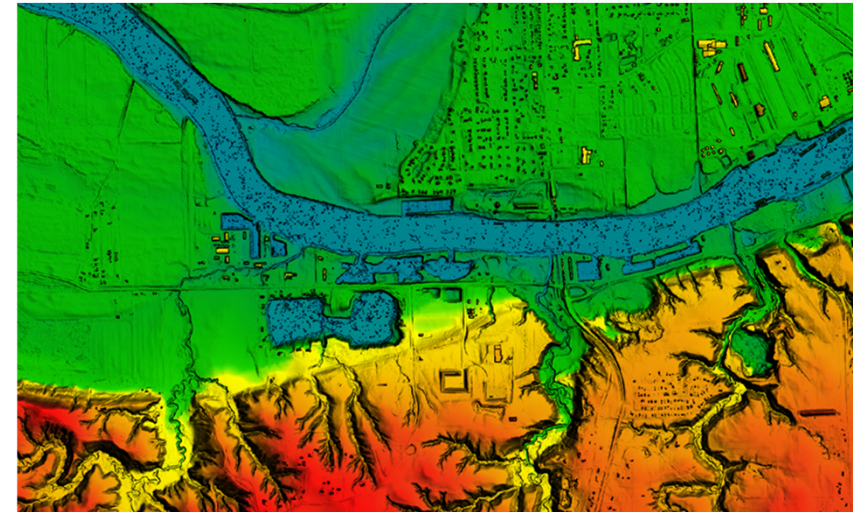
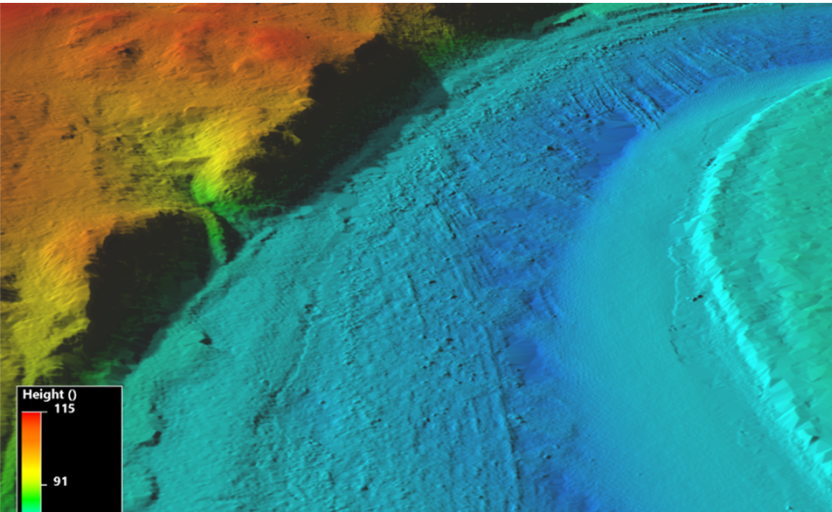
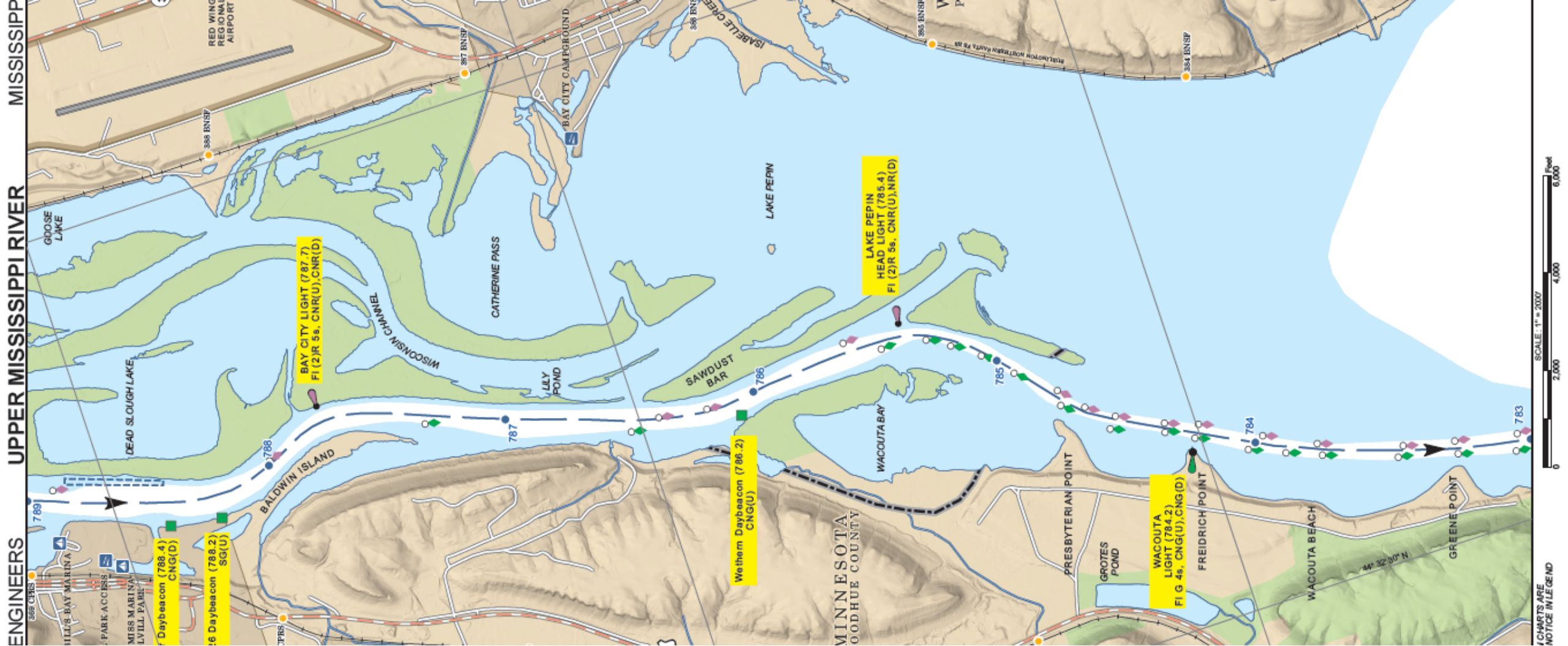




Bridging the Data Gap: High-Resolution Mapping on the Mississippi

SAME Savannah

June 25, 2025



ENGINEERS
UPPER MISSISSIPPI RIVER
MISSISSIPPI

CHARTS ARE
NOTICE IN LEGEND
SCALE: 1" = 2000'
0 2,000 4,000 6,000 Feet



Dewberry®



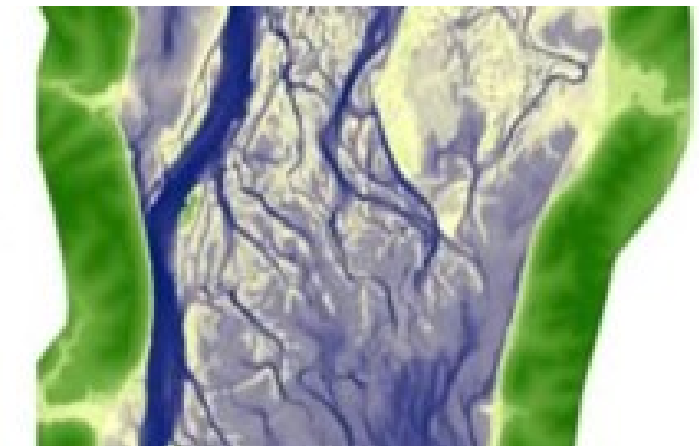
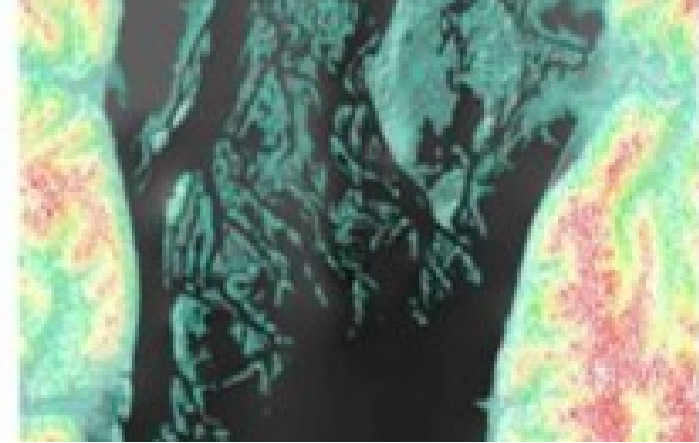


