

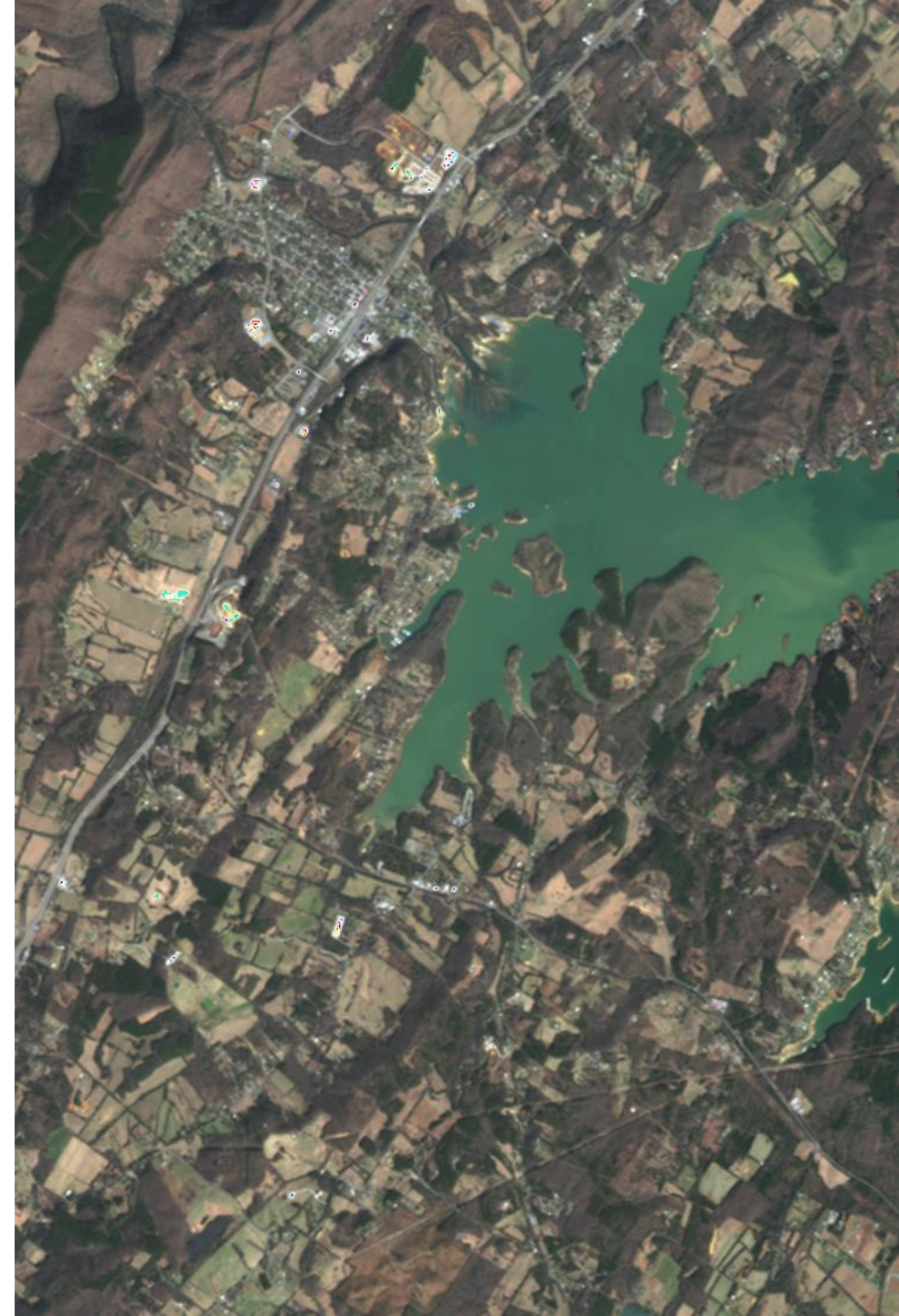
Environmental Law Institute Workshop

EXAMPLES OF REMOTE SENSING TECHNOLOGIES

Andrew Mindermann

Geospatial Operations Manager

Skytec LLC



Skytec

About Us

- Est. in 2015
- Based out of Chattanooga, TN
- 50+ years of GIS expertise

Services

- Ranger –Remote Monitoring
- Geospatial Consulting
- Drone Mapping & Analysis



ArcGIS Marketplace
Provider



Nonprofit
Specialty

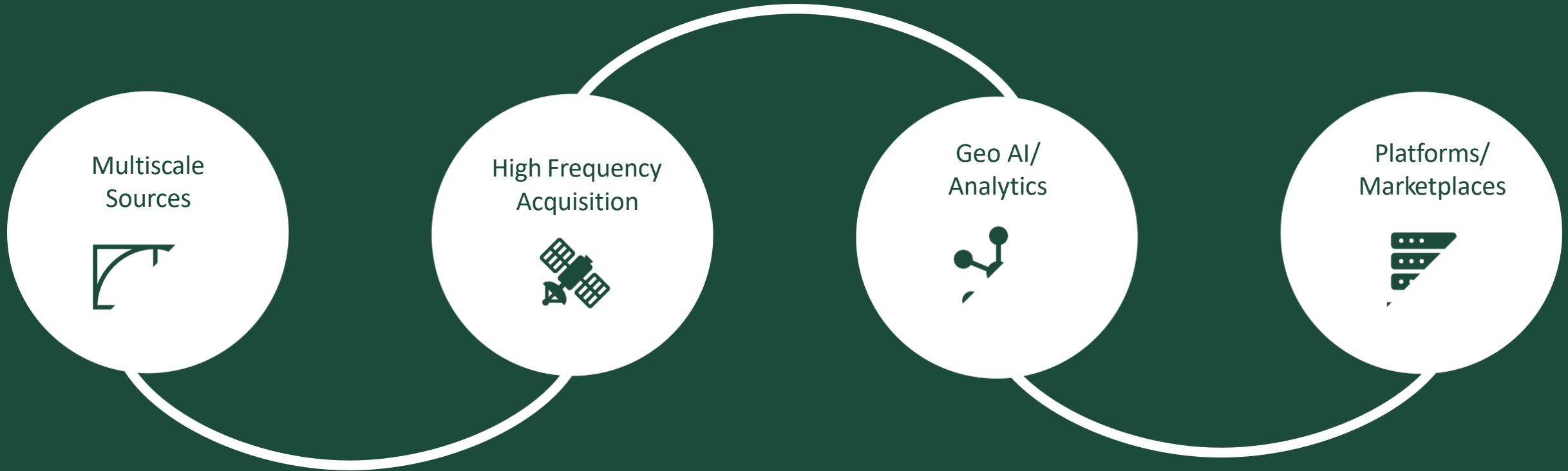


ArcGIS System Ready
Specialty



Key Technology Advancements

of remote sensing & remote monitoring





Multi-Scale Sources

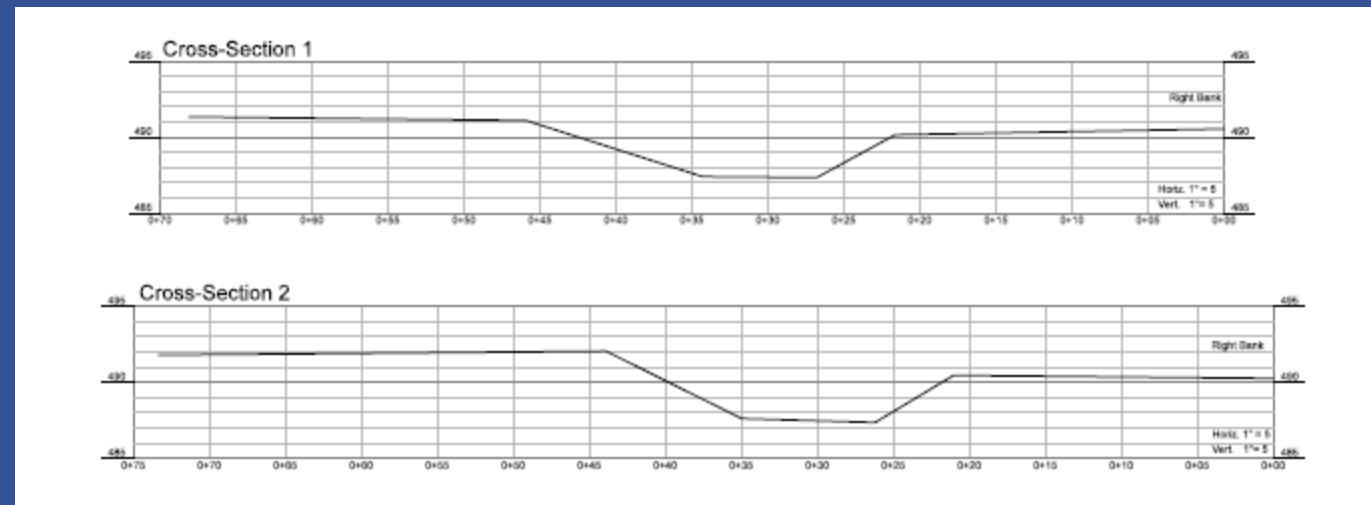
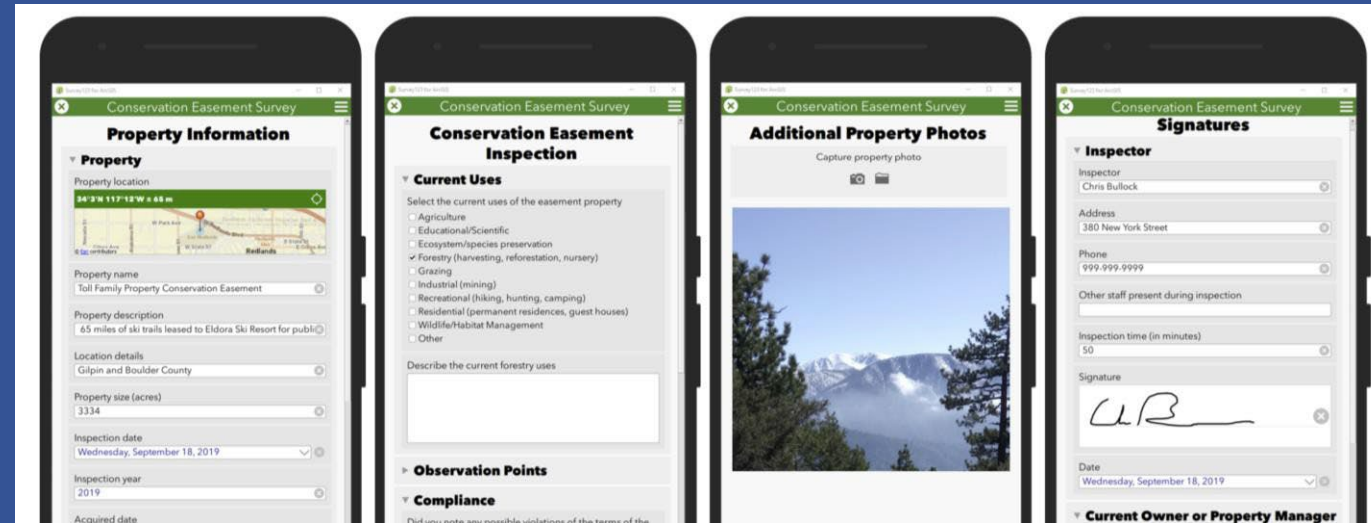
Get the resolution you need from the ground up.





