

Grand Bay NERR UAV Case Study

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Missions

Tradeoffs Study 03/20/2015

- Altavian Nova vs. MSU's Precision Hawk
- Coverage vs. Resolution
- Gauge collecting, processing and analyzing
- RGB vs. CIR (Color Infrared)

Sentinel Site 05/14/2015

- Differentiate *Spartina* and *Juncus*

Disaster Response Exercise 06/30/2015

Wildfire Assessment 07/29/2015



COA

GBNERR

Tradeoffs/
Sentinel Site

Disaster
Response

Wildfire

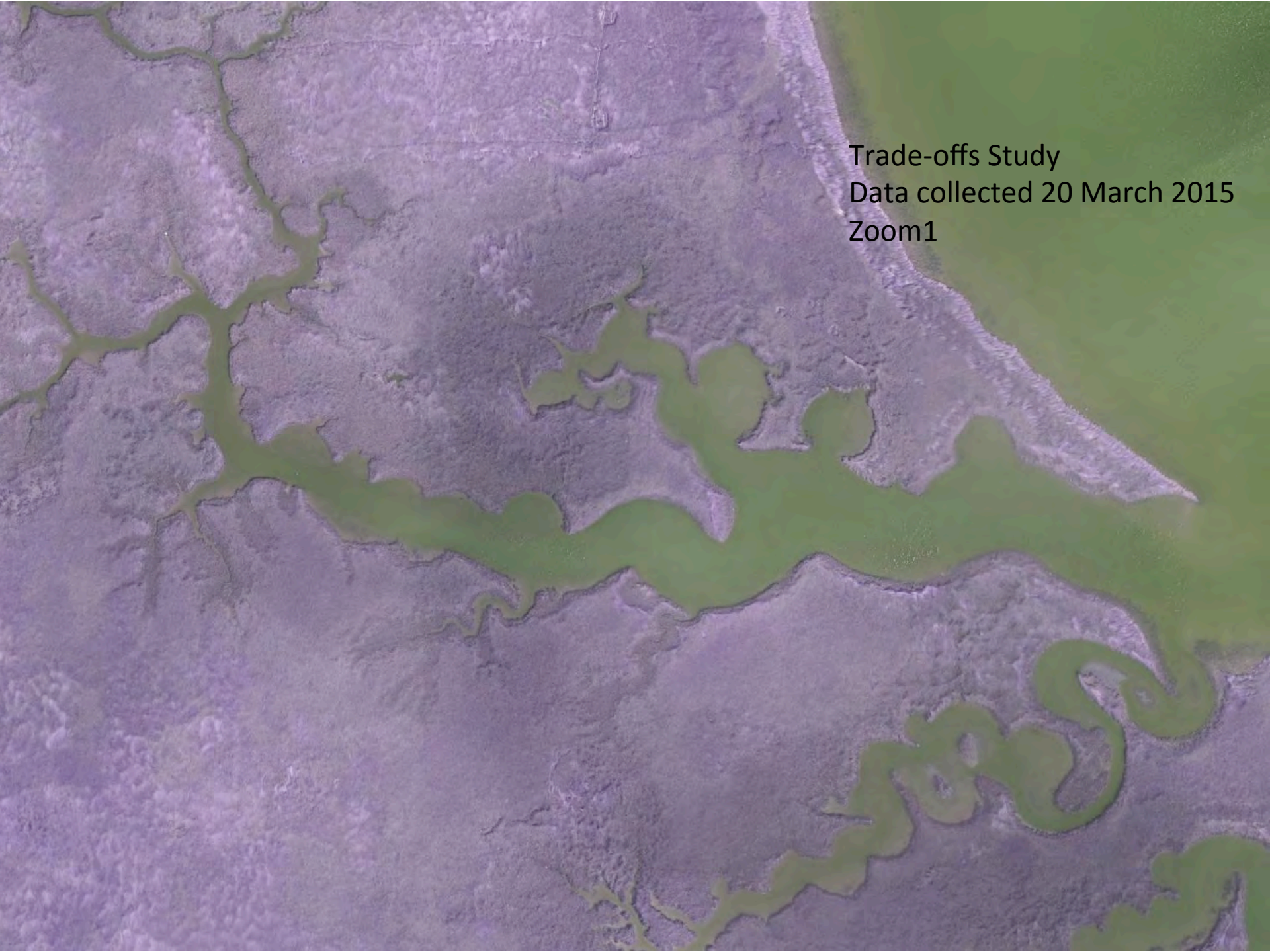
UAV Chart

Mission	UAV + Payload	Altitude (ft.)	GSD (in.)
Tradeoffs	Altavian Nova + CIR-modified Canon EOS Rebel SL1	510	1.3
Sentinel Site	PrecisionHawk Lancaster + CIR-modified Nikon J3	165	0.5
Disaster Response	DJI Phantom 2 Vision Plus	Various	Various
Wildfire Assessment	PrecisionHawk Lancaster + CIR-modified Nikon J3	590	2.0





Trade-offs Study
Data collected 20 March 2015



Trade-offs Study
Data collected 20 March 2015
Zoom1

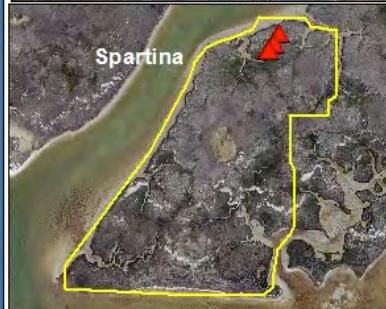
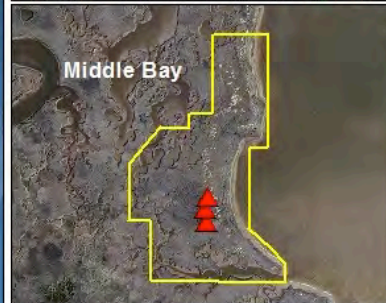
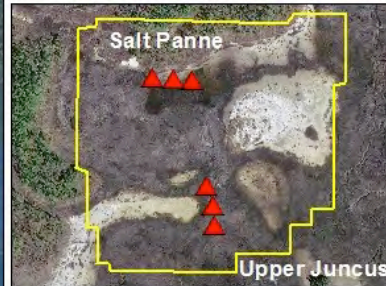
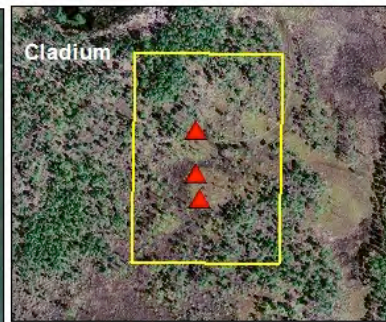
Trade-offs Study
Data collected 20 March 2015
Zoom2