Pilot Project



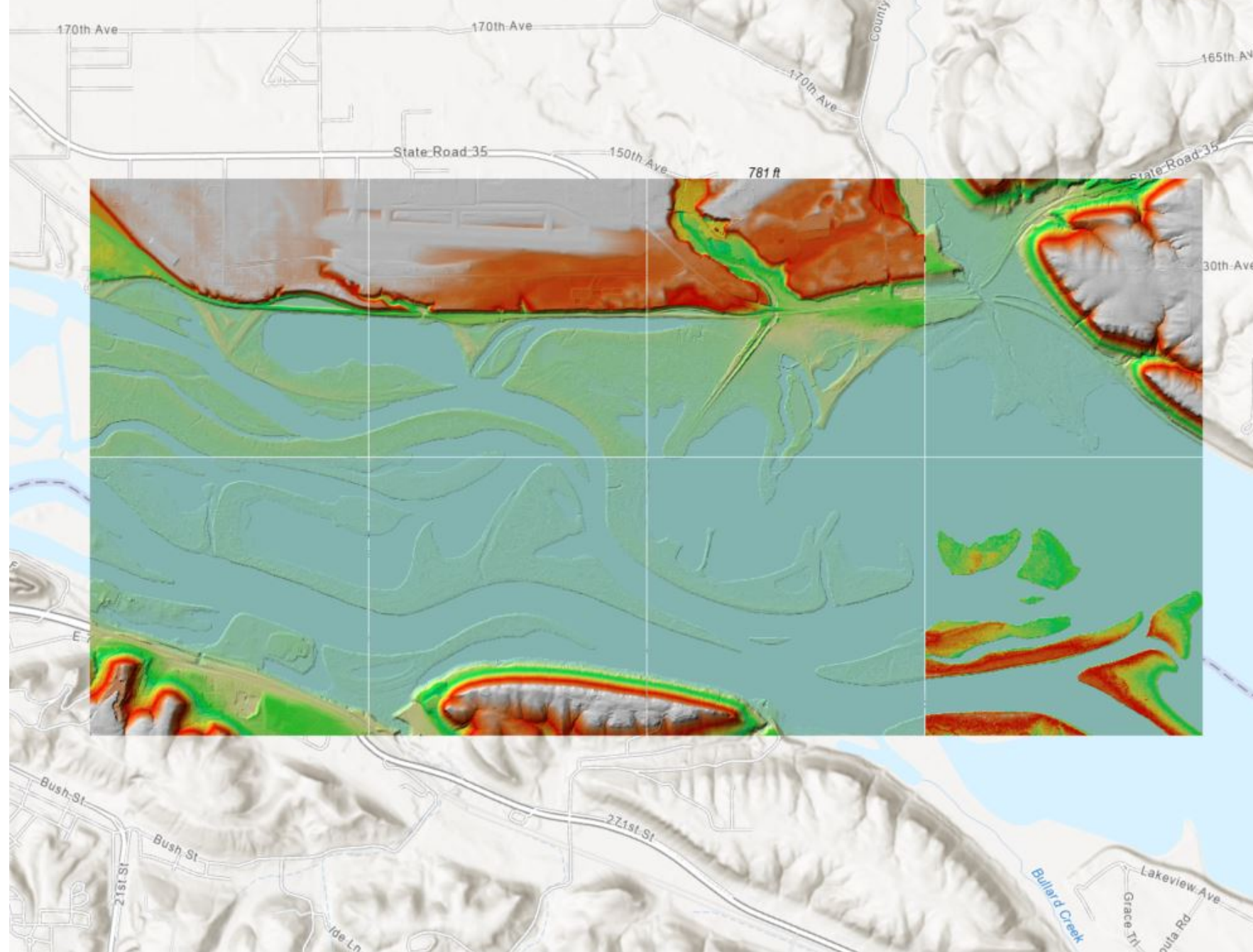
Project Goals

- Capture snapshot of UMRS topobathy
- Establish standard approach to capture topobathy
- Measure geomorphic change over time
- Create a seamless surface model by:
 - Combine land elevation (aerial lidar) and bathymetry (bathymetric lidar & sonar systems)
 - Combine multiple contractors' deliverables into a consistent dataset

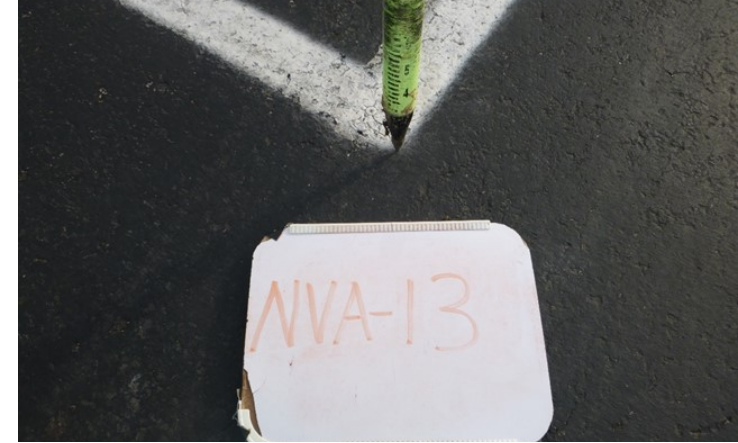


Pilot Key Deliverables

- **Topobathy:** Classified lidar, surface models (DEM), and breaklines
- **Hydro:** Georeferenced XYZ data, side-scan mosaics, and backscatter analysis



Ground Control and Survey



Hydro Survey Equipment

Vessels:

- 1 Cabin-class Multipurpose Survey Vessel
- 1 Jet boat – shallow environments

Key Sensors:

- Multibeam Echo Sounder (Ping 3DSS)
- Norbit Winghead i80s
- Parametric Dual-Frequency Sonar (Unabara Z-Sweep)
- Inertial Navigation System (Applanix Pos MV)
- GNSS (Trimble R10)
- Sound Velocity Sensors

Software Used: HYPACK, HydroMagic, FMGT, SonarWiz



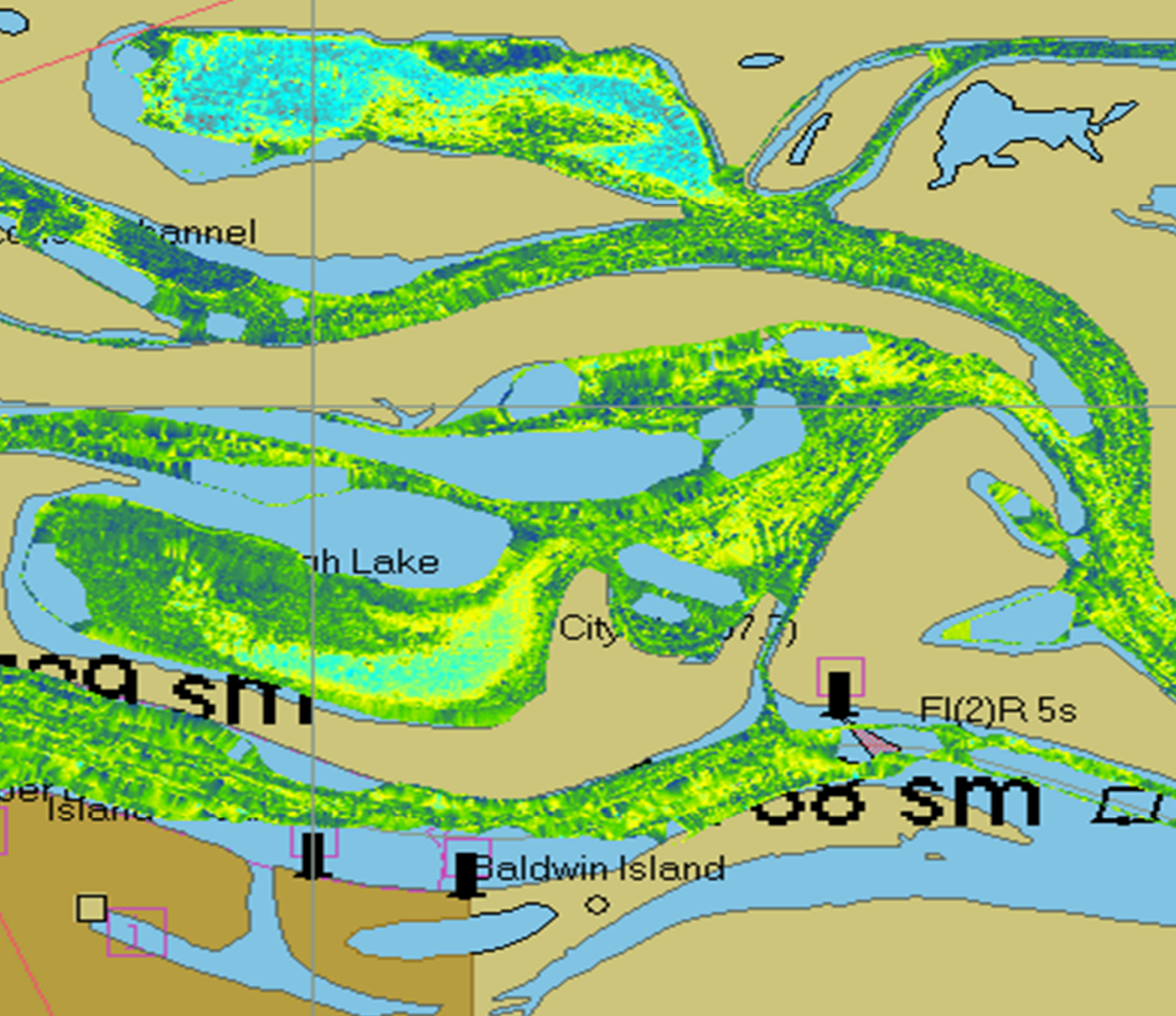
Hydro Survey Methodologies

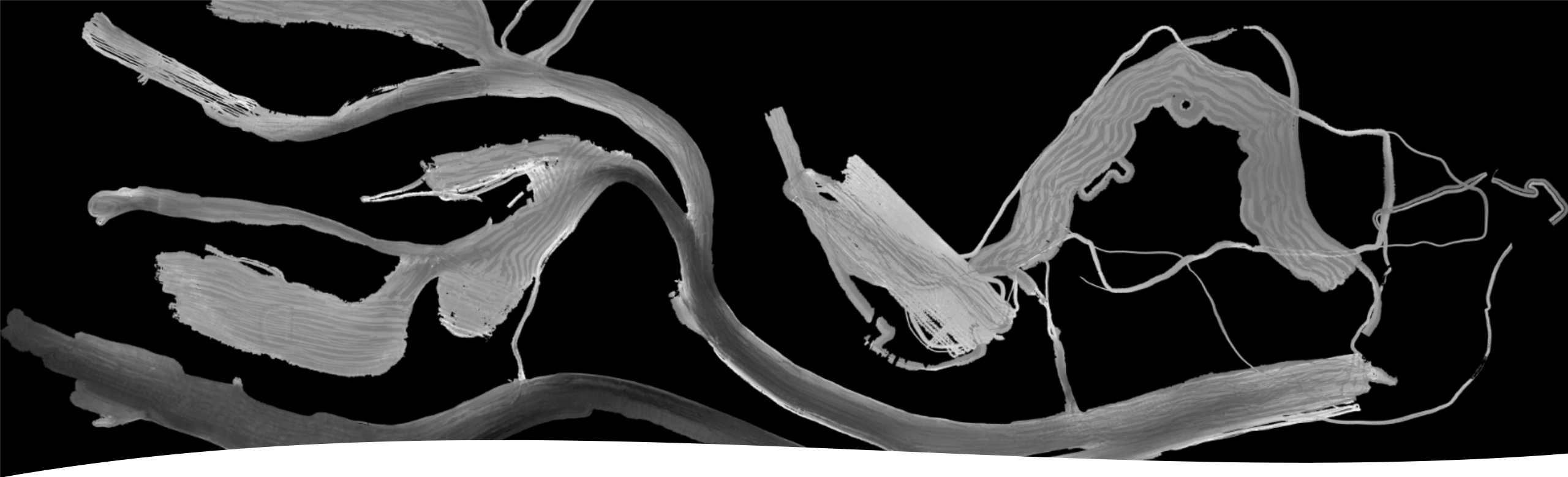
Data Collection:

- Multibeam data with 150% overlap for high-resolution mapping
- Ping 3DSS versus Norbit Winghead i80s backscatter – different boats, same time, same area
- Parametric sweep sonar for shallow water
- Side scan sonar for mosaic images

Verification:

- Manual lead-line depth checks and sound velocity profiling
- Comparison to single-beam check points, parametric data