Field Monitoring

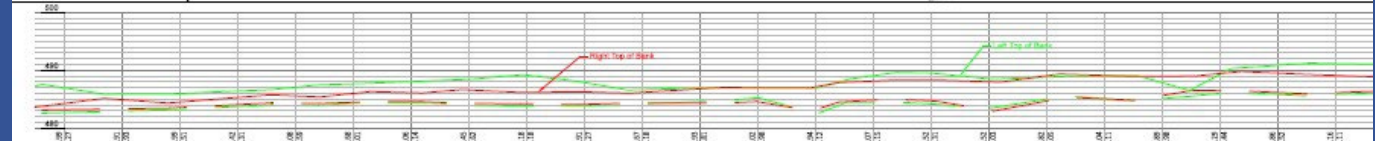
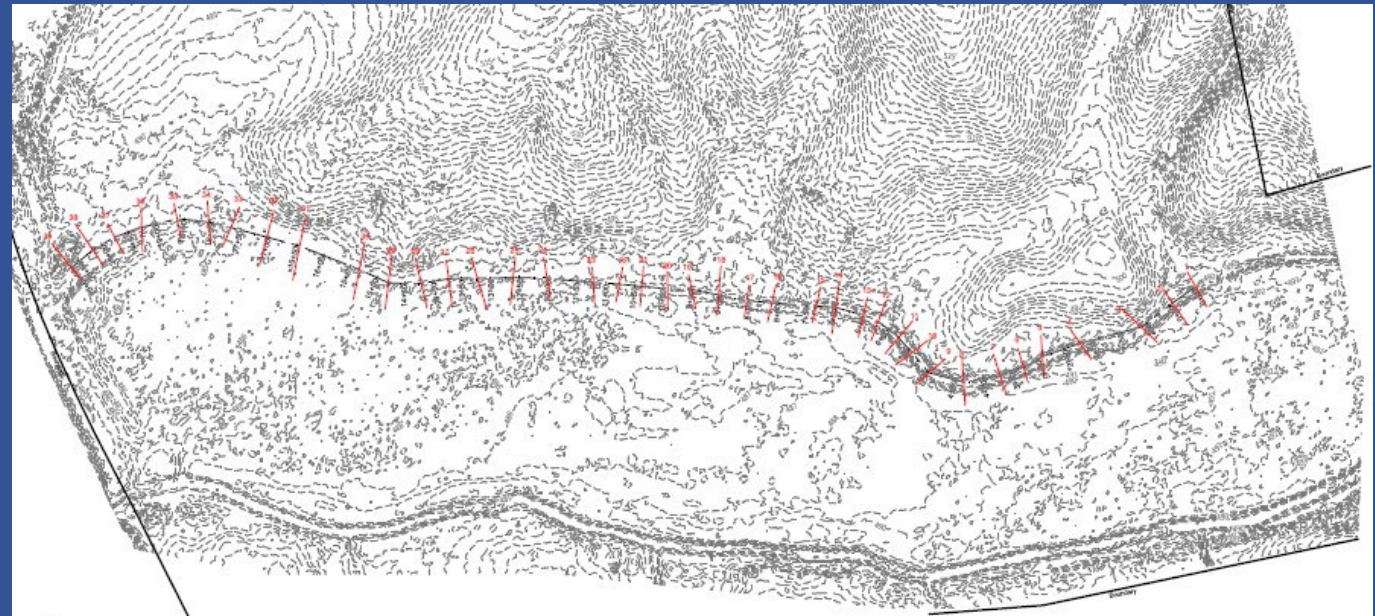
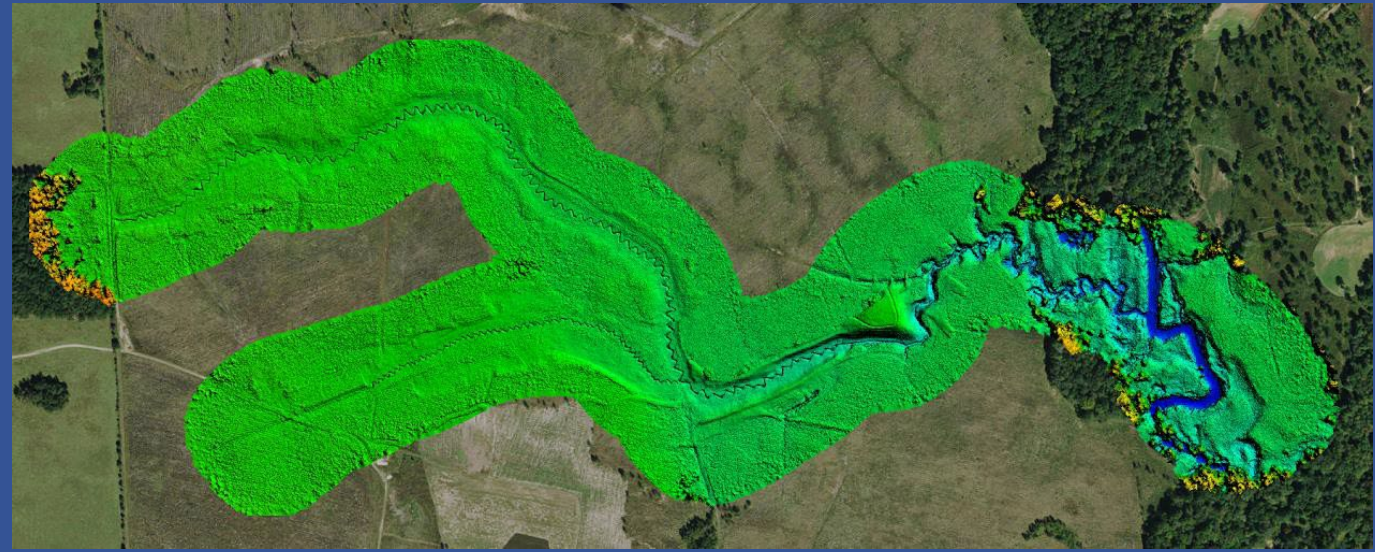
- Ground Control Points
- Oblique Imagery/Property Photos
- IoT/Sensors
- Traditional Field Monitoring





