

CALIFORNIA DEPARTMENT OF WATER RESOURCES

Blacklock Restoration: Phragmites Control Study

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CA Department of Water Resources

Tidal Habitat Restoration Section
Restoration Research and Enhancement Unit

Acknowledgements – Team Effort!

- **Research Team:** DWR & UCD
 - Krista Hoffman, JT Robinson, Gina Darin
- **Field & Lab:** Solitude Lake Management, Bryte Chem Lab, WECK Lab, Suisun RCD
- **Stakeholders**
- **Funders:** DC Prop 1 Grant & DWR Fish Restoration Program



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WATER RESOURCES

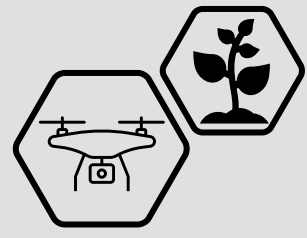
SACRAMENTO - SAN JOAQUIN
DELTA CONSERVANCY

Why care about phragmites?

Negative effects on:

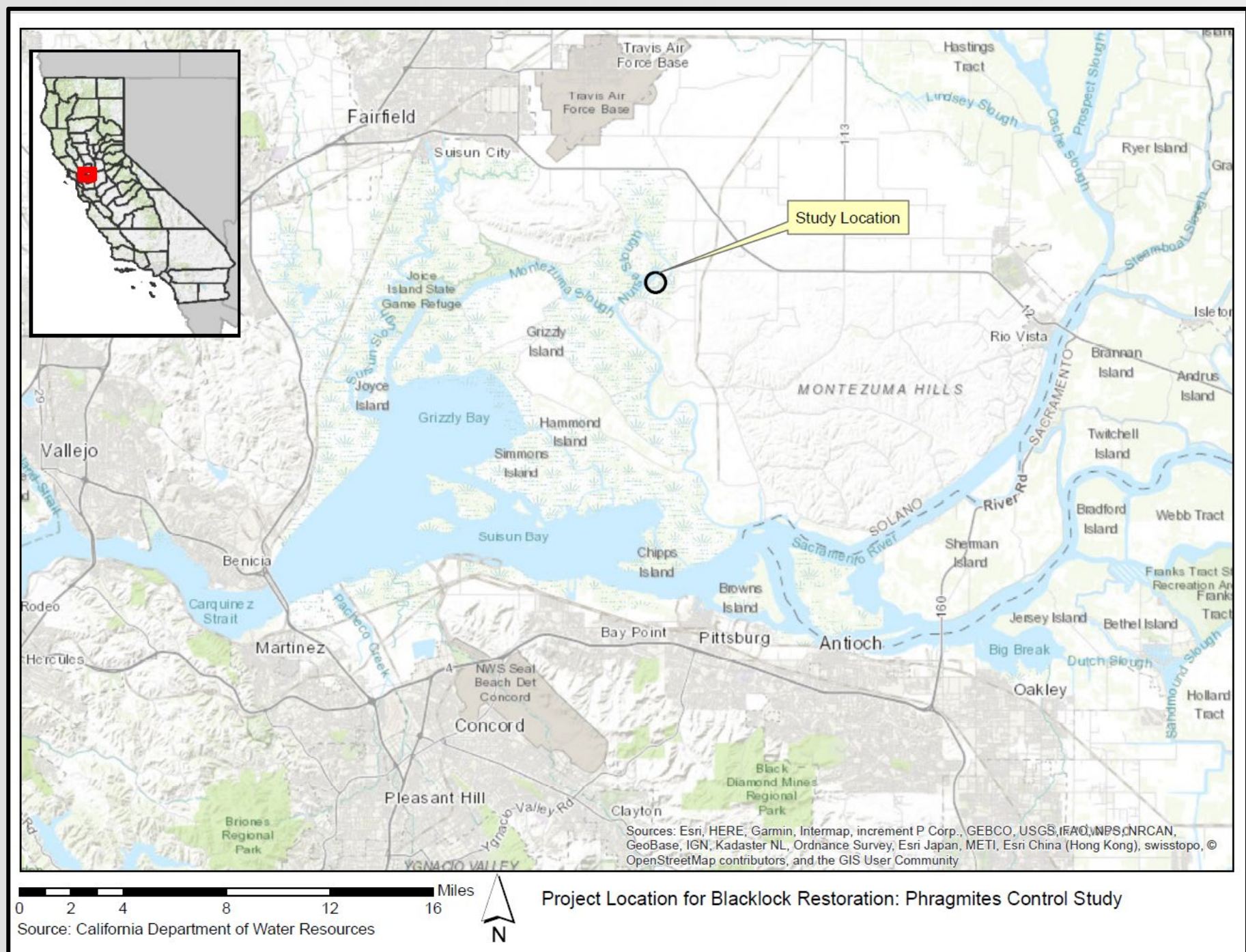
- Native vegetation, fish, and wildlife
- Water quality
- Recreation