Hydro Survey Results

- **Multibeam Echo Sounder:** Excellent coverage in depths greater than 6'
- **Parametric Sonar:** Shallow water coverage; difficulties with mounts and data processing
- **Sidescan:** Questionable usefulness as side-scan was incidental to multibeam
- **Backscatter:** Calibration challenges with the Ping system highlighted limitations in achieving consistent sediment classification, emphasizing the need for factory-calibrated alternatives like the Norbit system

Aerial Survey Equipment

Aircraft:

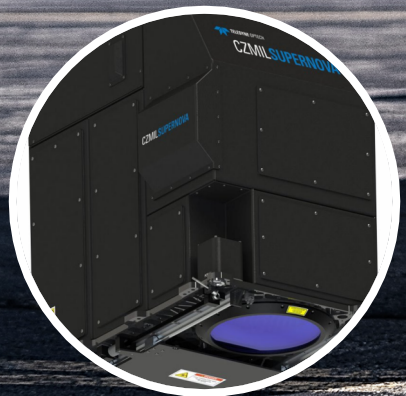
- Cessna 208B Grand Caravan

Sensor:

- Teledyne CZMIL SuperNova

Software Used:

- Teledyne Airborne Mission Manager
- Teledyne CARIS
- Applanix POSPac
- BayesMap StripAlign
- TerraScan





Aerial Survey Methodologies

Data Collection:

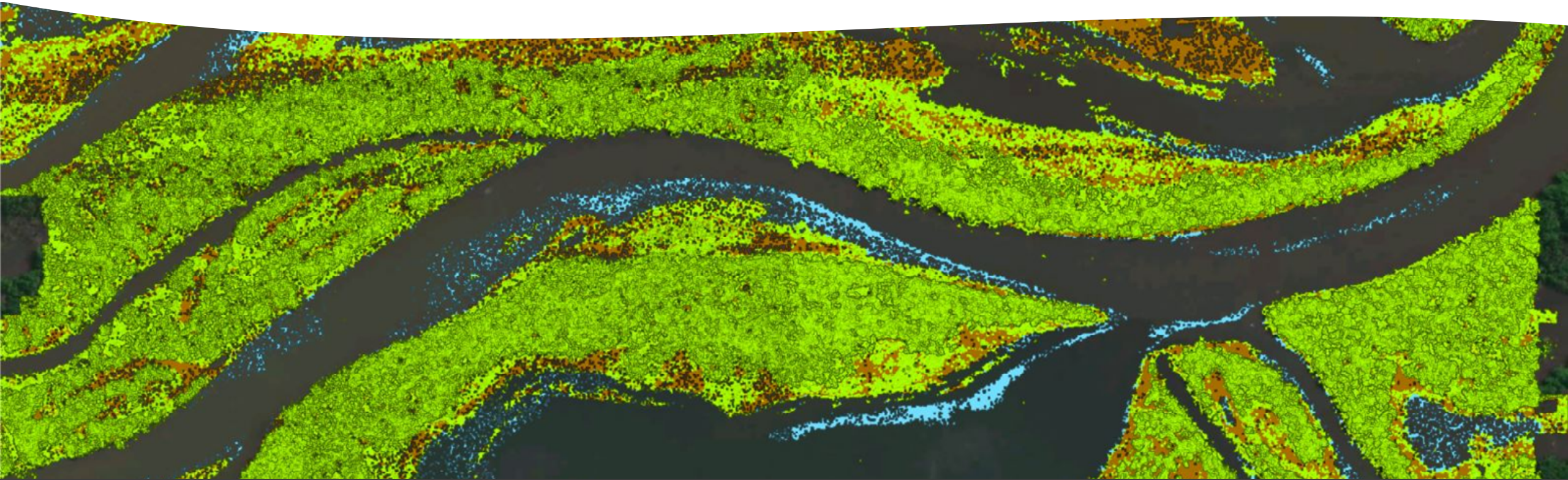
- Altitude: 400m AGL
- Airspeed: 110 knots
- Sidelap: 30%
- Average Point Density: 8.5 ppsm

Verification:

- RTK GPS Surveying
 - Ground Control Points
 - NVA
 - VVA
- Comparison to single-beam check points

Aerial Survey Results

- **Topographic Lidar:** Excellent coverage, achieving 16.4 ppsm NPD across both AOIs
- **Accuracy:** Met or exceeded vertical accuracy requirements
- **Topobathy Lidar:** Good coverage near the shorelines and shallow areas