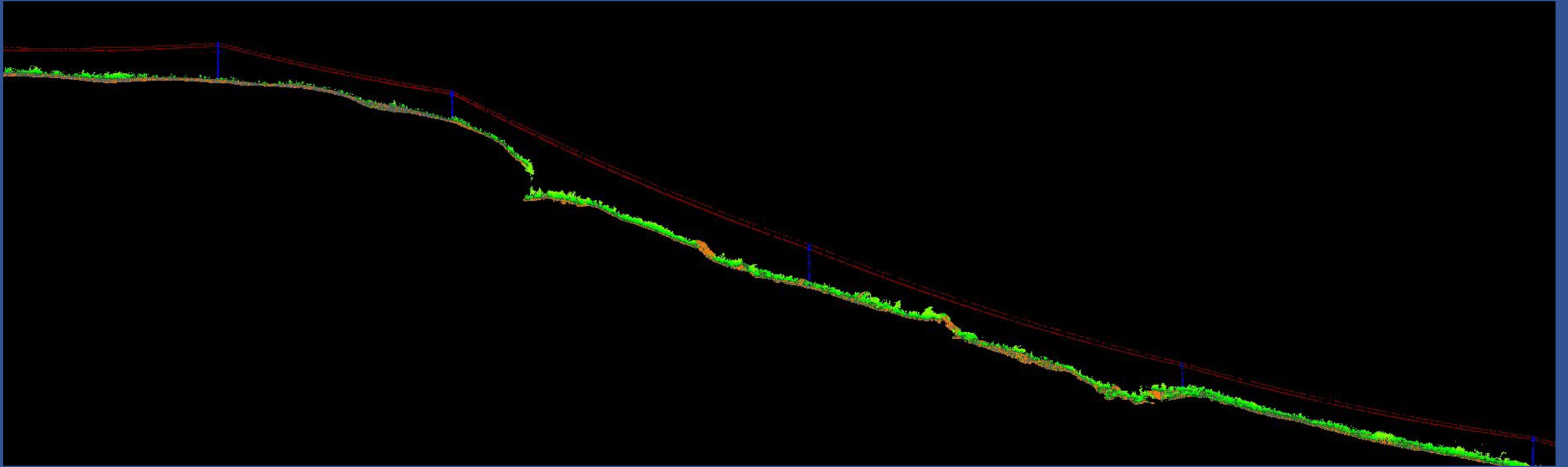
UAS/Airborne

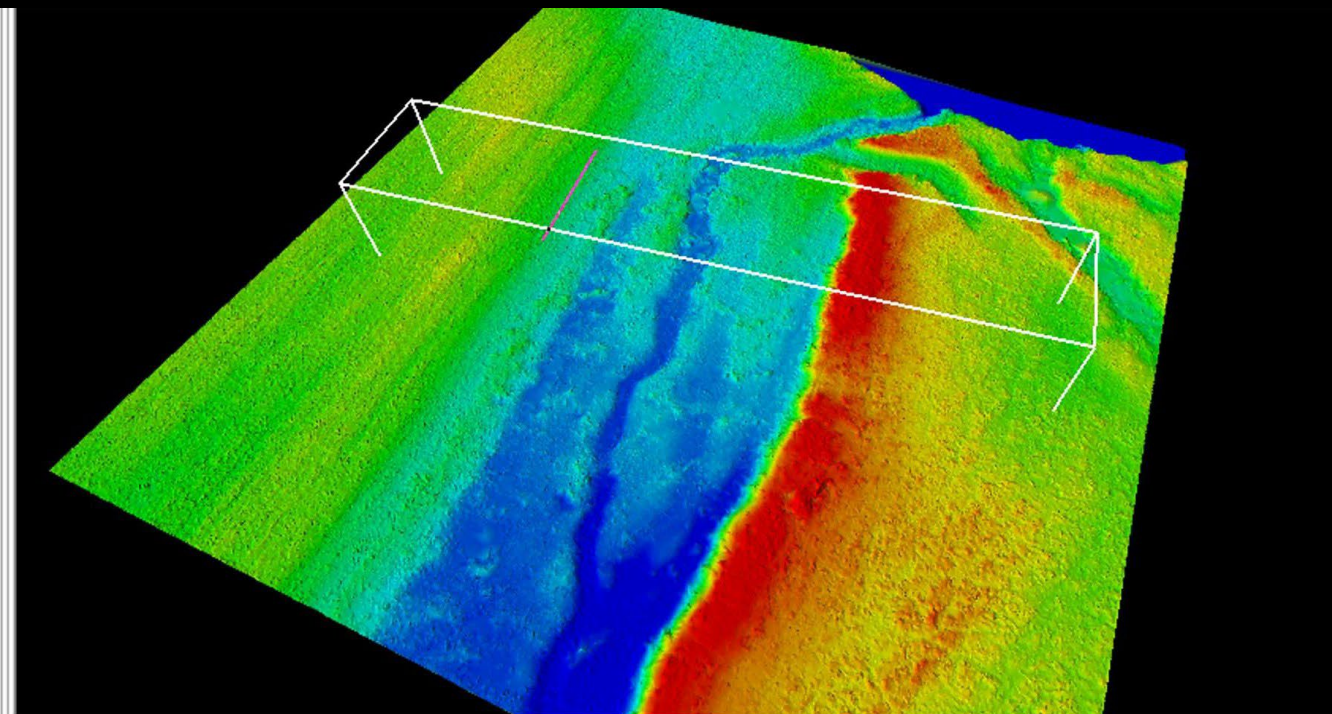
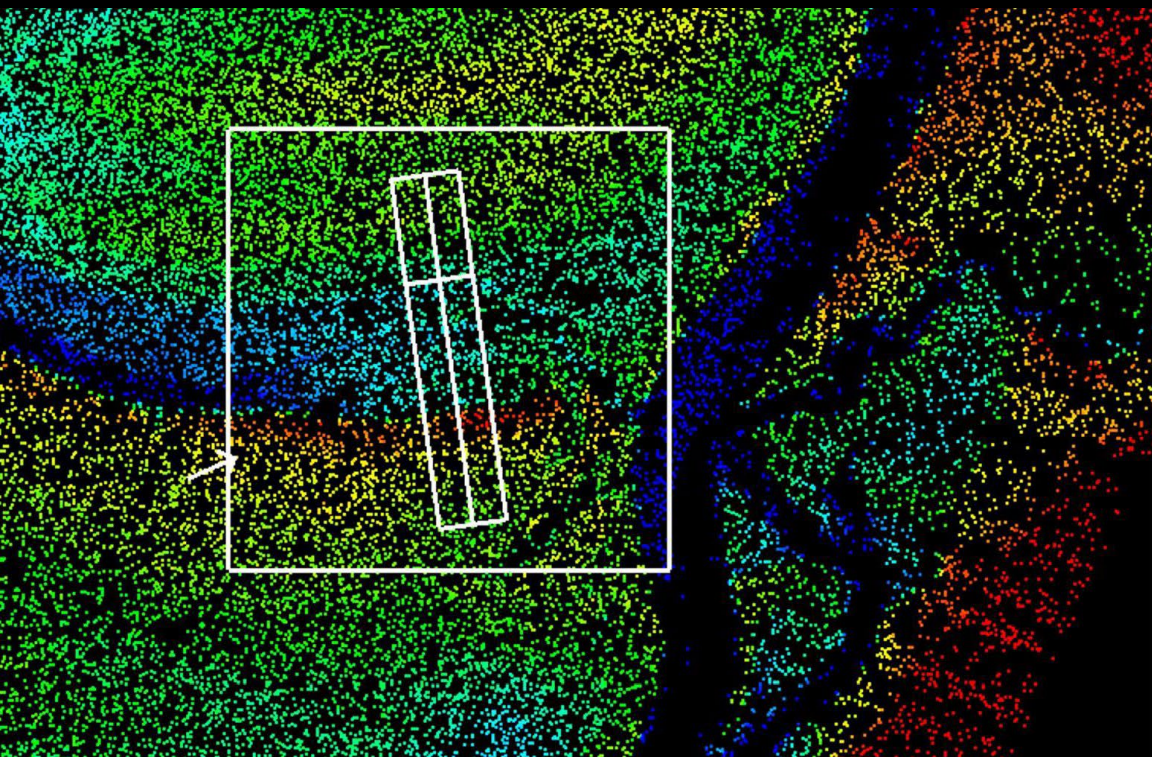
- High density LiDAR pointcloud
- High resolution imagery
- Integrated with survey control set by Professional Land Surveyor
- Creates authoritative baseline
- Future protocol for long term monitoring programs





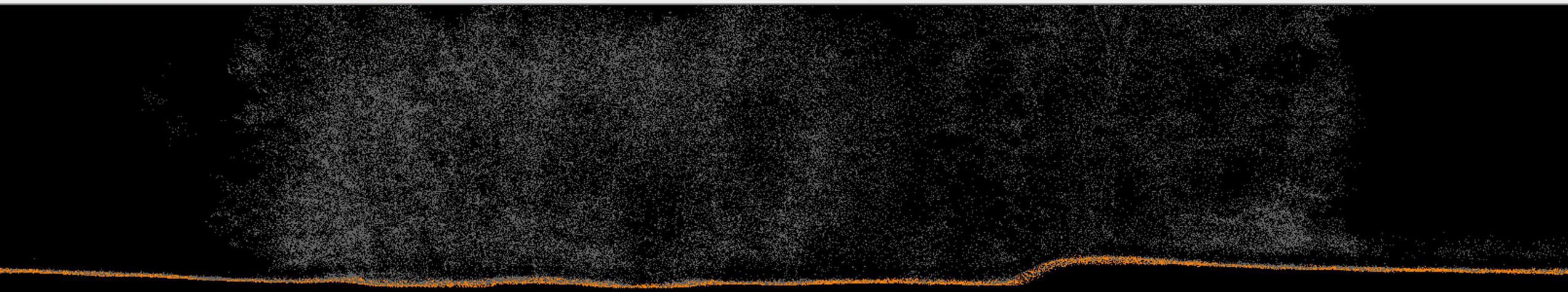
UAS LiDAR

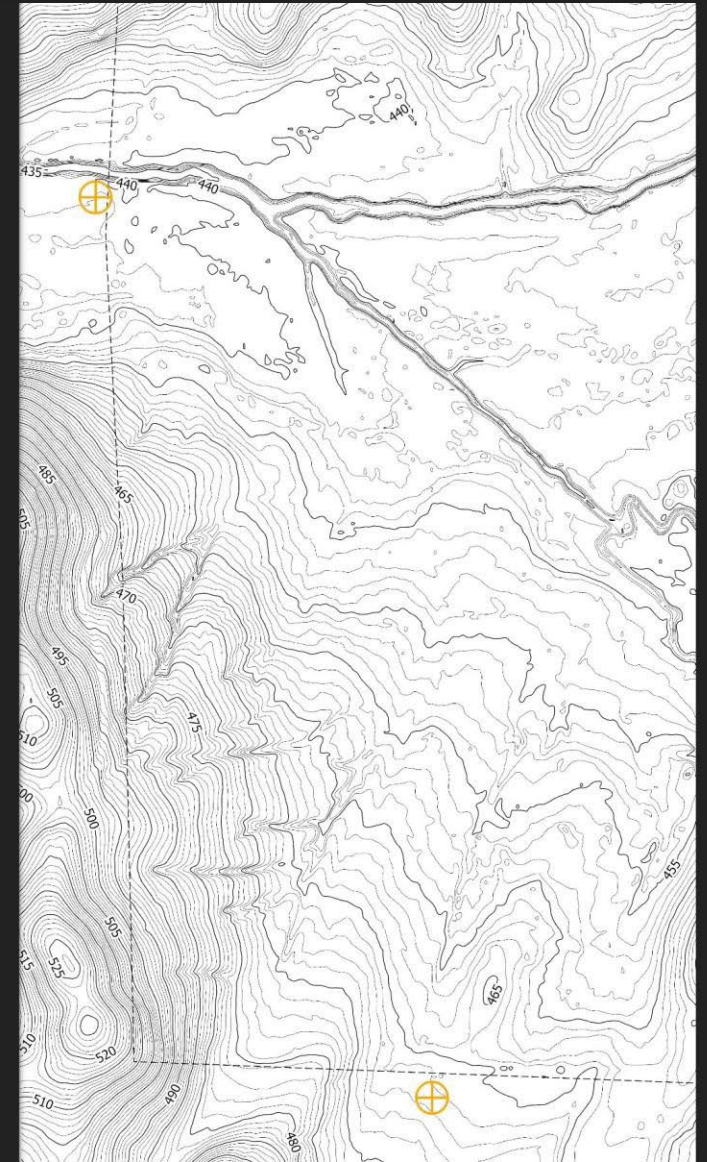
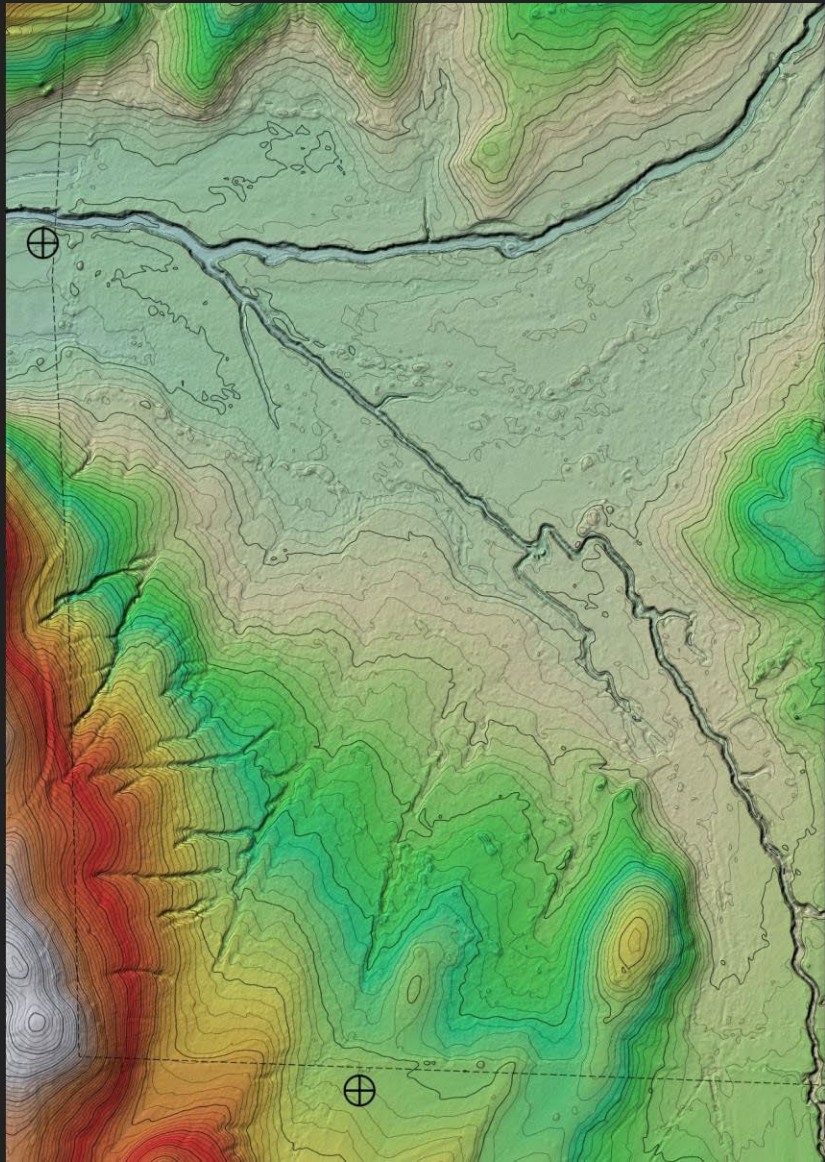