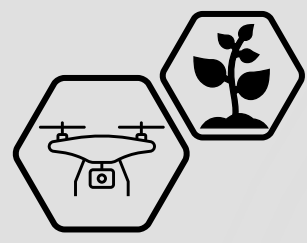




Blacklock Phragmites Control Study

- Purpose of Study: Justification & Goal
- Study Objectives: Efficacy & Impacts
- Study Timeframe: 2019-2022
- Sitewide Implementation



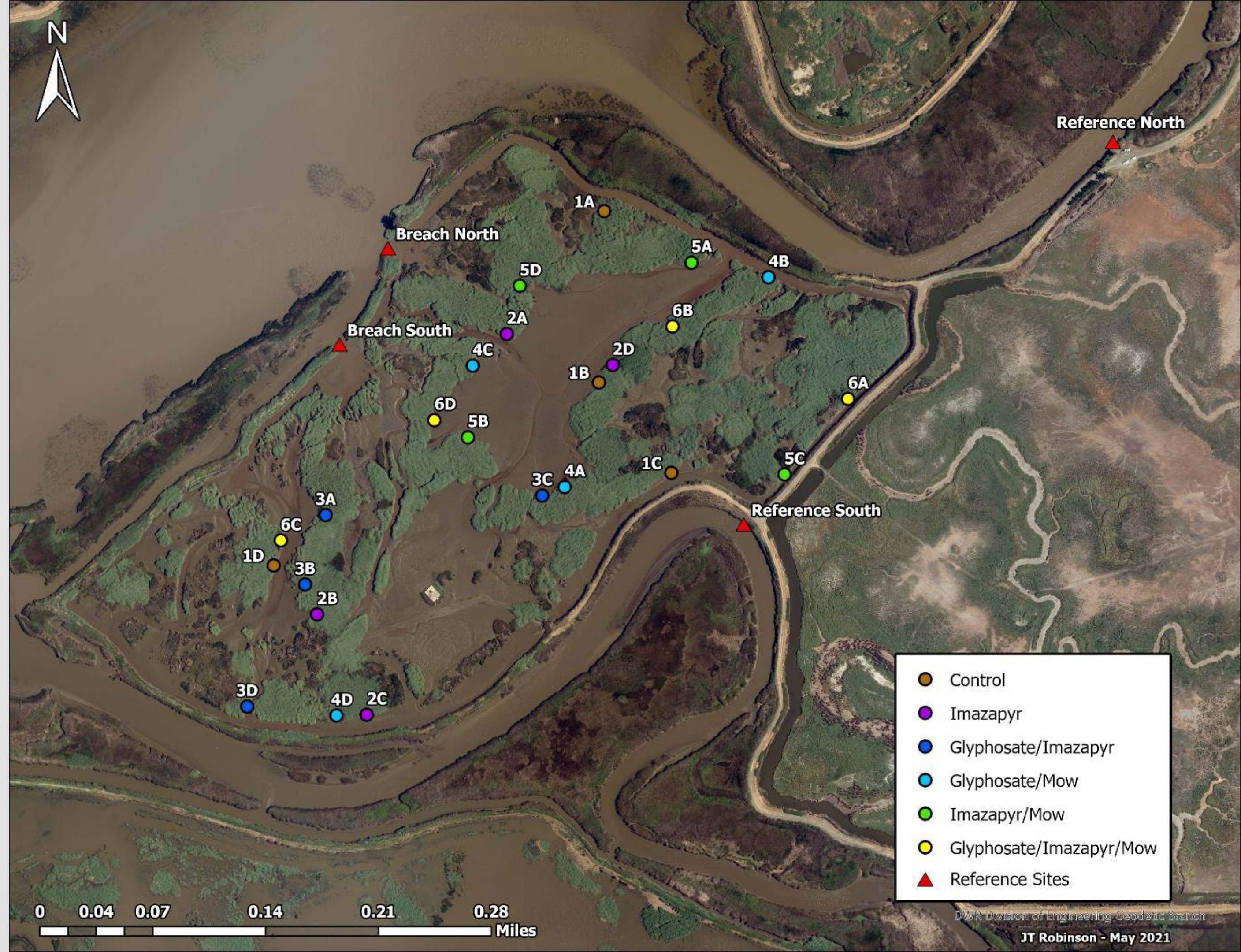


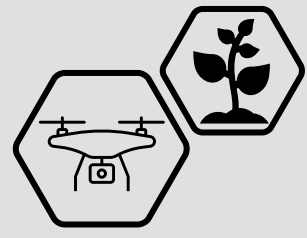
Blacklock Phragmites Control Study

Funding and
permits secured
2019

Contracted with
UCD, Solitude
Lake Management,
and WECK Labs