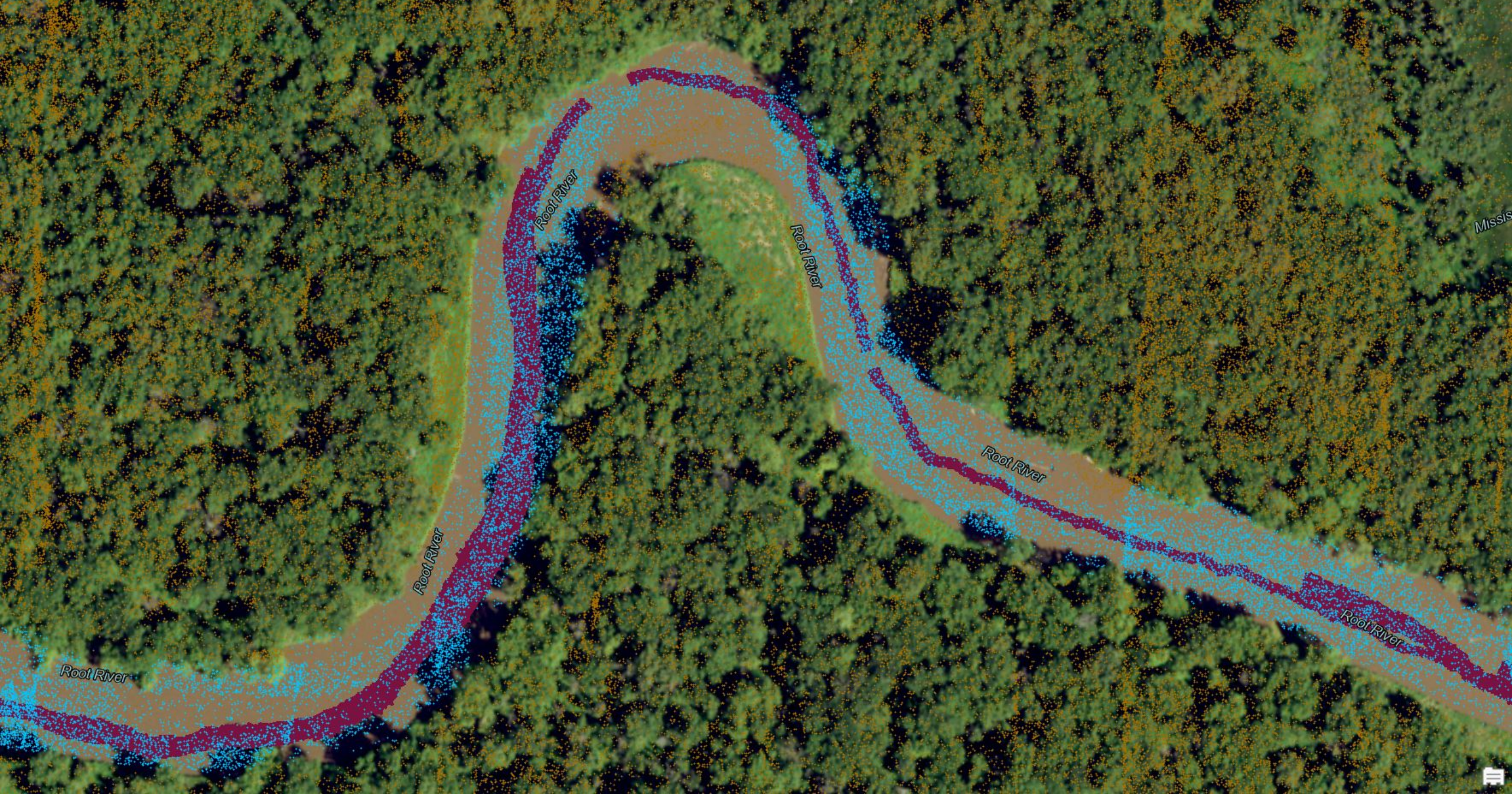
Pilot Project Results



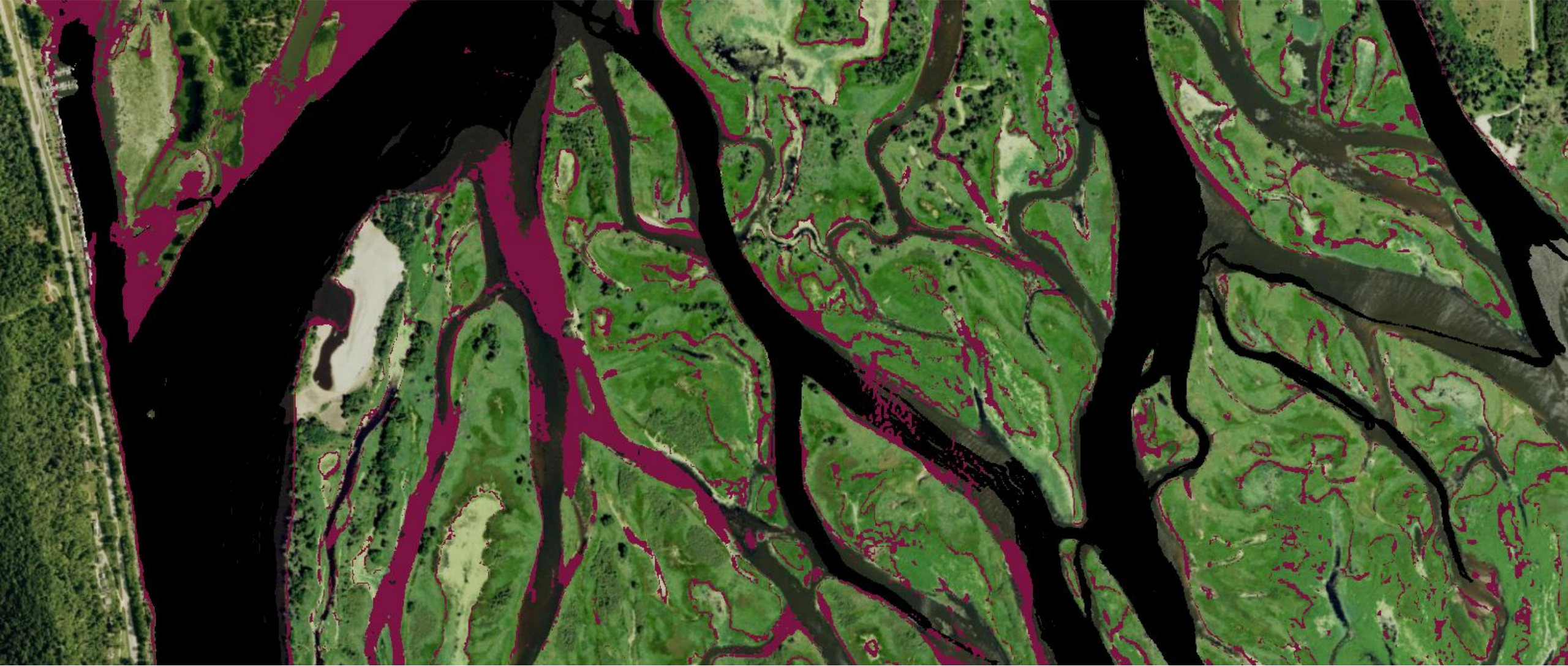




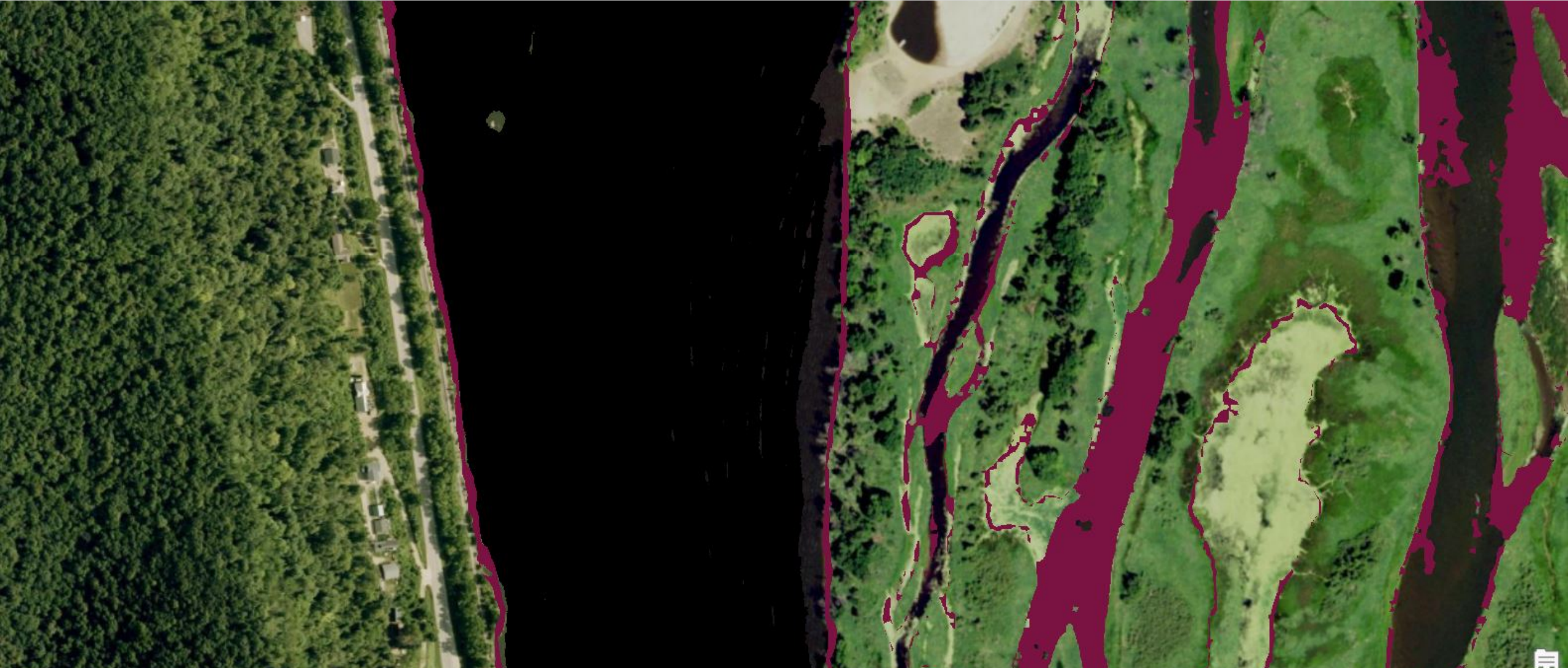




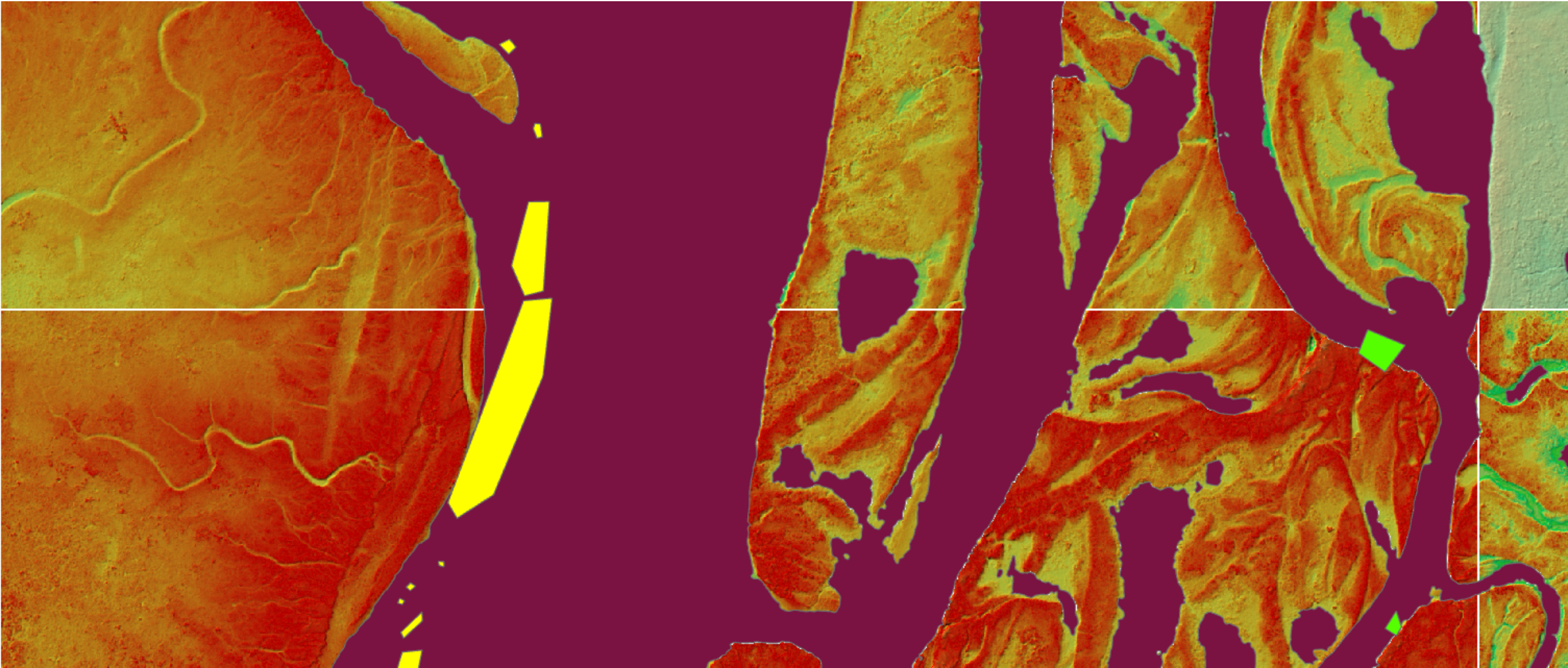
Pilot Project Results

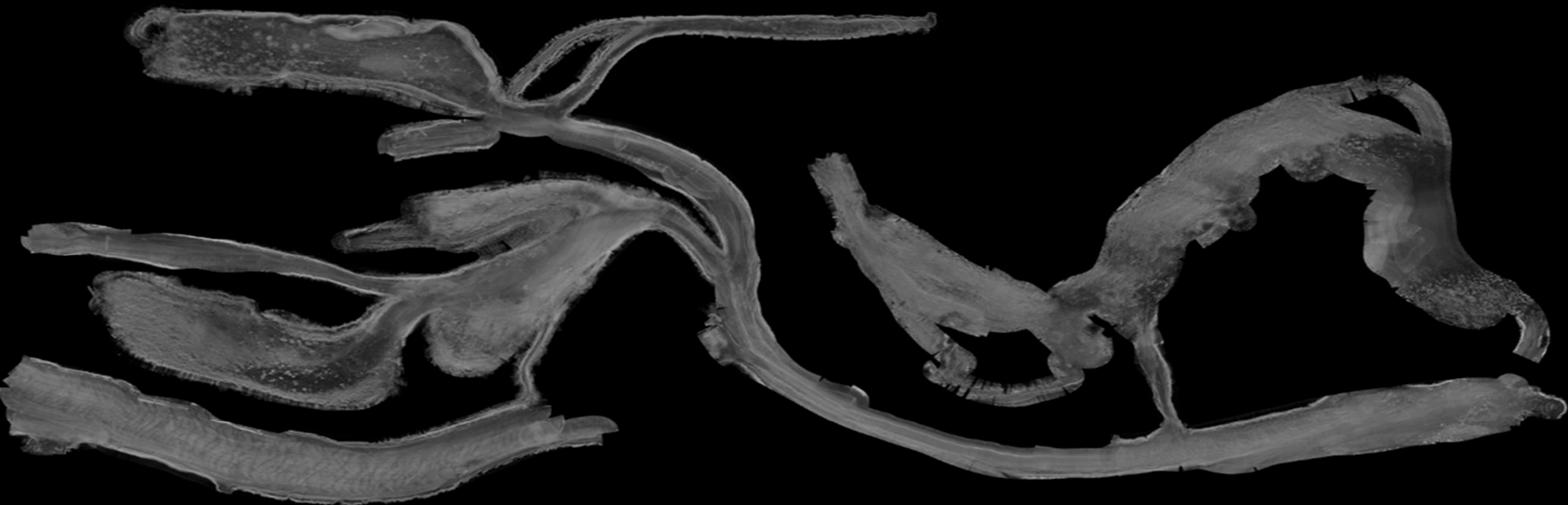


Pilot Project Results



Pilot Project Results





Lessons Learned





Survey Equipment

Single-beam

- Mechanical Vulnerability
- Software Limitations
- Operational Challenges
- Sediment Profiling Advantages
- Data Quality Issues
- Manufacturer Support