Drawing complete. 183,510 TIN (100.00%) Vertical Scale: 1.0000 F1 for Help

Filter: No Noise Destination Class & Flags:



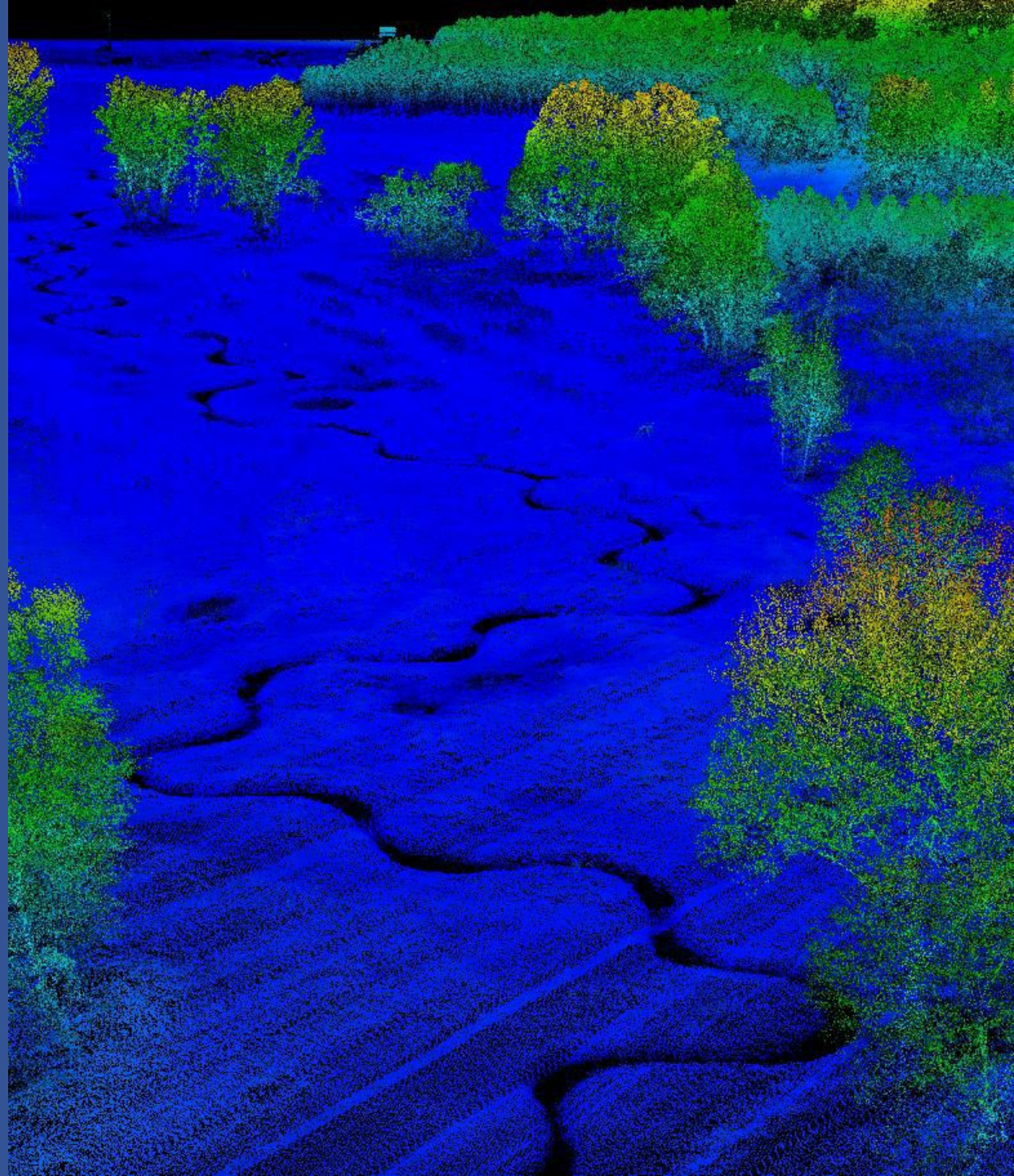




Digital Twins for Baseline Conditions

UAS/Airborne

- 3D design grade digital models of built & natural features
- Definitive baseline for future monitoring
- Commonly used in mitigation projects (pre and post design)





Satellite Imagery

Frequency

- Coverage ranges from daily up to every 8-16 days

Varying Resolution Based on Product

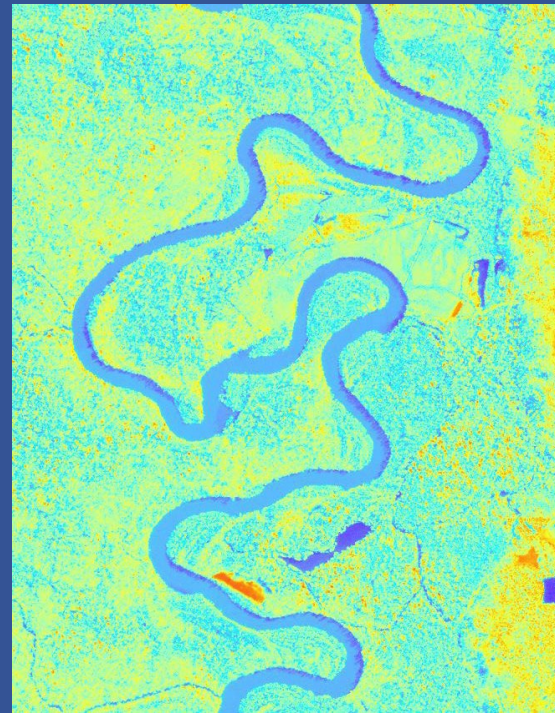
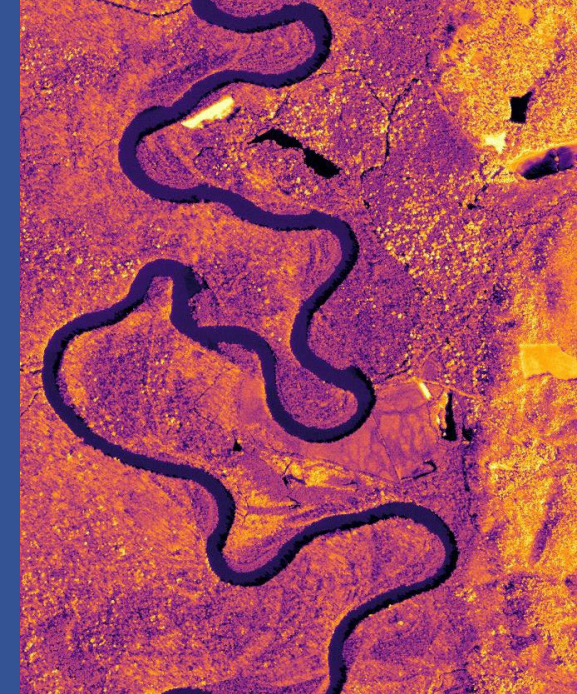
- 15 m resolution down to 24 cm

Cost Savings

- Prioritization of field work
- Desktop site discovery
- Remote assessments of vegetation establishment
- Continuous monitoring of numerous sites for changes to land use or site conditions

Spectral Bands

- 4 bands up to 300
- Each band corresponds to a specific range of wavelengths that convey specific information on feature of interest