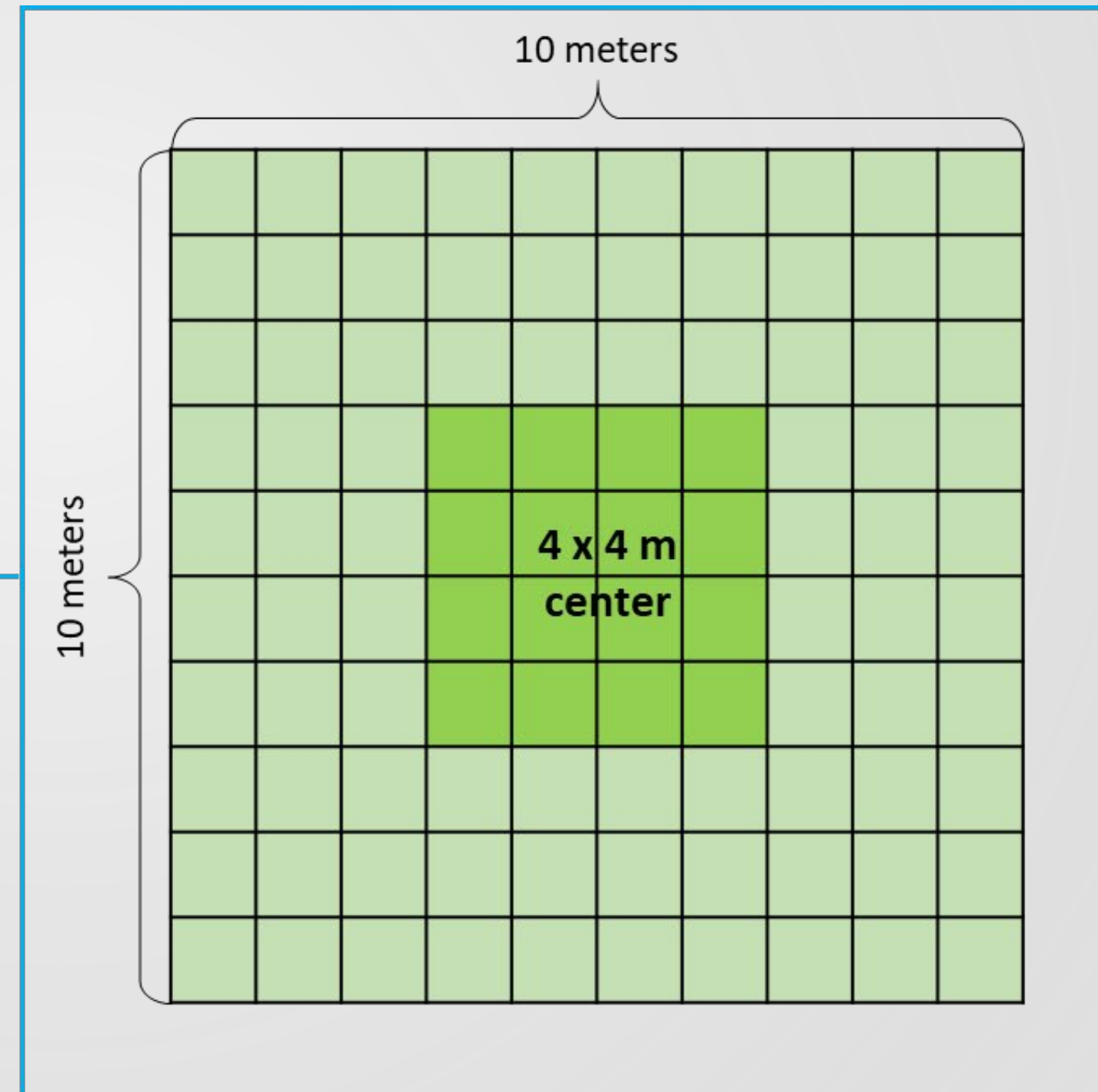
Last drone flight
May 2022

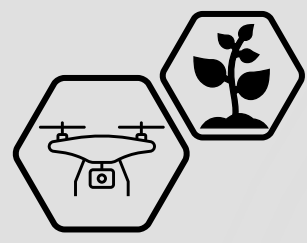




Treatment Plots

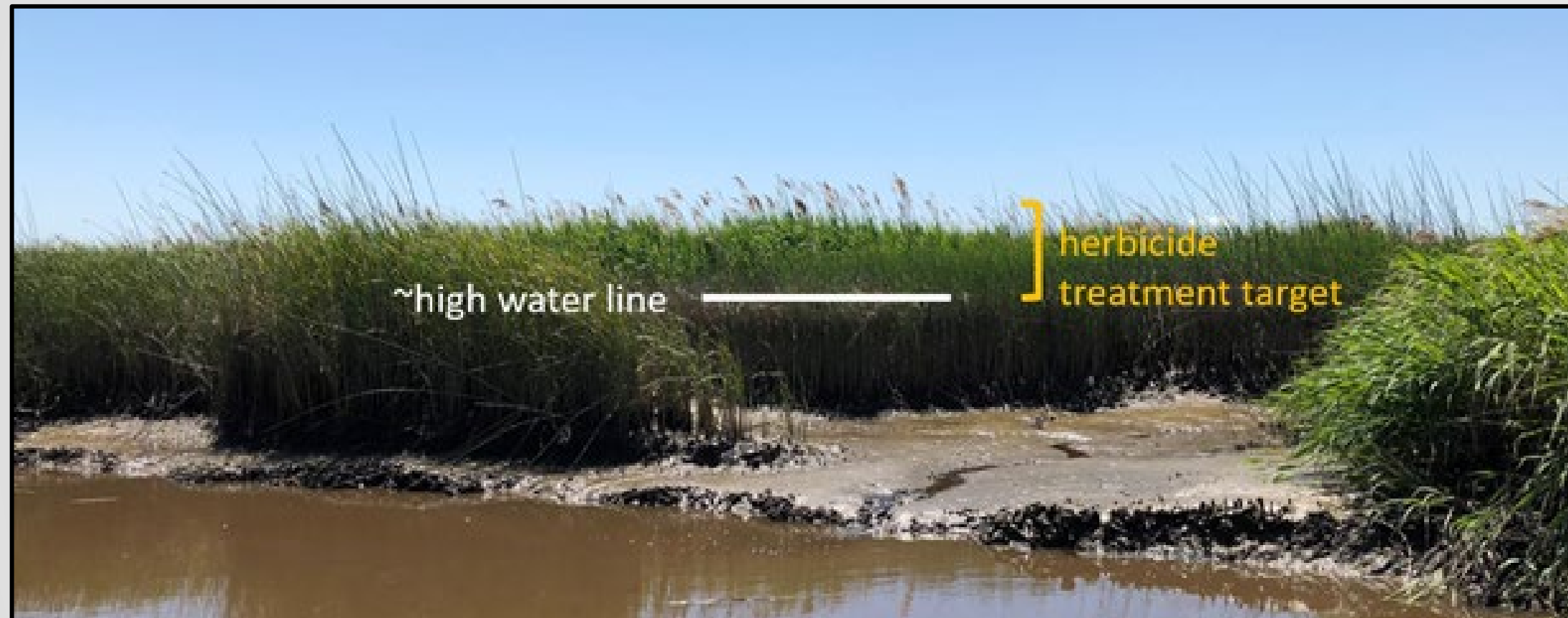
- 10 x 10 Meter Treatment Plots
- 4 x 4 Meter Monitoring Center