Multibeam

- Shallow Water Limitations
- Patch Test Importance
- Operational Efficiency
- Environmental Impact
- Equipment Calibration

Lessons Applied



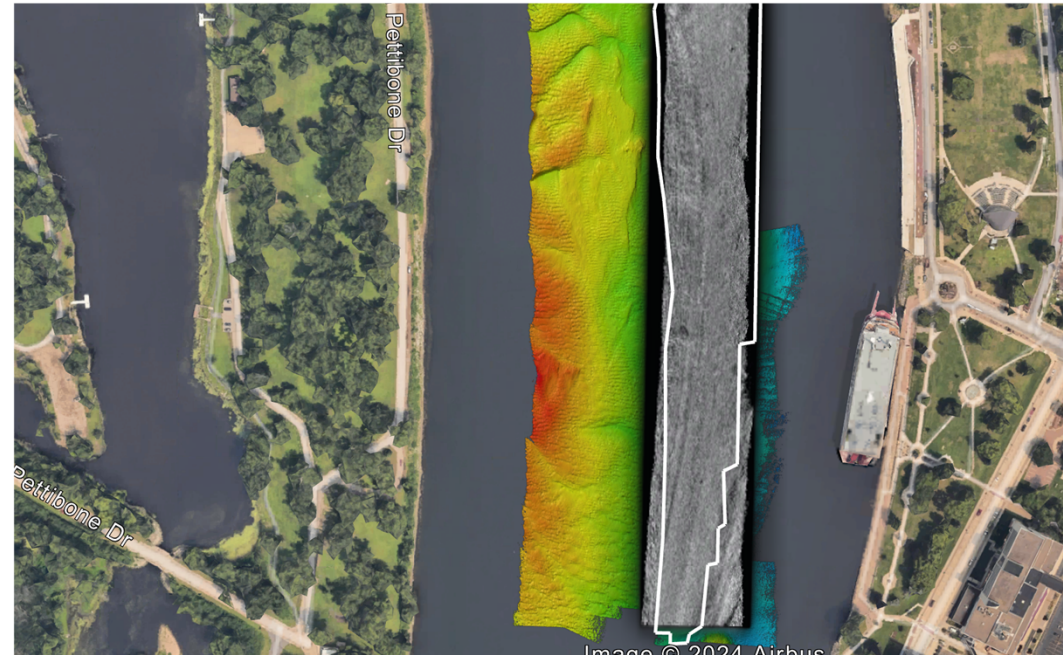
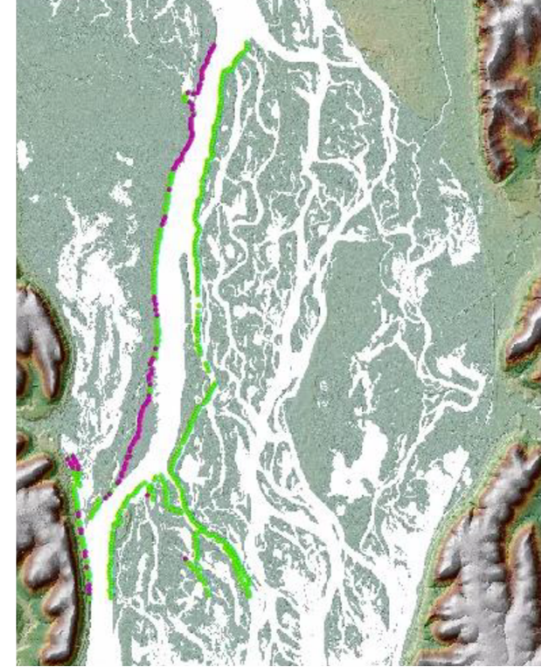
**Bathymetric
Lidar**