High Frequency Acquisition

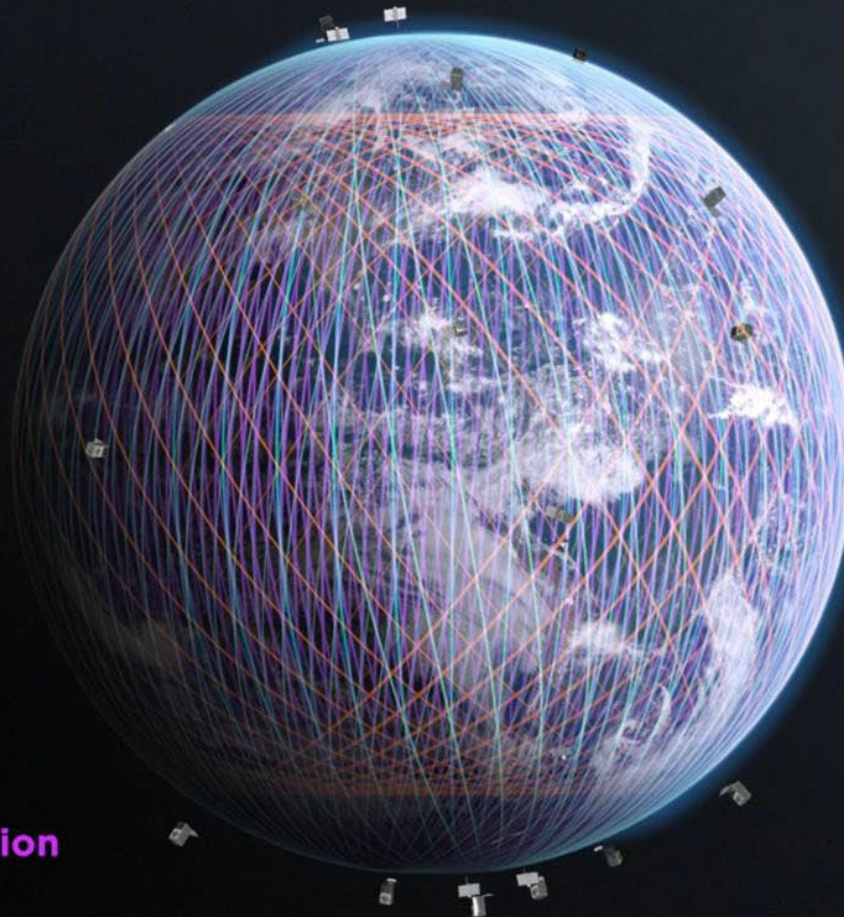
Planet Dove Satellite



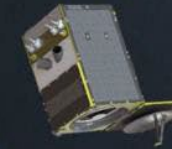
- Always-on, broad-area monitoring
- 3 meter resolution
- RGB and NIR bands

Planet Dove Constellation

~98° Sun-Synchronous Orbit



Planet SkySat Satellite



- Custom, targeted monitoring
- 50 centimeter resolution
- RGB, NIR, and Pan bands

Planet SkySat Constellation

SkySats 1-15

~98° Sun-Synchronous Orbit

SkySats 16-21

~53° Inclined Orbit





High Resolution Satellite Tasking

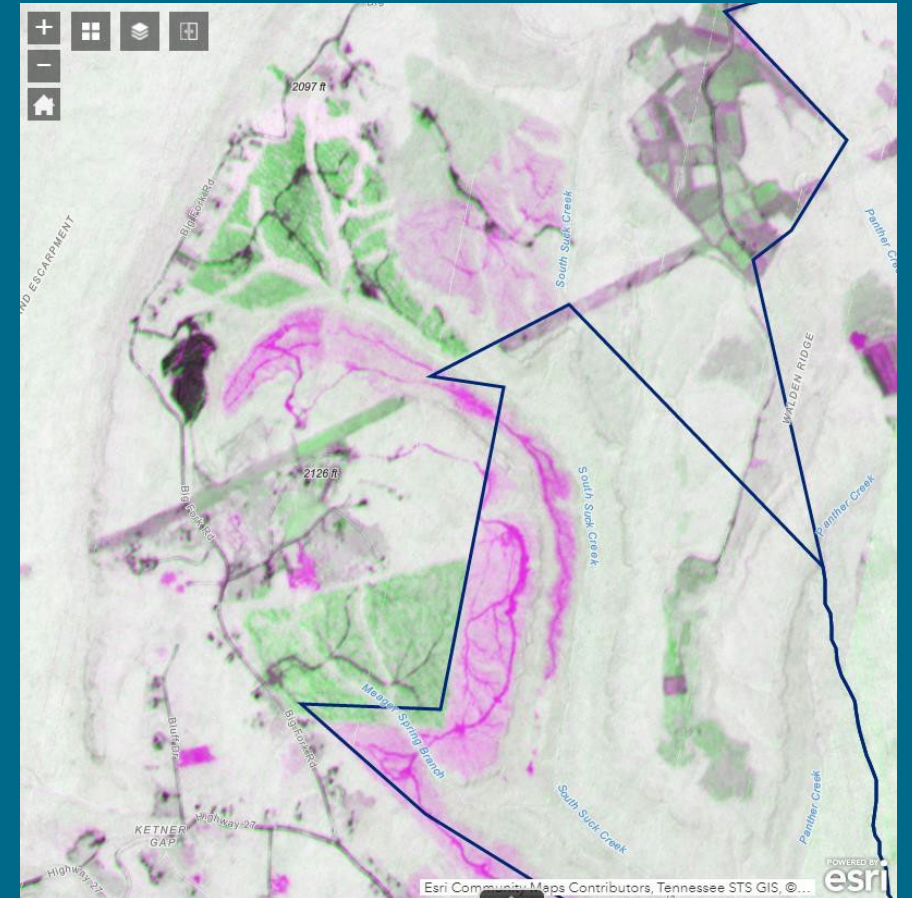
- Growing number of < 1-meter resolution tasking options on the market
- Most include multispectral with hyperspectral on the rise
- Great option for verification & high-resolution change detection





Geo AI/Analytics

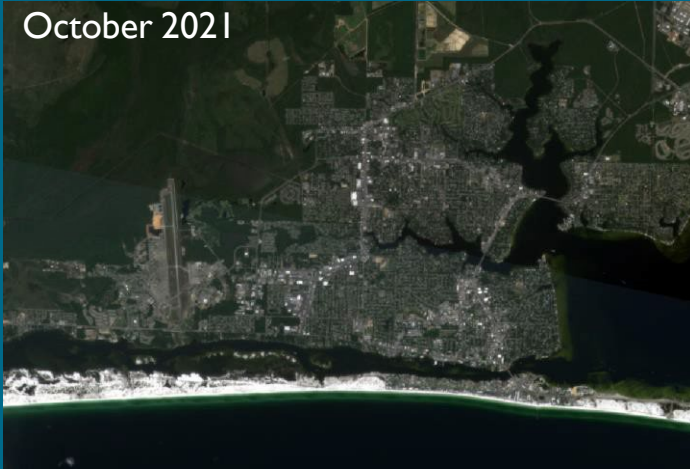
- Satellite imagery used for automating change detection
- Near Infrared band of imagery used to create indices
- **Green** areas represent vegetation growth
- **Magenta** areas represent harvesting or land disturbance
- Combination of spectral difference over time and machine learning feature extraction