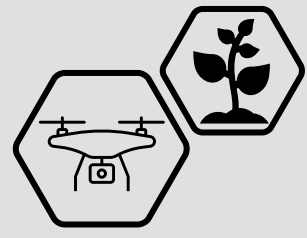


Herbicide & Mow Treatments

- Aquatic Glyphosate Formulation
- Aquatic Imazapyr Formulation
- Non-ionic surfactant



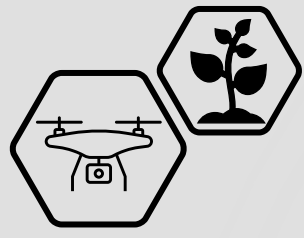
1	2	3	4	5	6
Control	Imazapyr	Glyphosate + Imazapyr	Glyphosate + mow	Imazapyr + mow	Glyphosate + Imazapyr + mow



Herbicide & Mow Treatments

- Marsh Master was used in 2019
- Jon boat, backpack sprayer, and weed eaters used in 2020 & 2021





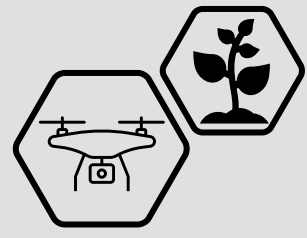
Monitoring

Physical
Vegetation
Sampling

Water Quality
Sampling

Frequent UAV
Monitoring

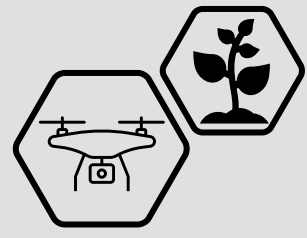




Physical Vegetation Monitoring

- Quadrat percent cover and shoot count
- Biomass collection and stand measurements



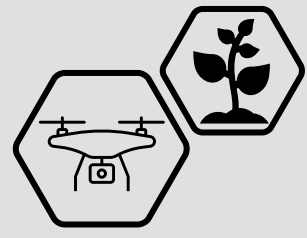


Water Quality Monitoring

Discrete water samples

- 24 hours before herbicide application
- During herbicide application
- 24 hours – 1 week after herbicide application

