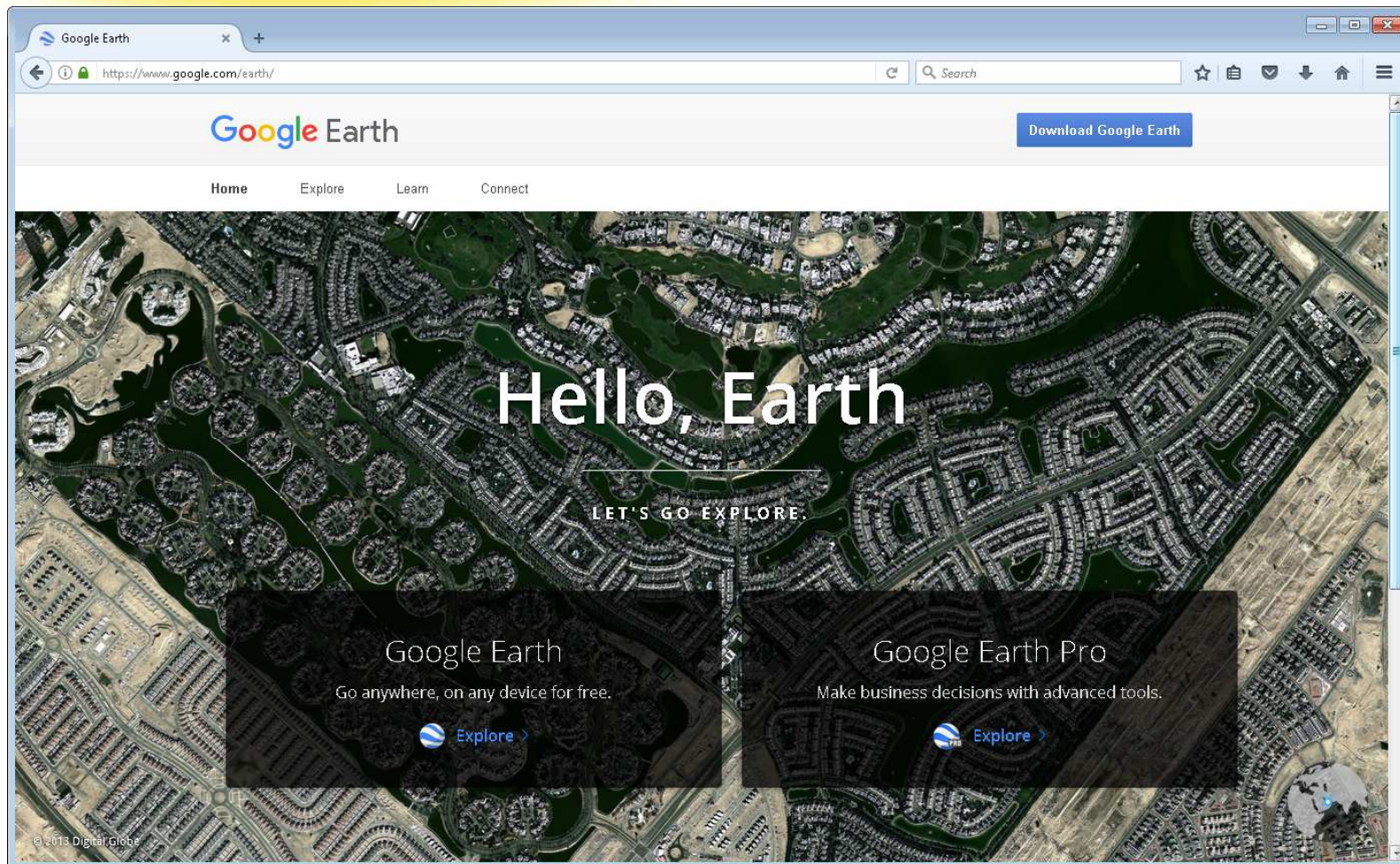


2. Google Earth





2. Google Earth





1

Expansion of the National Agricultural Imaging Program (NAIP)