Tradeoffs Study

Post Mission Comments/Conclusions

- Payload: MSU's & Altavian's CIR payload are different. Altavian's CIR payload has larger FOV for more coverage per unit of time; less resolution; flight needs to be below ~500 ft
- GBNERR feedback: This imagery not that useful
- MSU's conclusion: Effort towards specific focused missions

Sentinel Site Mission



Site	Area (mi ²)
Spartina SETs	0.062
Middle Bay SETs	0.046
Upper Juncus/Salt Panne SETs	0.078
Cladium SETs	0.011
SETs swath	5.87
Entire Reserve	29.06
Marsh within COA (not on map)	21

- ▲ Surface elevation tables
- Coastal Transition Transect
- Area of Interest
- Grand Bay NERR boundary





Sentinel Site #2
Data collected 14 May 2015

Sentinel Site #2
Data collected 14 May 2015
Zoom1

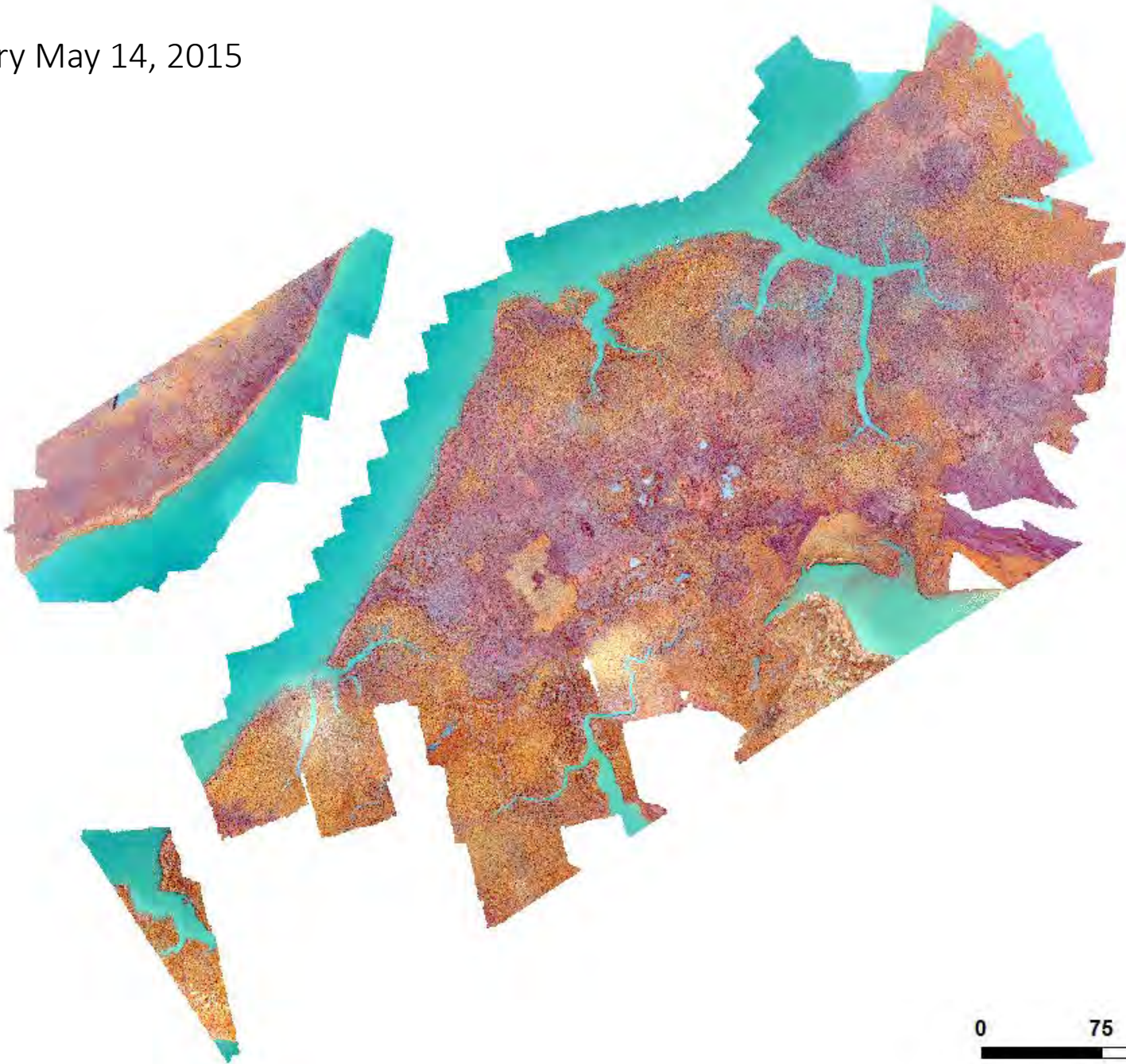




Sentinel Site #2
Data collected 14 May 2015
Zoom2

Sentinel Site #2
Data collected 14 May 2015
Zoom3

UAV imagery May 14, 2015



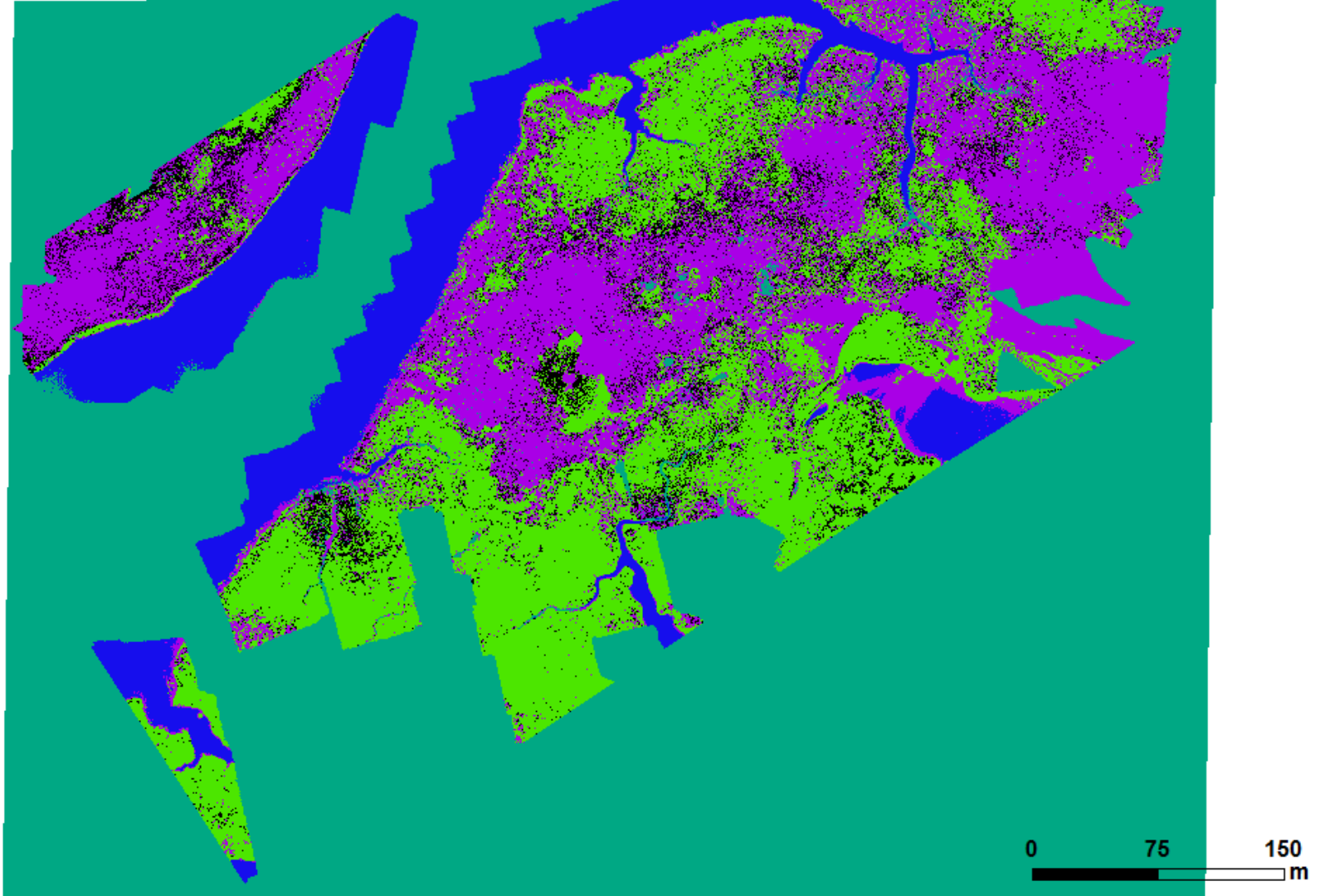
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m

WV3 imagery May 3, 2015



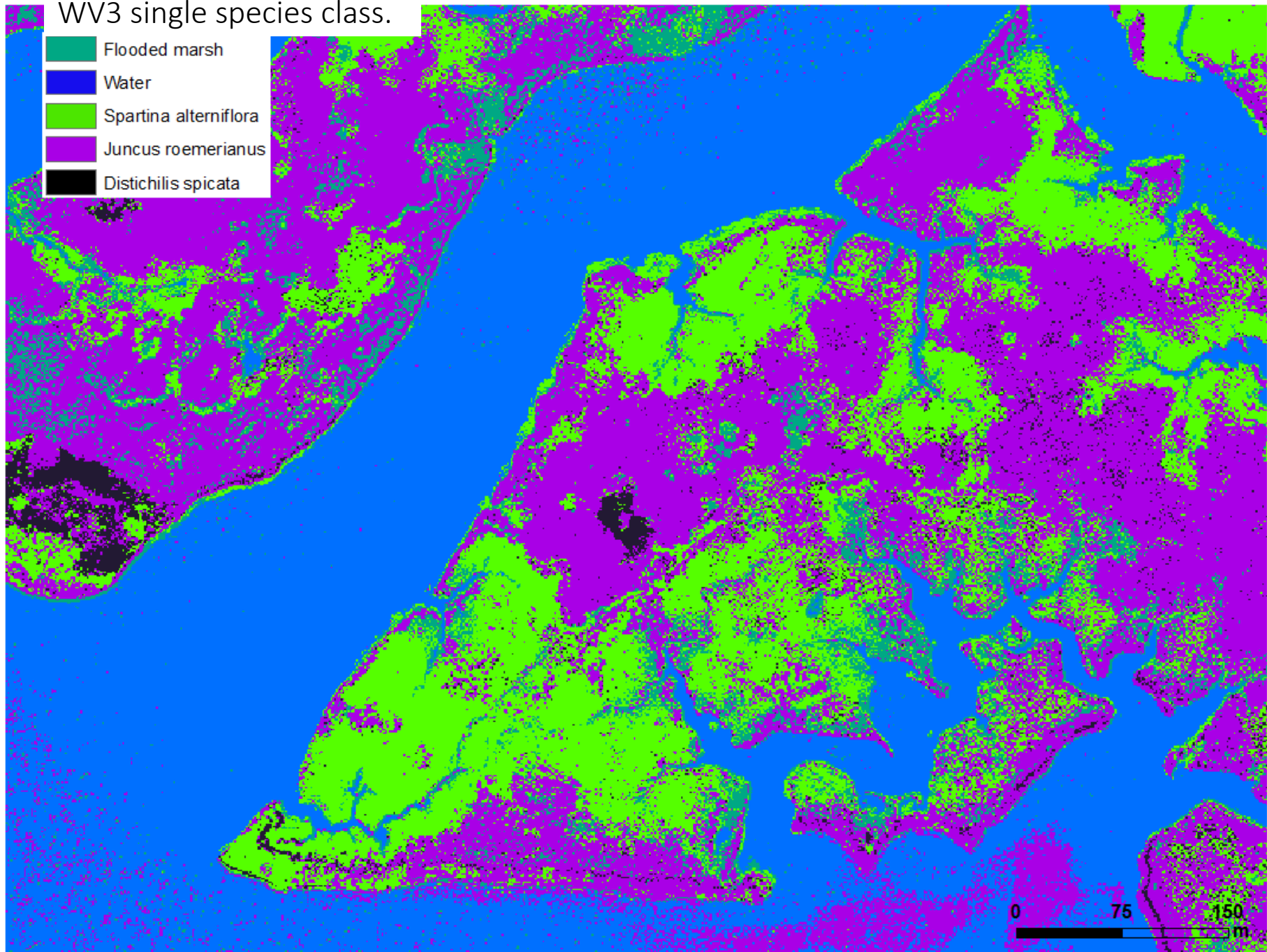
UAV single species class.