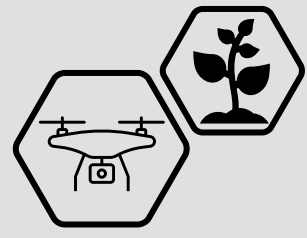




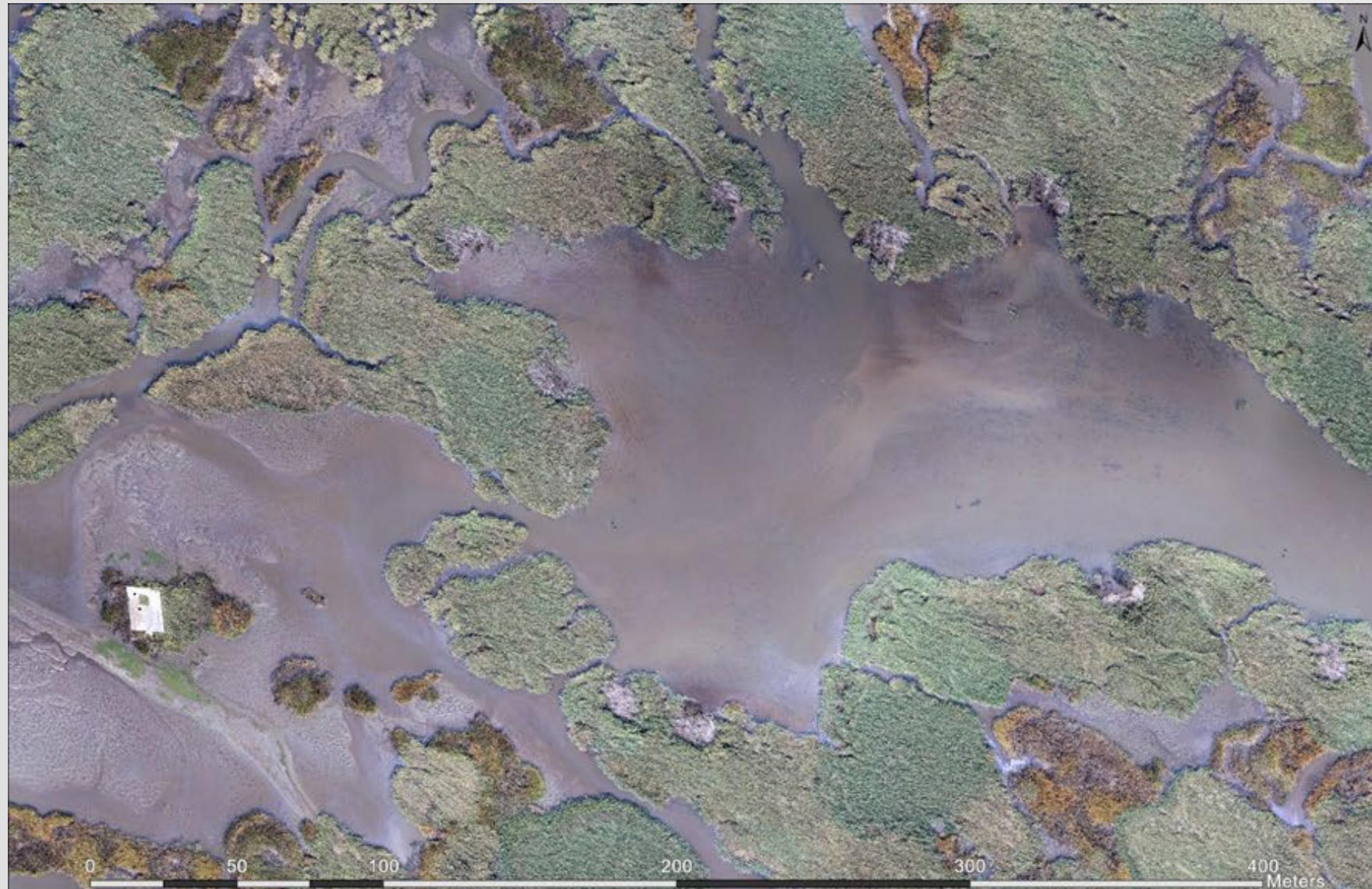
UAV (drone) Monitoring

- RGB imagery is collected using Phantom 4 Pro RTK
- Multispectral imagery is collected using Matrice 200 with Micasense 5-band sensor