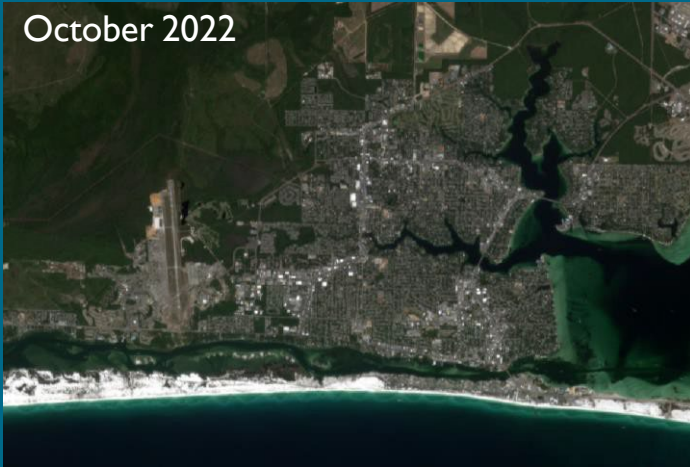


Geo AI/Analytics

October 2021



October 2022

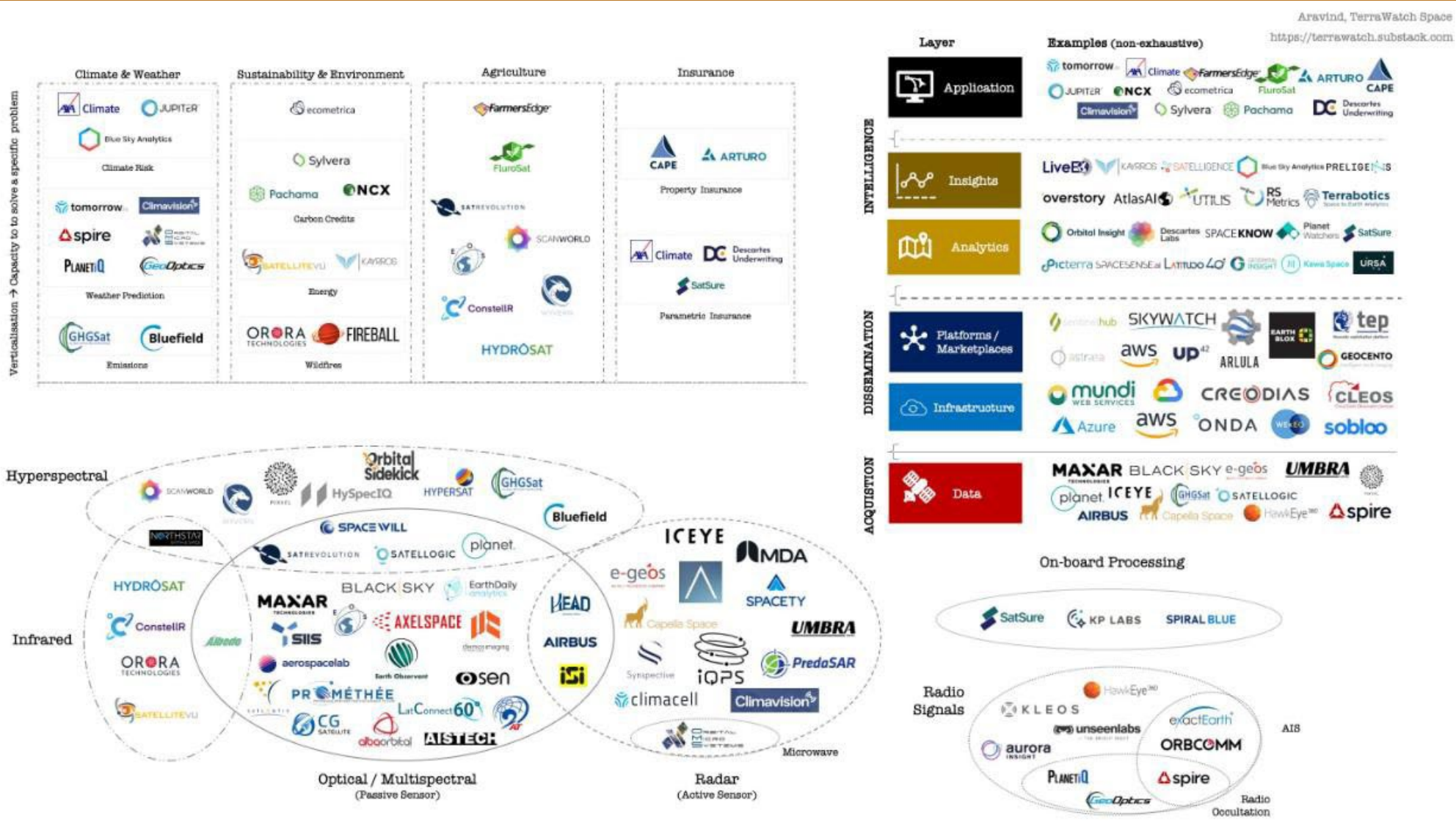




Geo AI/Analytics



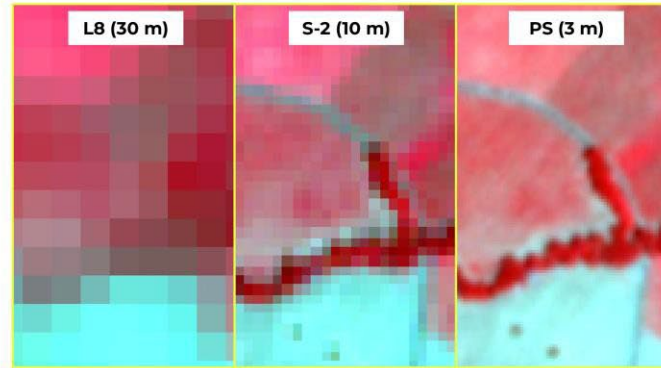
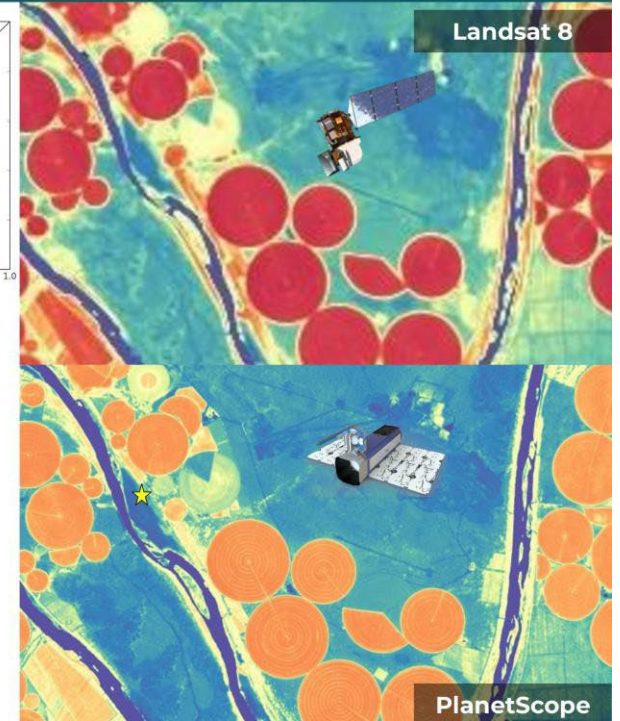
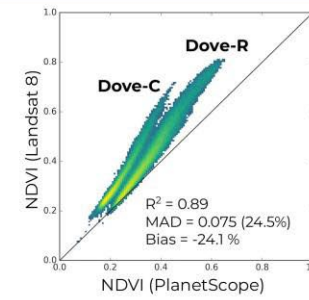
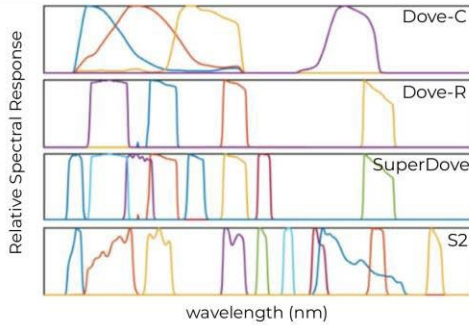
Platforms & Marketplaces



Challenges & Limitations

Interoperability *is* usability

planet



Source: "Planet Fusion Monitoring: Next generation ARD via a CubeSat enabled sensor fusion approach", Rasmus Houborg, JACIE 2022, [Link to Slides](#)

Cost Restrictions

High resolution/high cadence data can be expensive.

Acquiring Data

Data providers often have subscription models (often unclear). Many serve as data vendors without analysis capabilities.

Best Fit Option

Rapidly growing number of sensors, bundles, offerings, & solutions. Image resolution can make or break.

Misleading

Competitive market results in potential misleading features (ex. 3D when feature is only 2.5D)

Traceability

Fusion data and derivative products can be very difficult to verify or trace back to the image pixel level.

Often contains high interpretation values.

No notification if images are reprocessed in image stacks.



The Problem

Natural resources and built assets are impacted and impaired by increasing rate of change

While management responses are slow, reactive, and built on limited old technologies