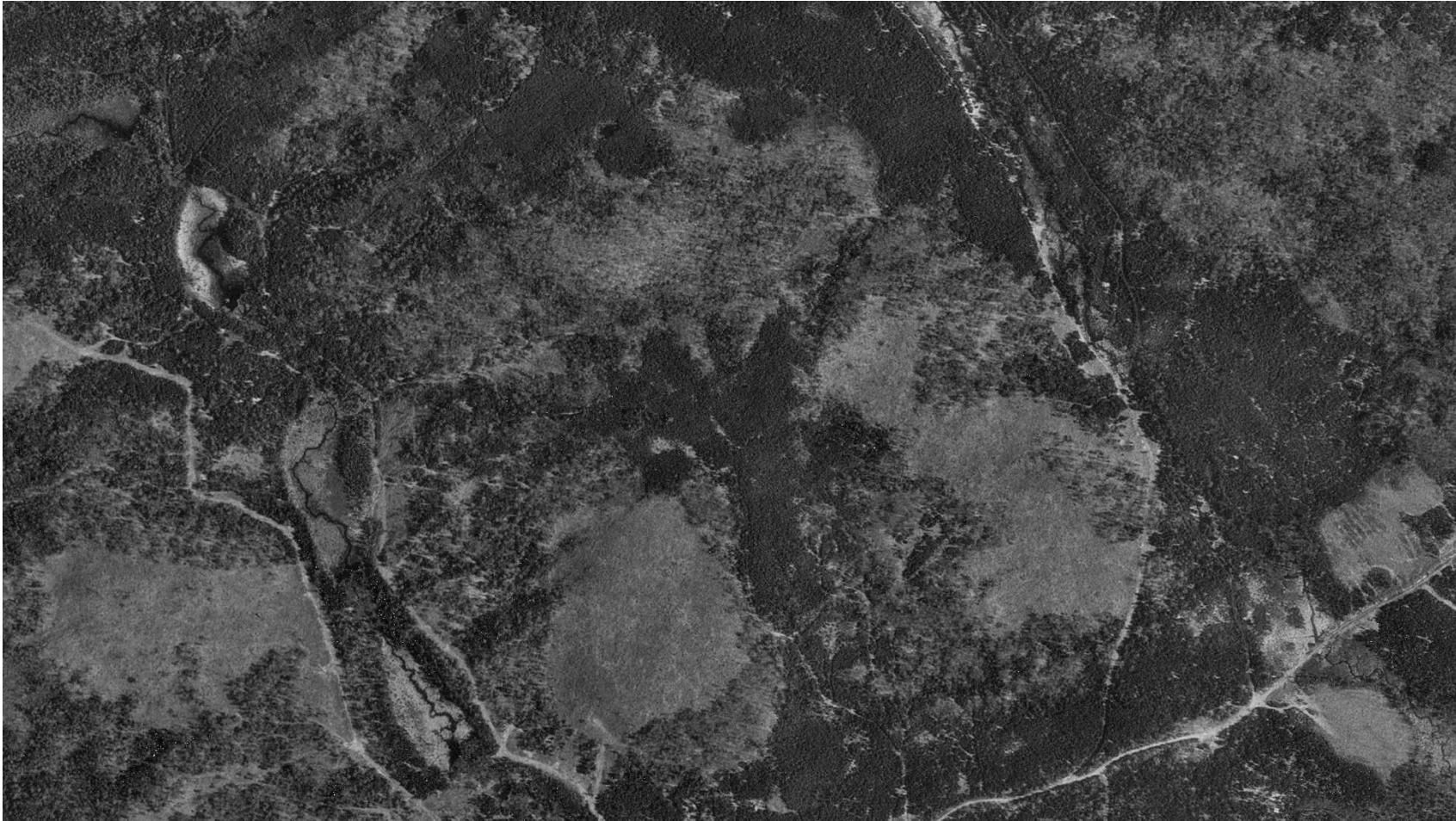


1. Expansion of NAIP





1. Expansion of NAIP





1. Expansion of NAIP





Wrap - Up

- **Don't forget about advancements in support infrastructure.**
- **It takes time for some technologies to truly show their value and benefit.**
- **Watch for the technologies that change how we think about things.**
- **Pay attention to technology that changes how others interact with forestry and the world.**
- **Significant changes do not necessarily come from earth shattering technological advancements.**



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