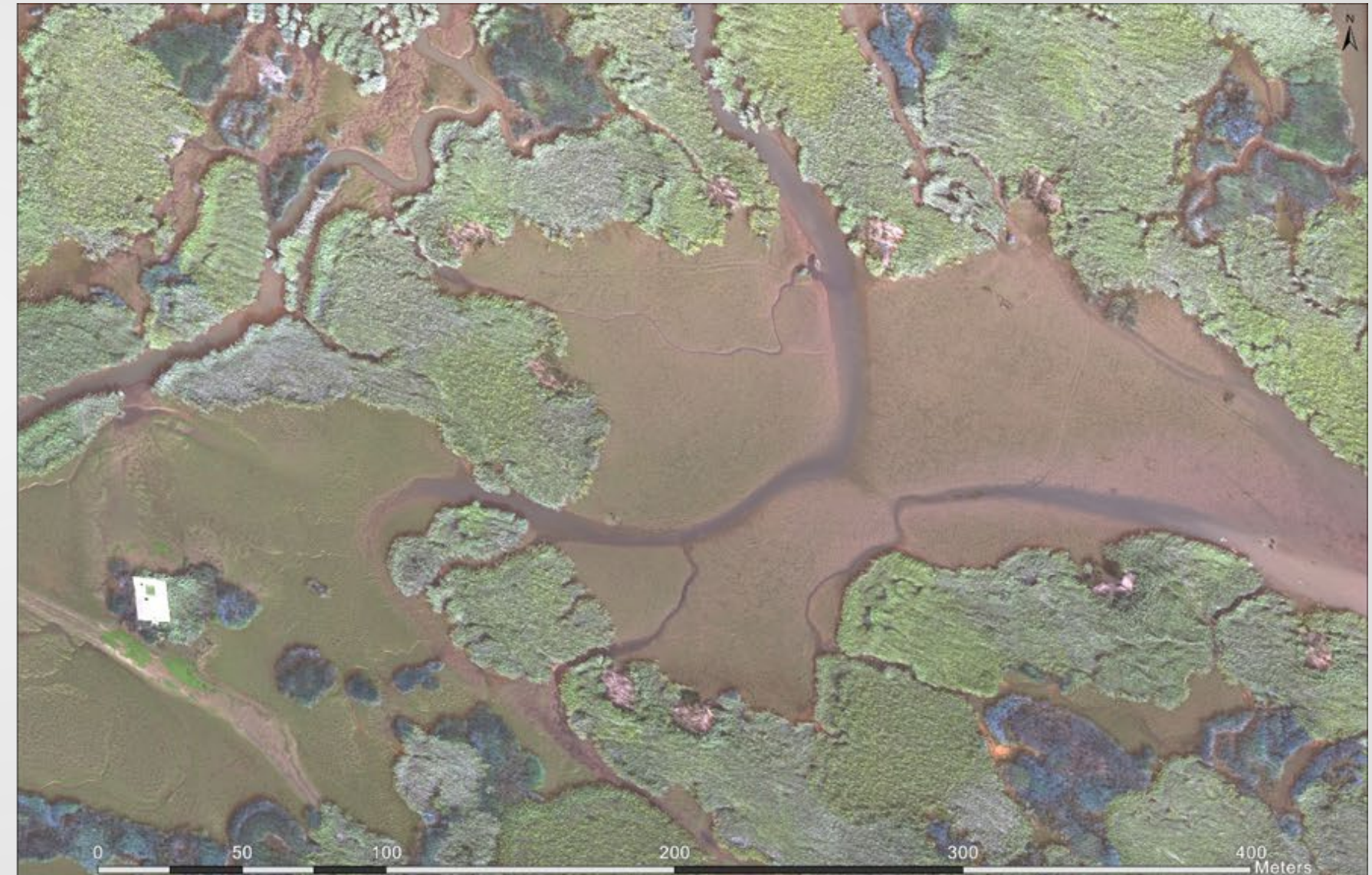




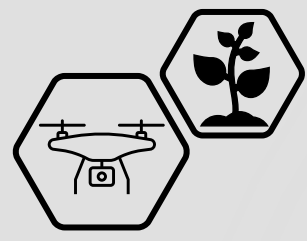
Blacklock Imagery – RGB and Multispectral Orthomosaic