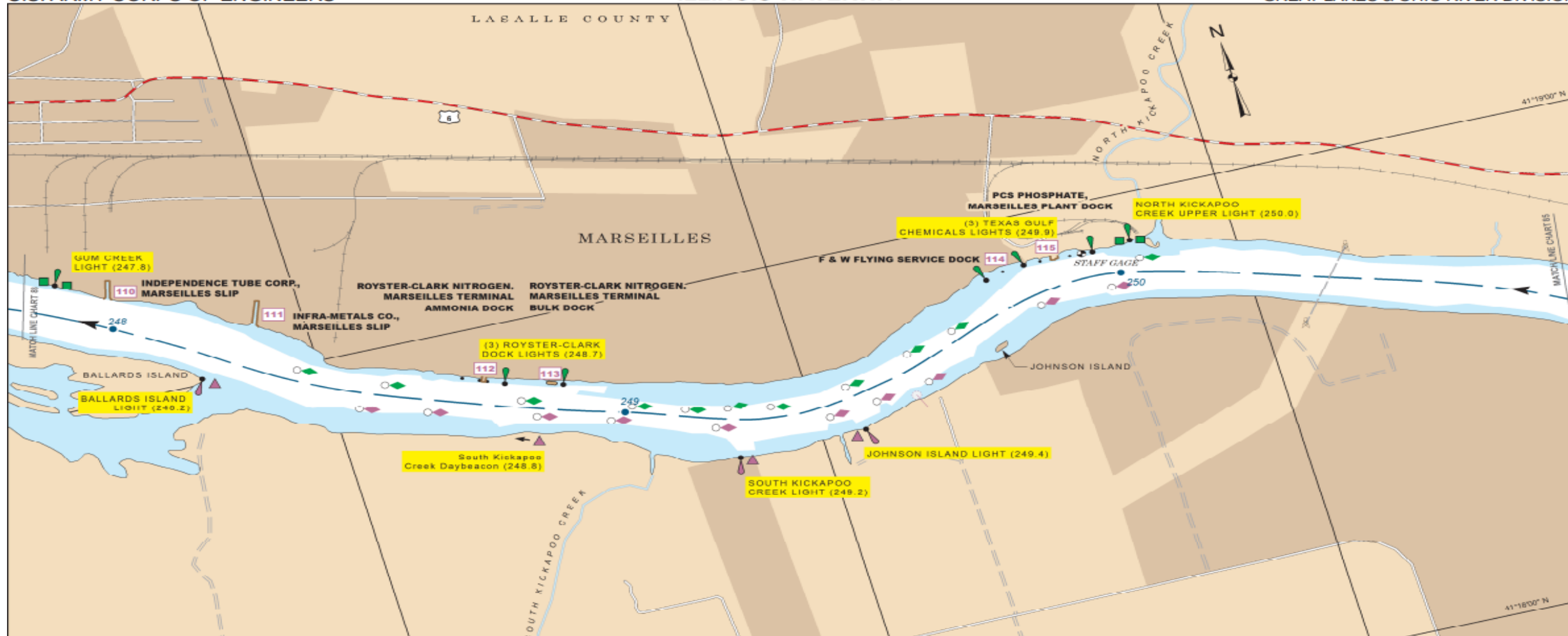


**Multi and
Single-Beam**



**Software
Requirements**



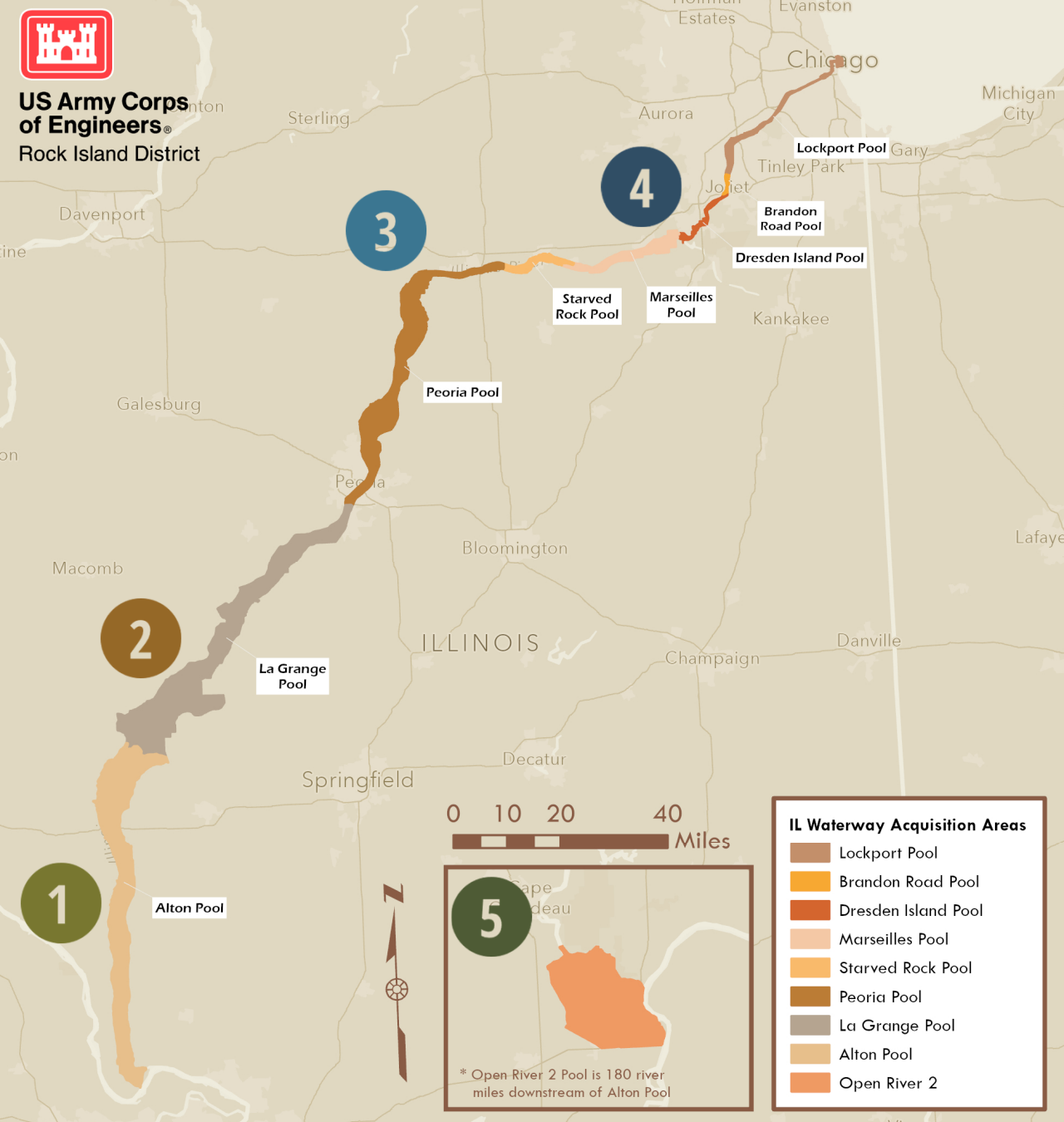


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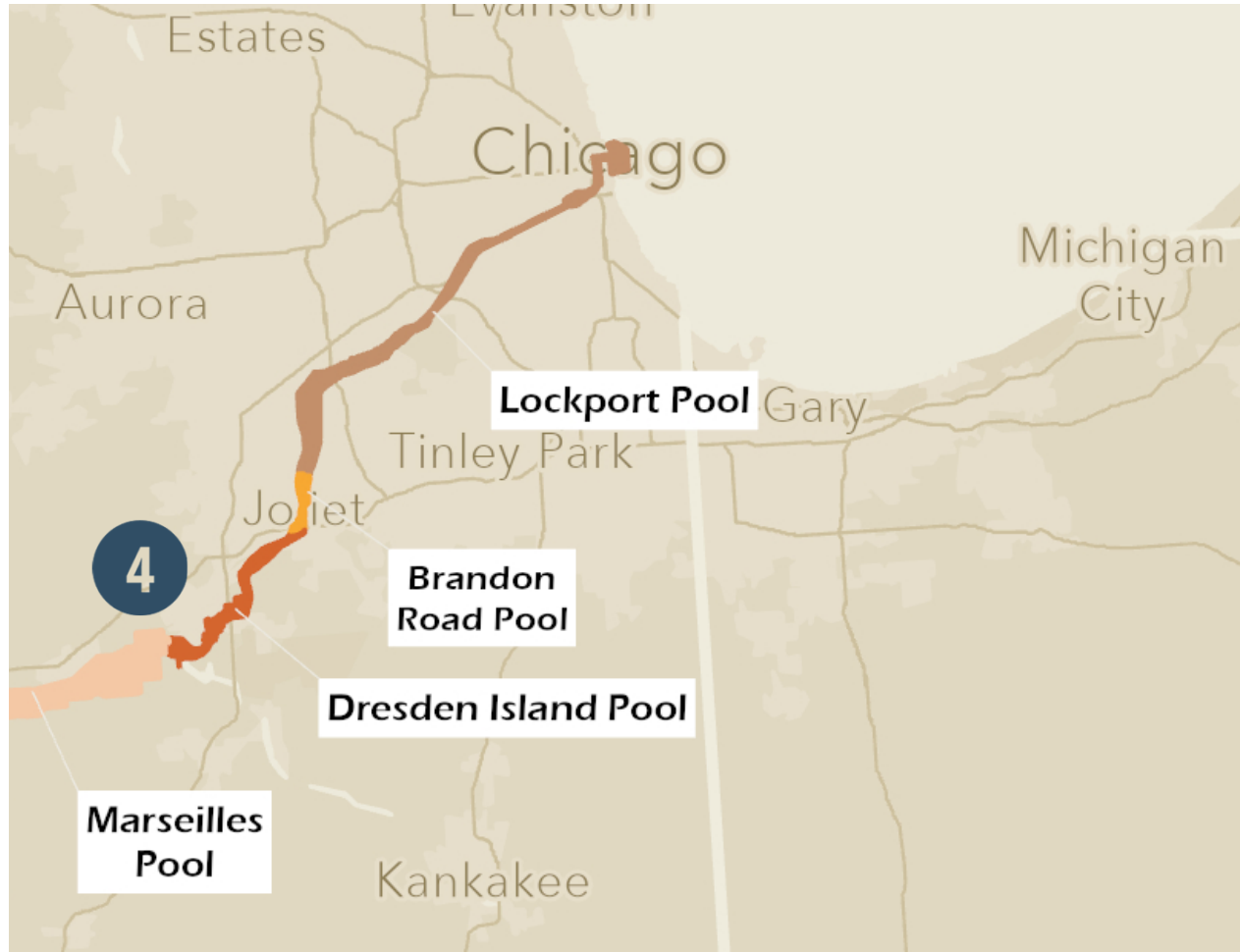
US Army Corps
of Engineers®
Rock Island District



Upper Mississippi River System Topobathy Acquisition FY24

- 1. Alton Pool (430 mi²)**
 - Acquisition TO – Contractor: A
 - QA TO – Contractor: Dewberry
- 2. LaGrange Pool (447 mi²)**
 - Acquisition TO – Contractor: B
 - QA TO – Contractor: A
- 3. Peoria-Starved Rock Pools (356 mi²)**
 - Acquisition TO – Contractor: C
 - QA TO – Contractor: A
- 4. Marseille-Lockport Pools (207 mi²)**
 - Acquisition TO – Contractor: Dewberry
 - QA TO – Contractor: A
- 5. Open River 2 Pool (306 mi²)**
 - Acquisition TO – Contractor: A
 - QA TO – Contractor: Dewberry

Acquisition Task Order

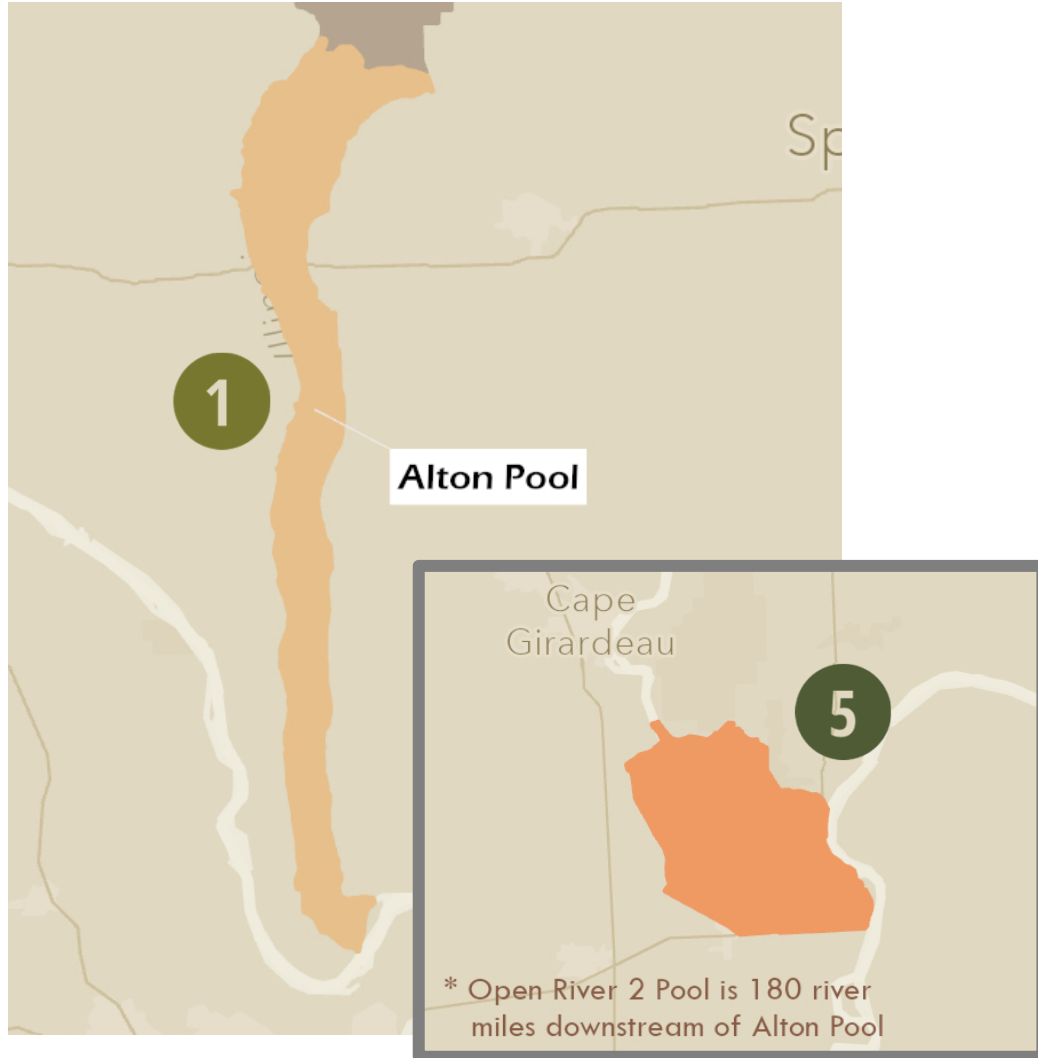


Upper Mississippi River System Topobathy Acquisition FY24

4. **Marseille-Lockport Pools (207 mi²)**

- Acquisition TO – Contractor: Dewberry
- QA TO – Contractor: A

QA Task Order



Upper Mississippi River System Topobathy Acquisition FY24

1. Alton Pool (430 mi²)

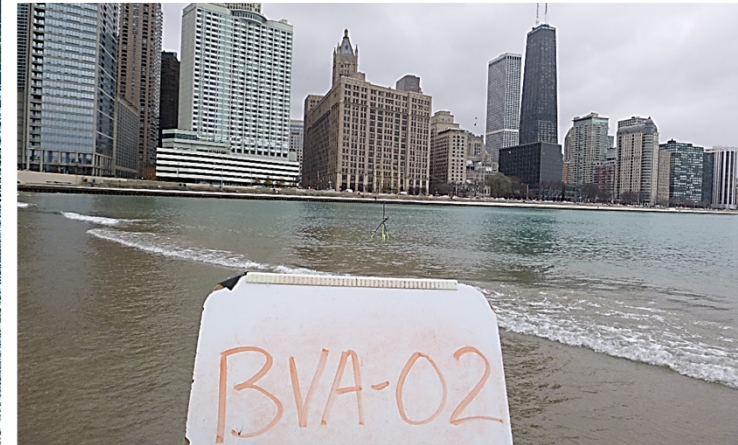
- Acquisition TO – Contractor: A
- QA TO – Contractor: Dewberry