-  Flooded marsh
-  Water
-  *Spartina alterniflora*
-  *Juncus roemerianus*
-  *Distichilis spicata*



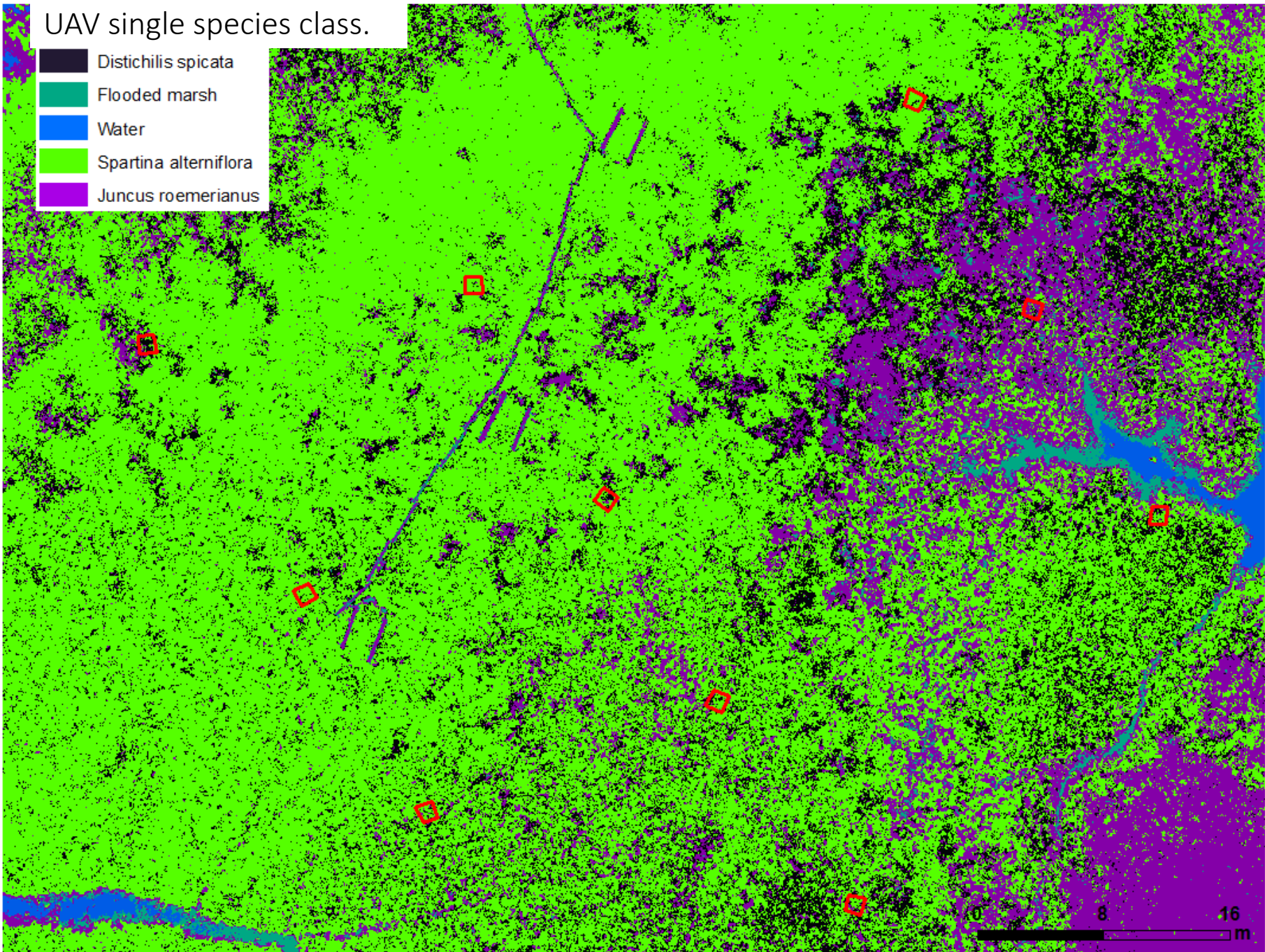
WV3 single species class.

-  Flooded marsh
-  Water
-  *Spartina alterniflora*
-  *Juncus roemerianus*
-  *Distichlis spicata*