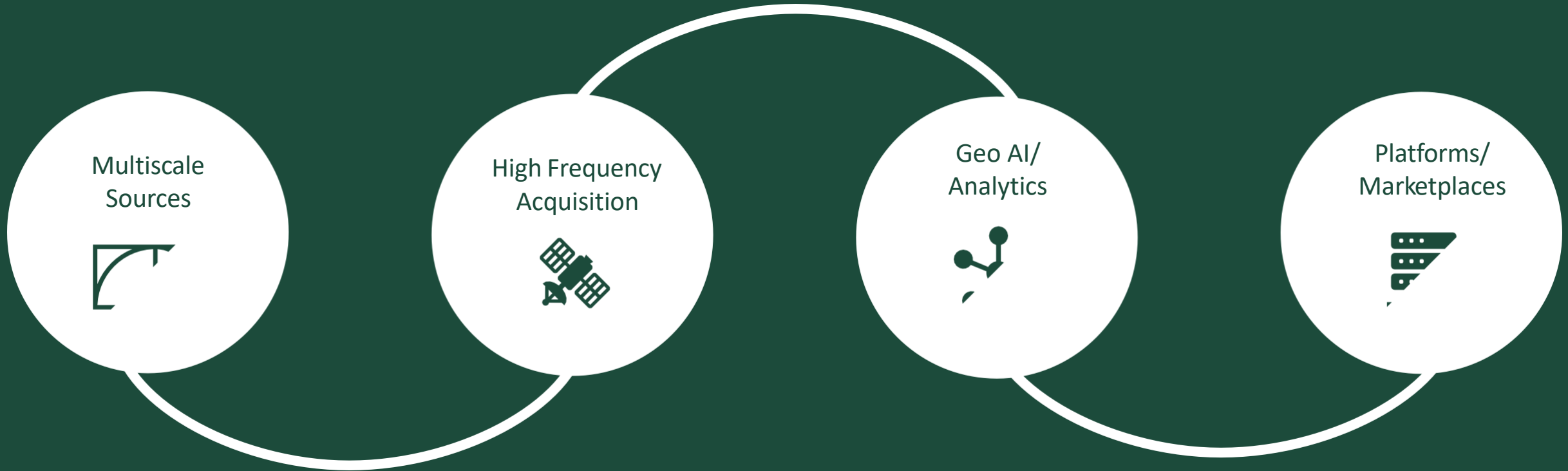


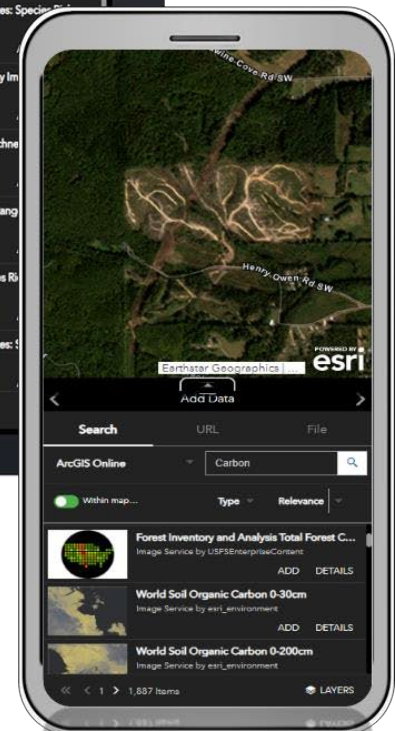
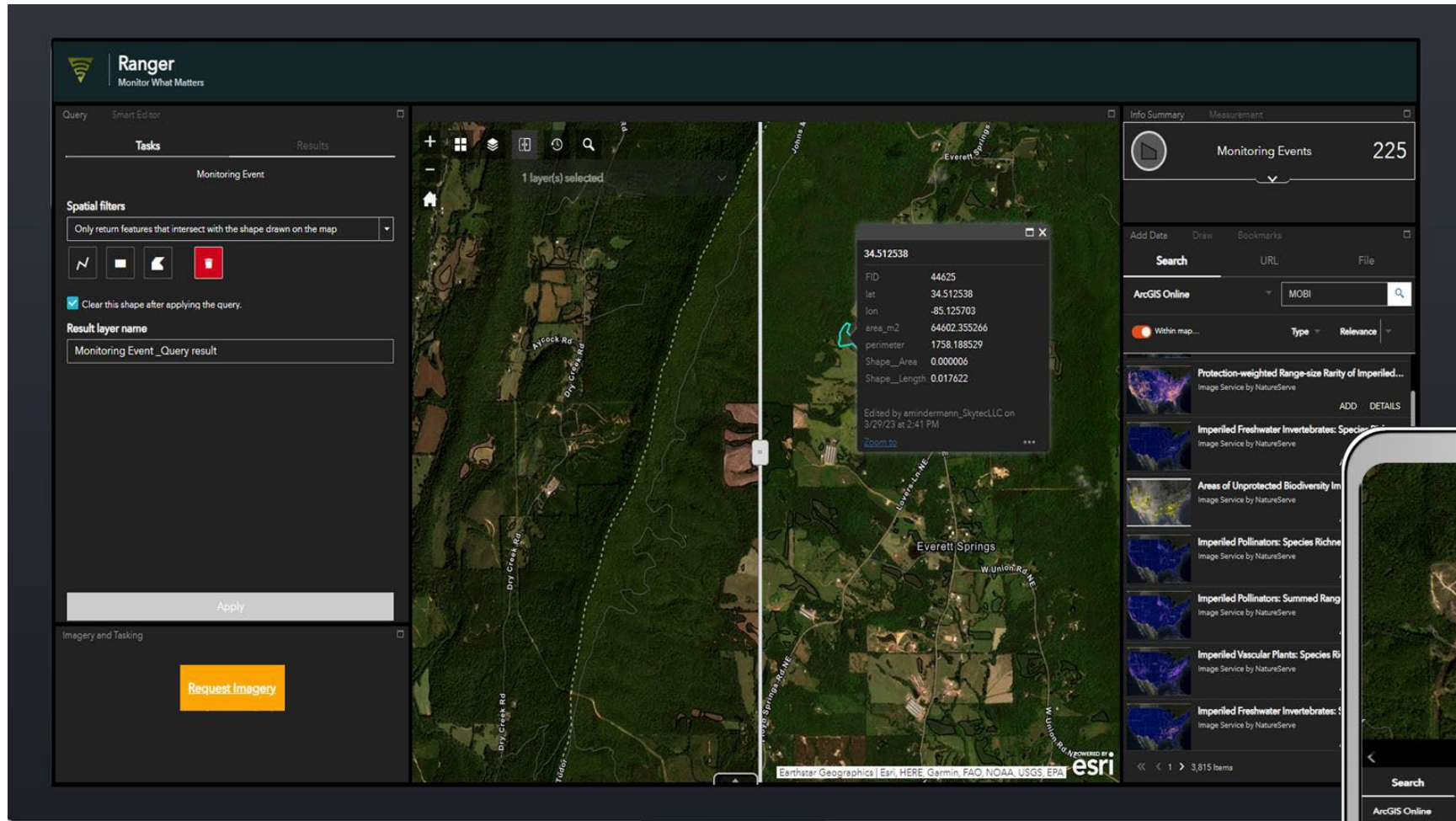
Our Solution

- An earth observation platform that allows near real-time monitoring at a global scale
- For natural and built environments so clients can **Monitor What Matters™** to them

Key Technology Advancements

of remote sensing & remote monitoring







Ranger

Monitor What Matters

Query Smart Editor

Tasks

Results



Spatial Query Monitoring Events

Spatial filters

Only return features that intersect with the shape drawn on the map



Clear this shape after applying the query.

Apply a search distance

100

Meters

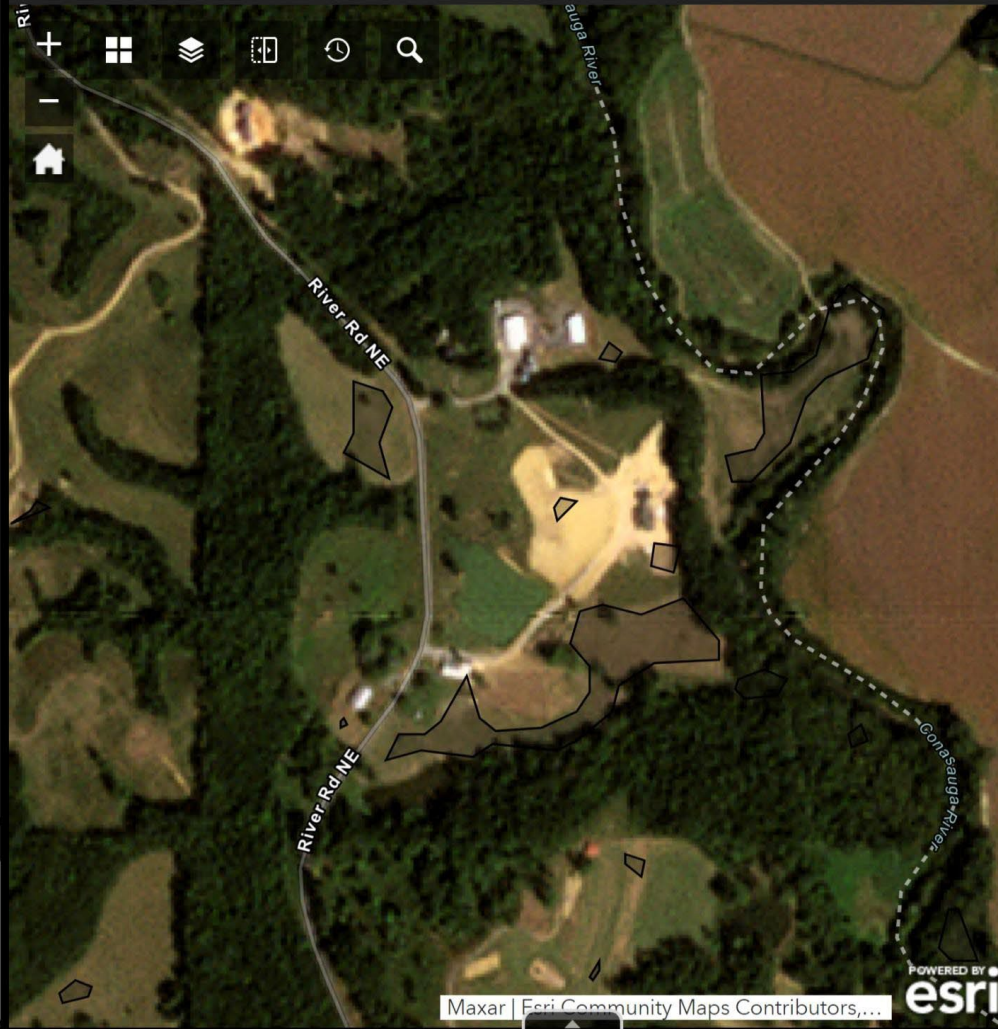
Result layer name

Spatial Query Monitoring Events_Query result

Apply

Imagery and Tasking

Request Imagery



Info Summary Measurement



Monitoring Events

16

Event: 79691

Event: 79721

Event: 79770

Add Data Draw Bookmarks

Search

URL

File

ArcGIS Online

Search...



Within map

Type

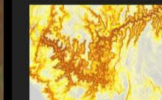
Relevance



World Imagery (Wayback 2014-02-20)

WMTS by esri_imagery

ADD DETAILS



Terrain: Slope Map

Image Service by esri

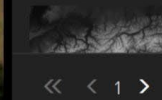
ADD DETAILS



Sentinel-2 10m Land Use/Land Cover Time Series

Image Service by esri_imagery

ADD DETAILS



Terrain

Image Service by esri

<< < 1 > 10,000 Items

LAYERS



ArcGIS Living Atlas of the World - Live Feeds Status

Sort By: **Status** / Title / 1 Hour Usage

<p>^ Live Stream Gauges </p> <p>Stream gauge observations of stage height and discharge contributed by the GIS community.</p>			Warning		
Last Updated	Next Update Check	Usage Trend			
Mar 25, 07:30	Mar 25, 11:22	Increasing			
6 Hour Usage	1 Hour Usage	Feature Count			
10,839	20,101	34,007			
feature requests per hr	feature requests per hr				
<p>v USA Short-Term Weather Warnings </p>			Normal		
<p>v Active Hurricanes, Cyclones and Typhoons </p>			Normal		
<p>v USA Weather Watches and Warnings </p>			Normal		
<p>v Recent Earthquakes </p>			Normal		
<p>v USA Current Wildfires </p>			Normal		
<p>v Satellite (VIIRS) Thermal Hotspots and Fire Activity </p>			Normal		
<p>v Current Weather and Wind Station Data </p>			Normal		



Ranger

Monitor What Matters

Query Smart Editor

Tasks

Results

Tracts

Spatial filters

Only return features that intersect with the shape drawn or



Clear this shape after applying the query.