5. Open River 2 Pool (306 mi²)

- Acquisition TO – Contractor: A
- QA TO – Contractor: Dewberry

Ground Control and Survey

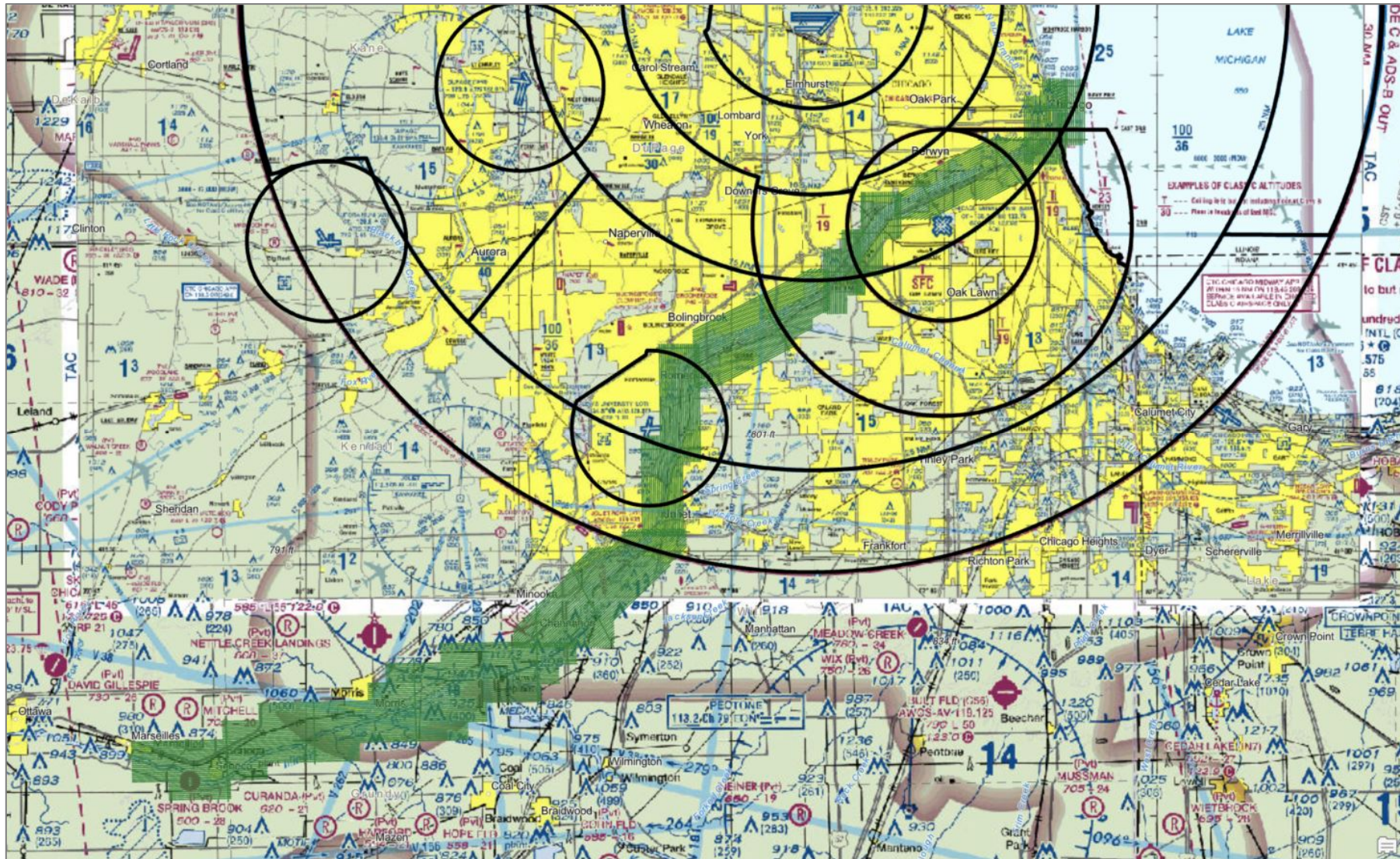
- “Pole” checkpoints
- Bathymetry checkpoints (BVA)
- Survey “Tie-In”



Topobathymetric Acquisition



Challenges: Airspace

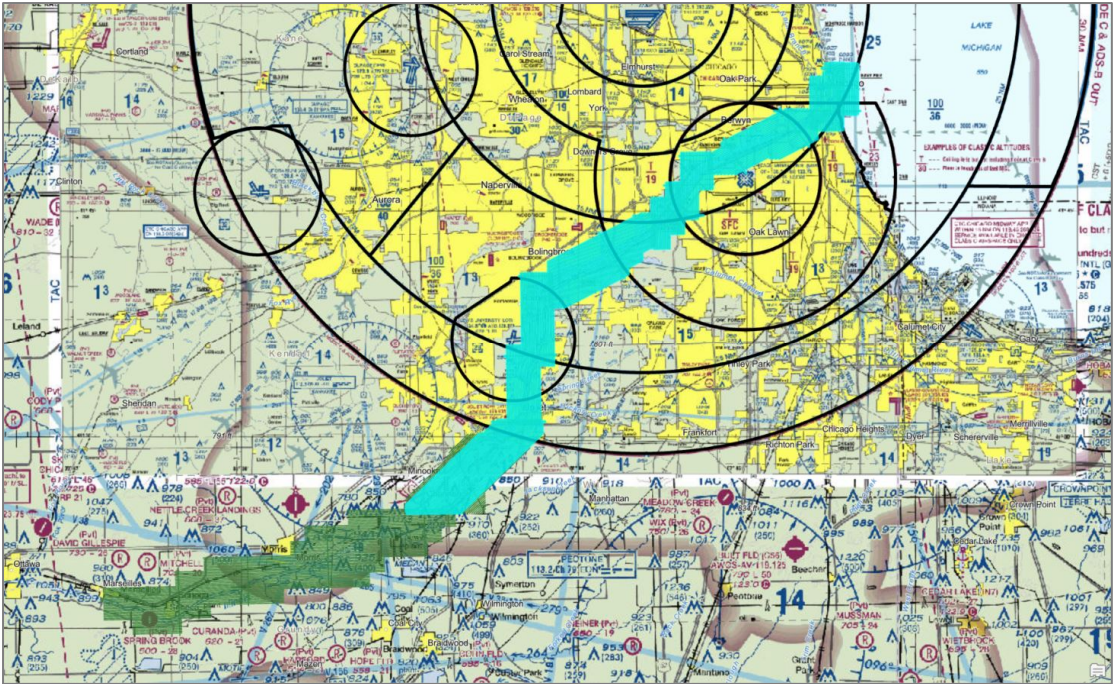
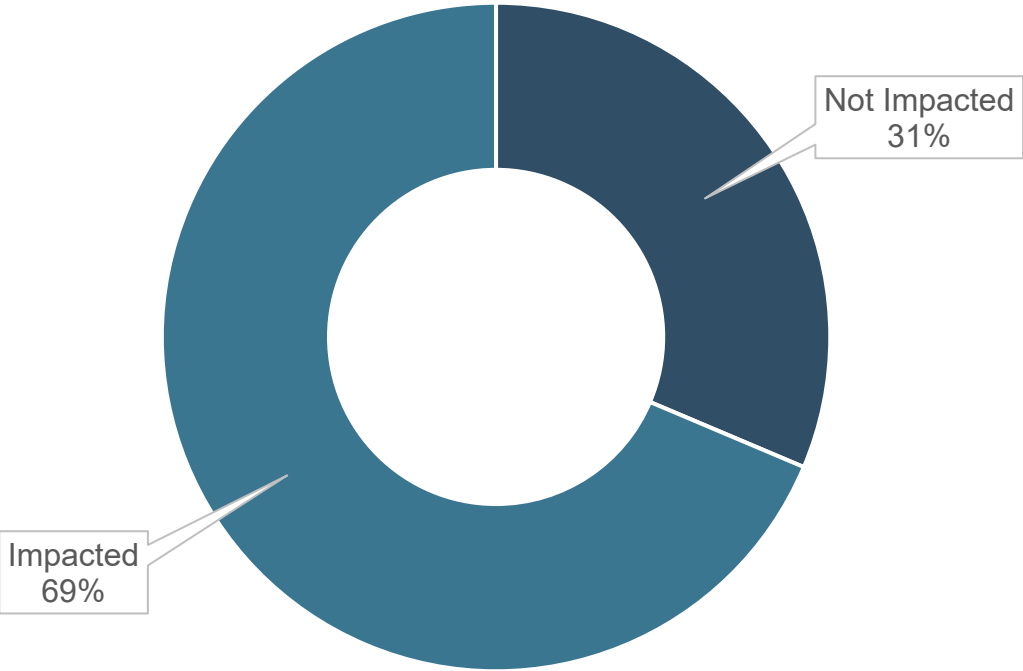


Challenges: Airspace

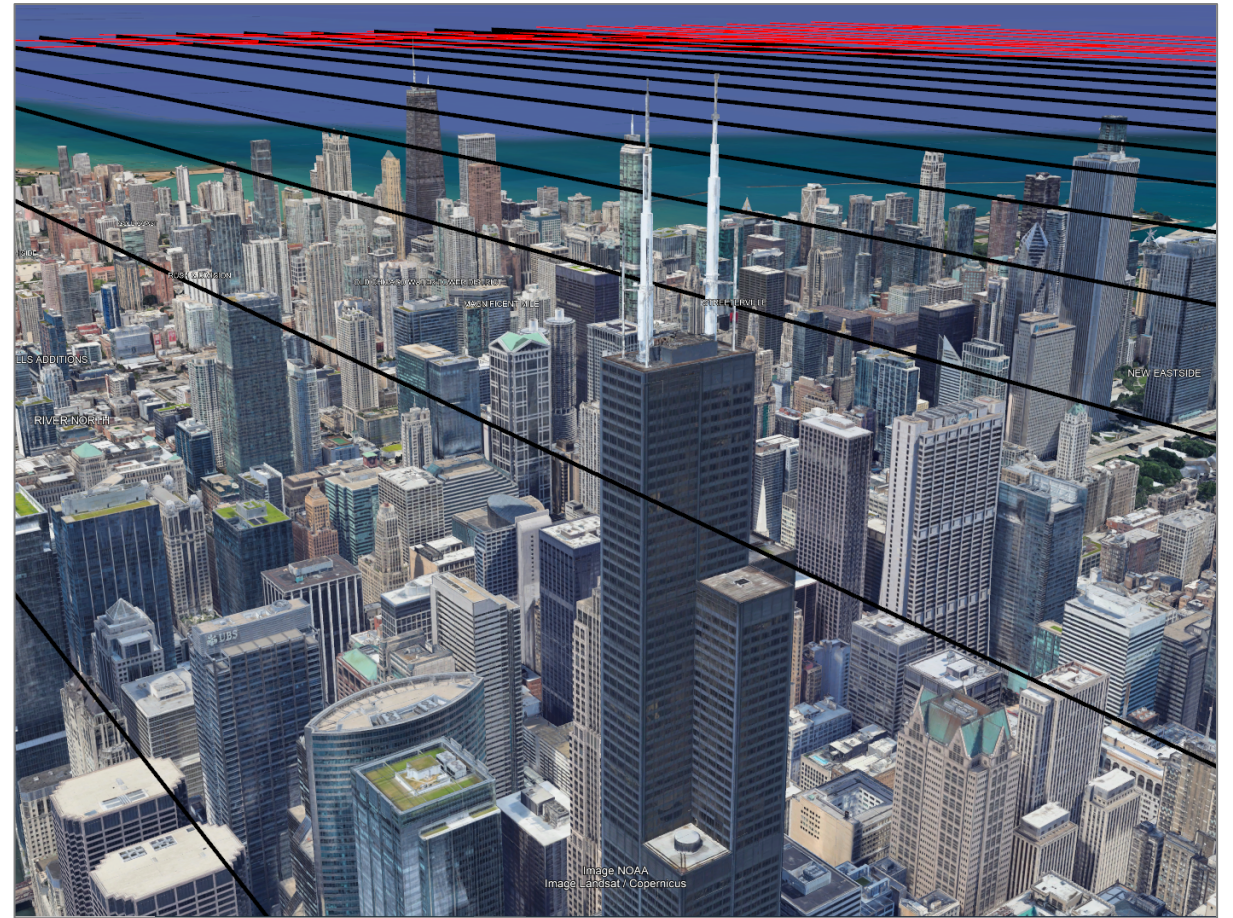


Challenges: Airspace

Lines



Challenges: Obstacles





Hydro Survey Equipment & Methodologies

Vessels:

- 4 Multipurpose Survey Vessels

Key Sensors:

- 2x Ping 3DSS Multibeam Echo Sounder
- Odom E20 Single-beam
- Parametric Dual-Frequency Sonar (Unabara Z-Sweep)

Software Used: HYPACK, Hydromagic

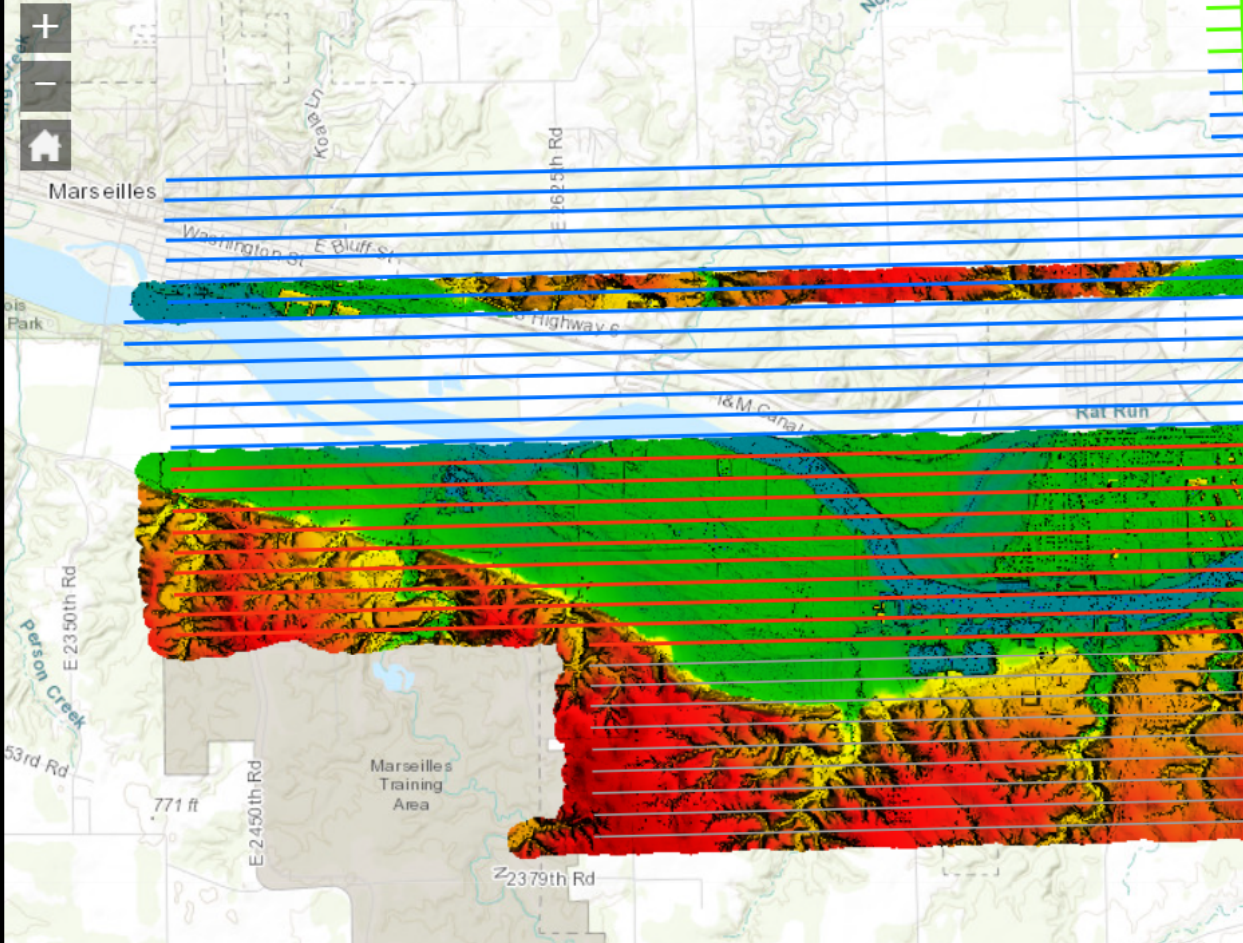
Multibeam Data Collection:

- 25% overlap, areas 6'+ water
- Patch test at the start of each survey

Single-beam Data Collection:

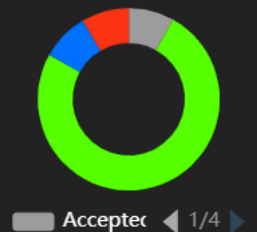
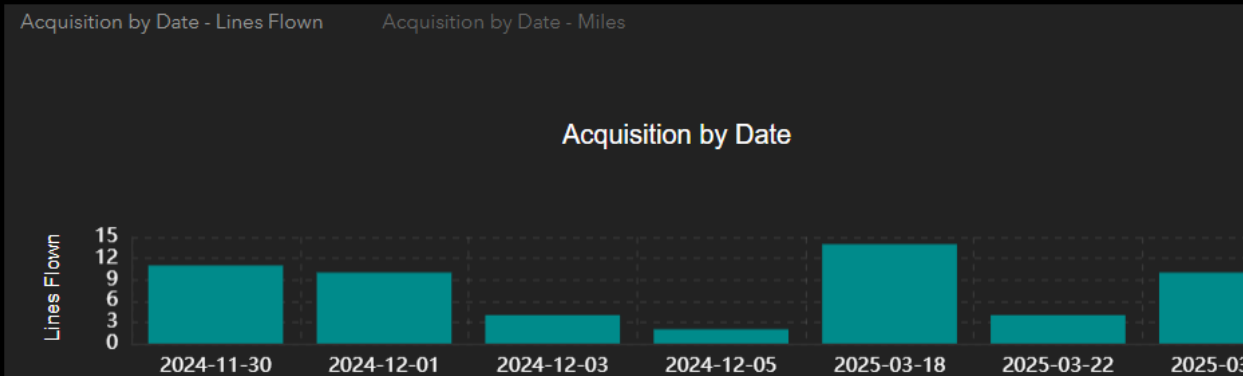
- Overlap/fill in multibeam gaps (shallow water)
- Survey lines parallel to river flow
- 200-foot line spacing

- Layers**
- ☒ Acquisition Flightlines
 - ☐ Acquisition AOs
 - ☐ Initial Processing
 - ☐ QC_Calls_Master
 - ☐ Pre_Production_Calls_Master
 - ☐ QC_Calls_Analyst
 - ☐ Pre_Production_Calls_Analyst
 - ☐ USACE_STL_U
 - ☐ MRS_TB_production_tile_grid



Project Results (to date)

- Ground Survey
 - Completed 12/18/2024
- Topobathy
 - Currently 17% complete – delayed until Fall 2025
- Multibeam
 - Completed 3/26/25
- Various stages of processing
- Single-beam
 - Completed 4/15/25
 - Various stages of processing





Key Take Aways

Key Takeaways

- Priorities – know what's important
- Environment – control the controllables
- Equipment - right tool for the job
- More is better - increased survey



Most optimal scenario – fly lidar first, then fill in with acoustic SBES/MBES. Greater coverage, more efficient, lower cost option.



CONNECT



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256.715.6778

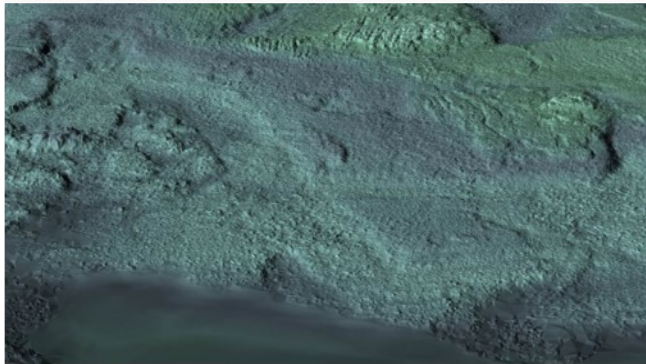
Questions / Discussion



Uses of Topobathy Lidar

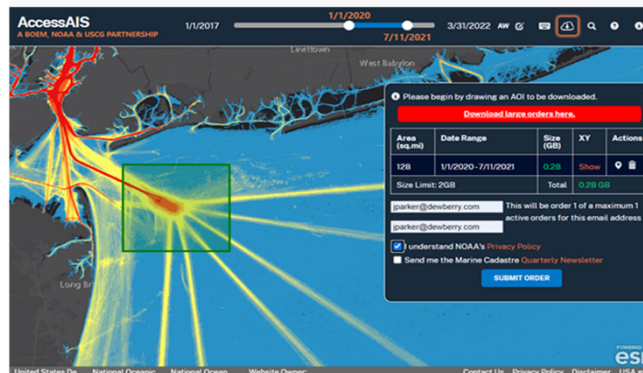
Standard Mapping

- Seamless topographic and bathymetric capture
- Coastal and shoreline mapping
- Riverine systems
- Shallow lake bathymetry
- Benthic habitat and submerged aquatic vegetation studies
- Estuarine / wetland mapping



Engineering & Resiliency

- Change detection
- H&H modeling
- Dredge cut/fill analysis
- Coastal engineering and structure monitoring
- Nautical Charting
- Port/harbor Surveying
- Regional Sediment Management
- Marine Spatial Planning
- Marine Archeology



GeoEM

- Flood risk management
- Emergency Response Mapping
- Storm surge modeling