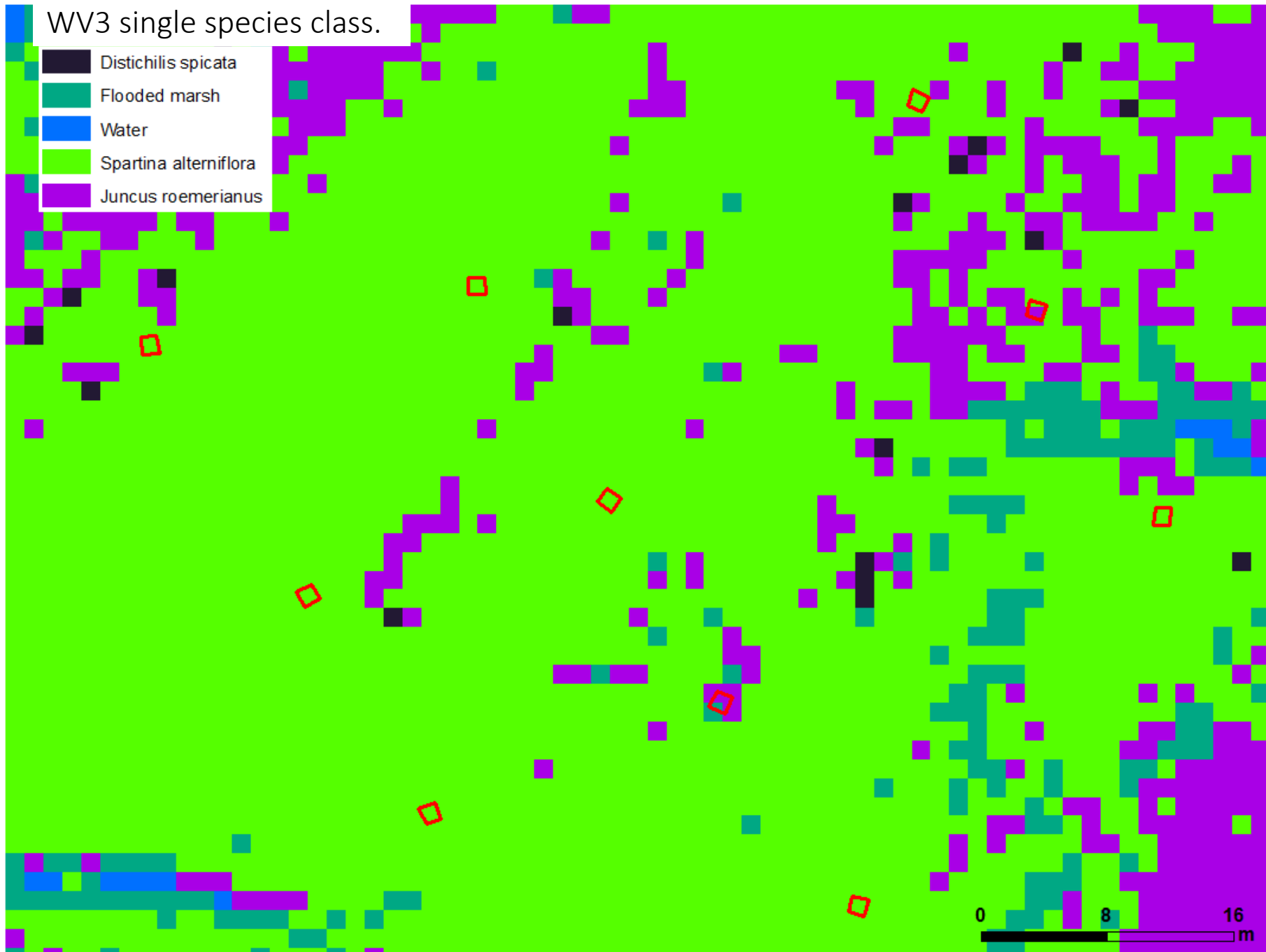
UAV single species class.

- Distichilis spicata
- Flooded marsh
- Water
- Spartina alterniflora
- Juncus roemerianus



WV3 single species class.

- Distichilis spicata
- Flooded marsh
- Water
- Spartina alterniflora
- Juncus roemerianus