Apply a search distance

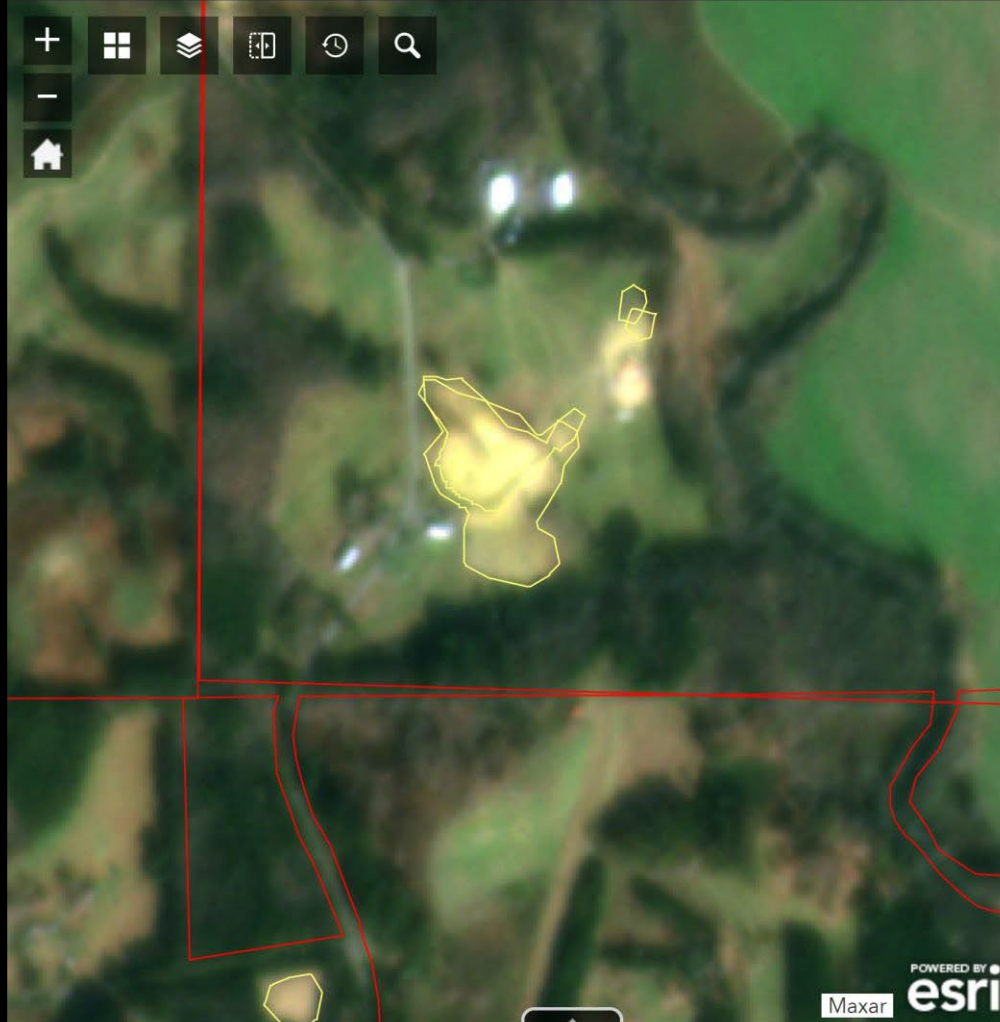
Meters

Result layer name

Apply

Imagery and Tasking

Request Imagery



Info Summary Measurement

Monitoring Events 5

Start Date: 7/1/2021 3

Start Date: 10/1/2021 2

Baseline Events

Add Data Draw Bookmarks

Search URL File

Generalize features for web display

File upload options: SHAPE FILE, CSV, KML, GPX, GeoJSON

DROP OR BROWSE

BROWSE

LAYERS



Ranger

Monitor What Matters

Query Smart Editor

Tasks

Results

Tracts

Spatial filters

Only return features that intersect with the shape drawn or



Clear this shape after applying the query.

Apply a search distance

0 Meters

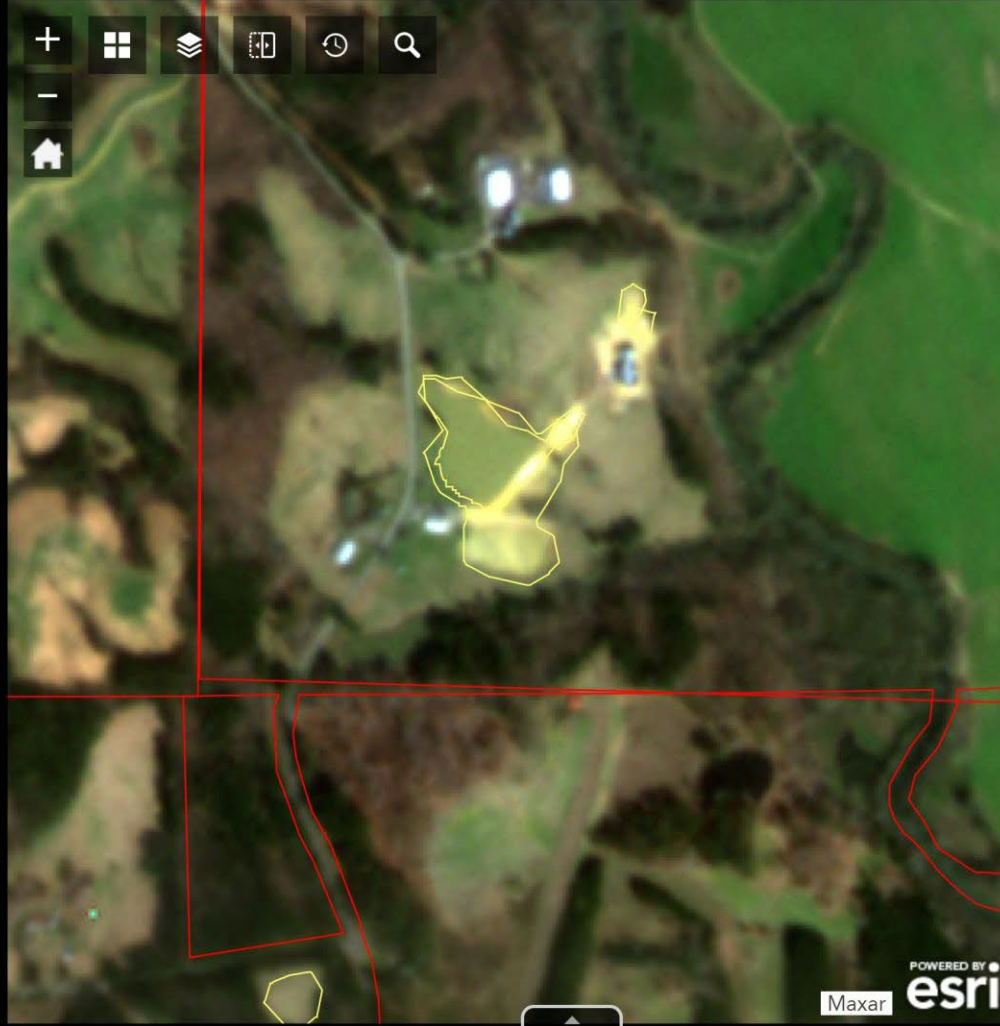
Result layer name

Recent Events

Apply

Imagery and Tasking

Request Imagery



Info Summary Measurement

Monitoring Events 5

Start Date: 7/1/2021 3

Start Date: 10/1/2021 2

Baseline Events

Add Data Draw Bookmarks

Search URL File

Generalize features for web display

File upload options: SHAPE FILE, CSV, KML, GPX, GeoJSON

DROP OR BROWSE

BROWSE

LAYERS



Ranger

Monitor What Matters

Query Smart Editor

Tasks

Results

Tracts

Spatial filters

Only return features that intersect with the shape drawn or



Clear this shape after applying the query.

Apply a search distance

0 Meters

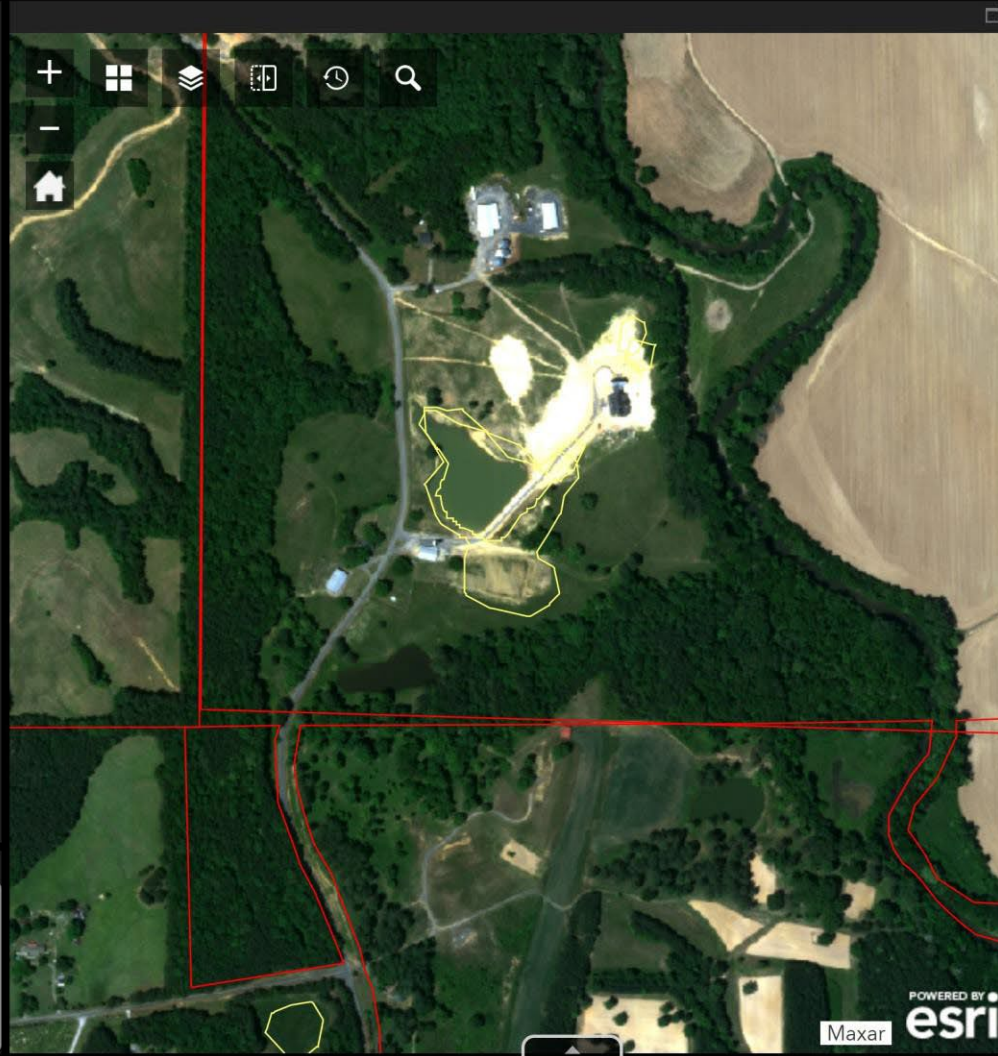
Result layer name

Recent Events

Apply

Imagery and Tasking

Request Imagery



Info Summary Measurement

Monitoring Events 5

Start Date: 7/1/2021 3

Start Date: 10/1/2021 2

Baseline Events

Add Data Draw Bookmarks

Search URL File

Generalize features for web display



DROP OR BROWSE

BROWSE

LAYERS



Ranger

Monitor What Matters

Query Smart Editor

Tasks

Results

Tracts

Spatial filters

Only return features that intersect with the shape drawn or



Clear this shape after applying the query.

Apply a search distance

0 Meters

Result layer name

Recent Events

Apply

Imagery and Tasking

Request Imagery



Info Summary Measurement

Monitoring Events 2

Start Date: 7/1/2021 1

Start Date: 10/1/2021 1

Baseline Events

Add Data Draw Bookmarks

Search URL File

Generalize features for web display

File upload options:

- SHAPE FILE
- CSV
- KML
- GPX
- Geo JSON

DROP OR BROWSE

BROWSE

LAYERS

Questions?

Andrew Mindermann

Geospatial Operations Manager

amindermann@skytecllc.com

www.SkytecLLC.com

Link: [Ranger Story Map](#)