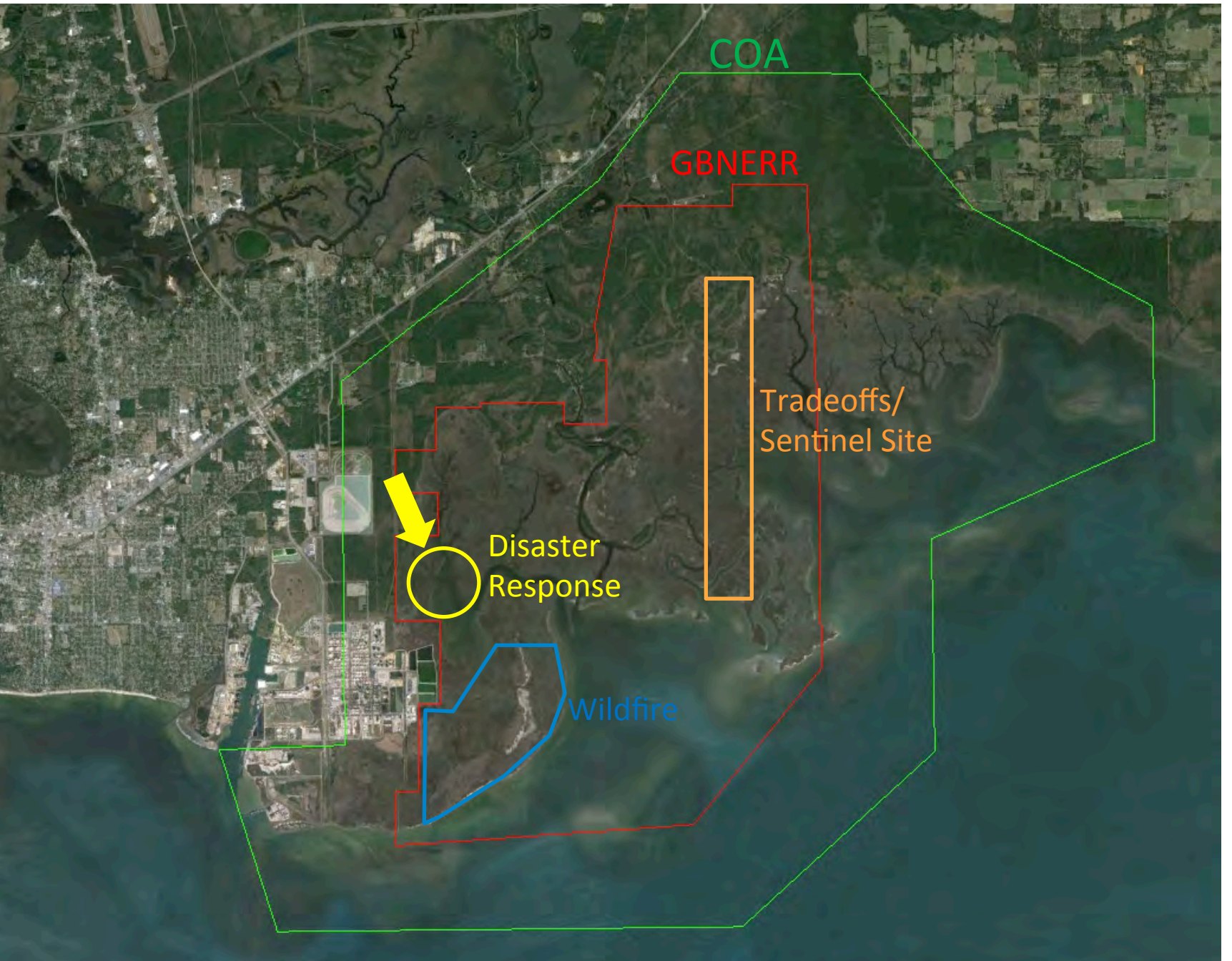
Sentinel Site

Post Mission Comments

- Payload: MSU's CIR payload great resolution, covering Sentinel Site areas in 1 field day, smaller FOV not an issue
- GBNERR feedback: The imagery is sufficient for single species mapping, comparable to vegetation plots. Need to fly again next spring/summer for change assessment.

Simulated Chemical Spill

- Simulate chemical spill from Mississippi Phosphates plant
- Bangs Lake area
- Multi-university and multi-agency team
 - GBNERR personnel
 - NGI: USM, DISL, MSU
 - Mississippi Department of Marine Resources
 - NOAA Disaster Response Center
 - Local television documented
- MSU task: Monitor the release of Fluorescein dye



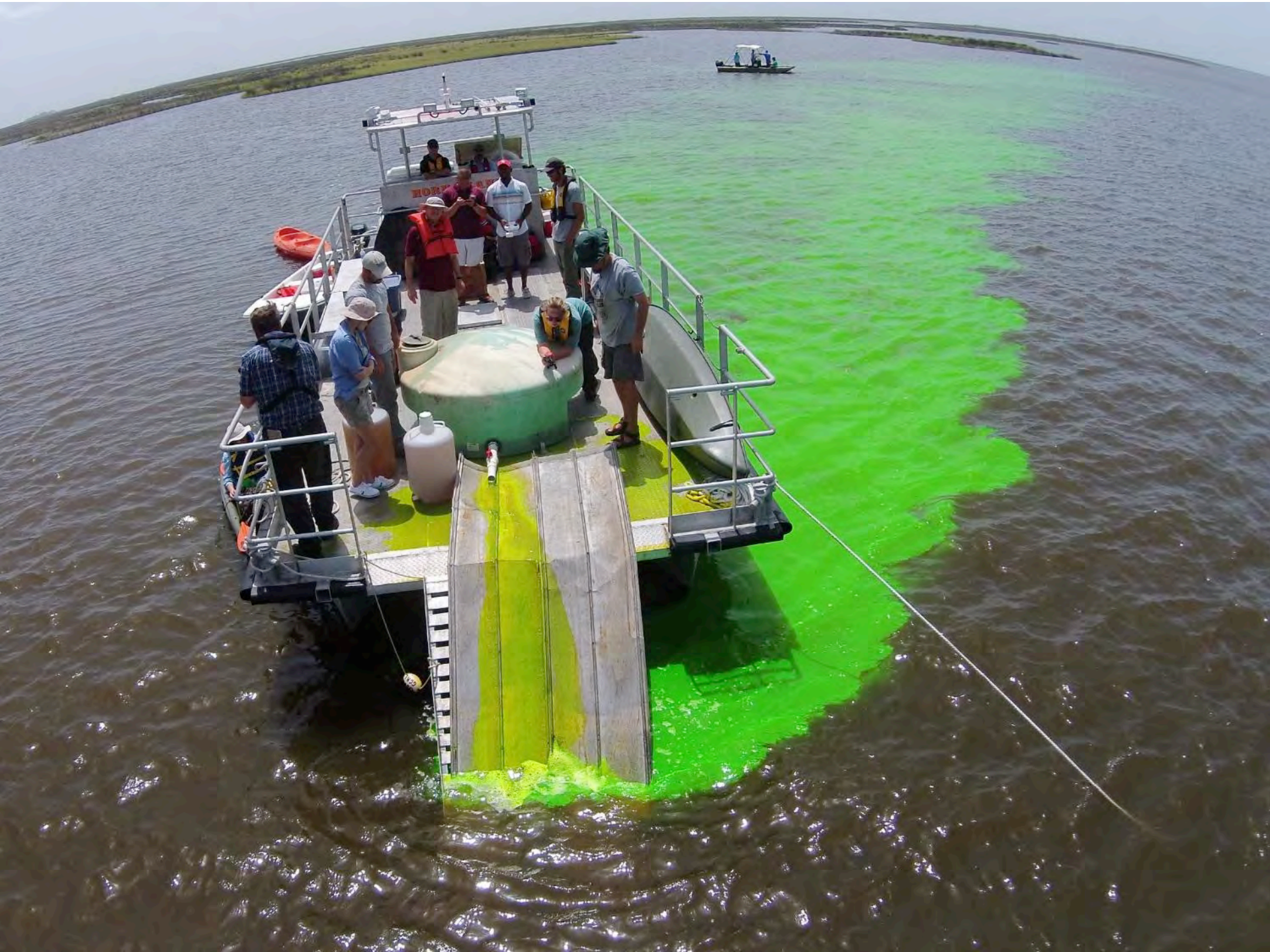
COA

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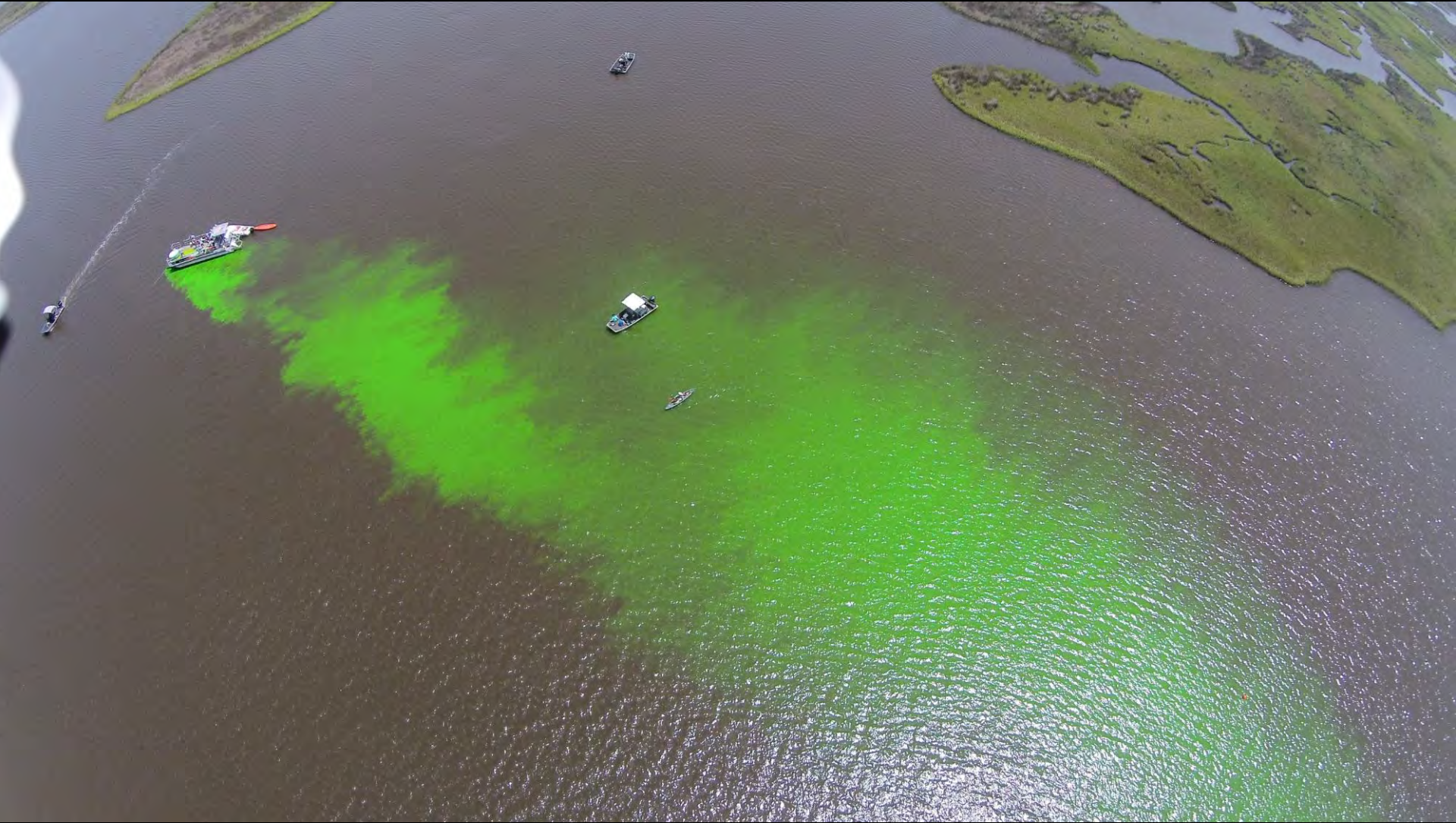
Tradeoffs/
Sentinel Site

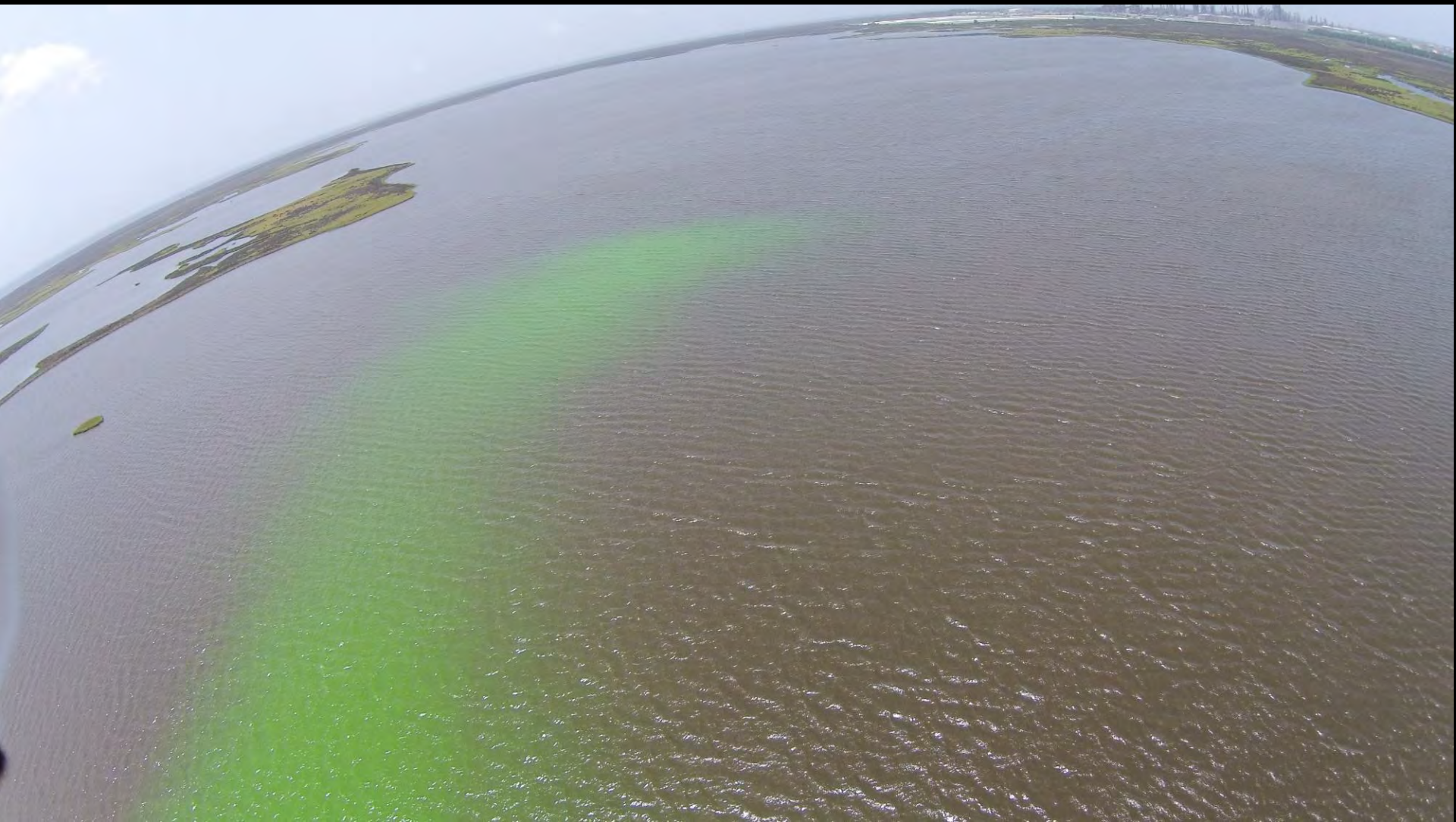
Disaster
Response

Wildfire







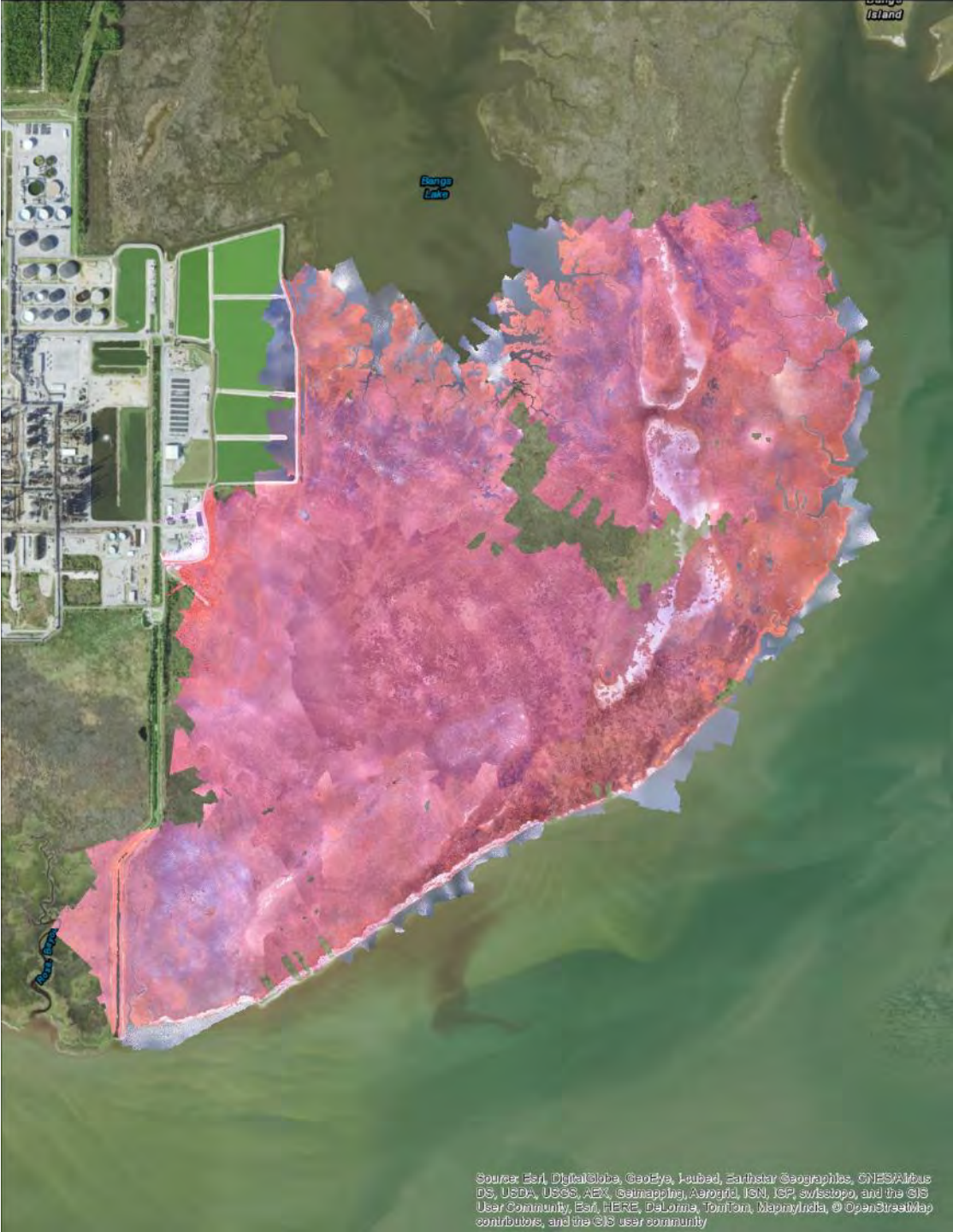






Marsh Fire Mission

- Determine conditions in area immediately after fire
- ~1700 acres
- Plan to monitor (re-fly) as vegetation regrows
- Two MSU employees executed mission. One GBNERR person provide transportation to site.
- Precision Hawk was a bit small. Needed bigger plane to cover more area per unit time and to deal with wind.



Marsh Fire Area
Data collected 29 July 2015

Source: Esri, DigitalGlobe, GeoEye, AeroVista, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, Esri, HERE, DeLorme, TomTom, Mapbox/India, © OpenStreetMap contributors, and the GIS user community

Summary

- It takes a shed full of tools and a team of people to accomplish the varied missions in a NERR. Would suggest a small fixed wing (e.g., Precision Hawk), a larger fixed wing (Altavian Nova or bigger), and at least one multi-rotor copter. Need multiple payloads (visible, multispectral, ...). Strongly suggest bringing in a team with tools for most UAV projects.
- UAV are VERY beneficial tools to the NERR mission.
- The GBNERR folks have been great to work with. Would enjoy working with other NERRs with similar folks and interests.
- Unmanned Aerial Systems (UAS) Imagery Acquisition Roadmap