RGB Orthomosaic
1.8cm x 1.8cm

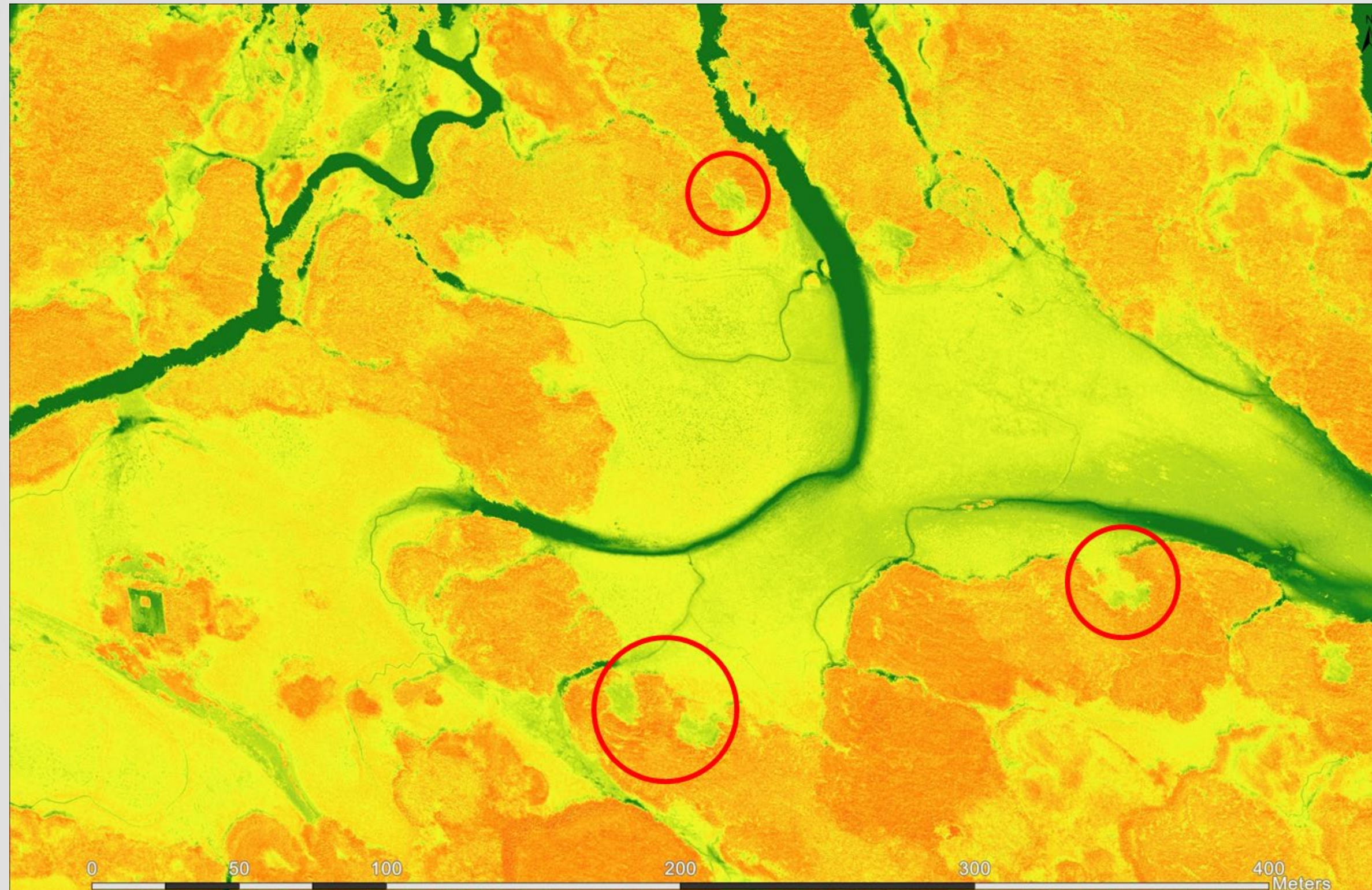


Multispectral (RGB) Orthomosaic
4.2cm x 4.2cm



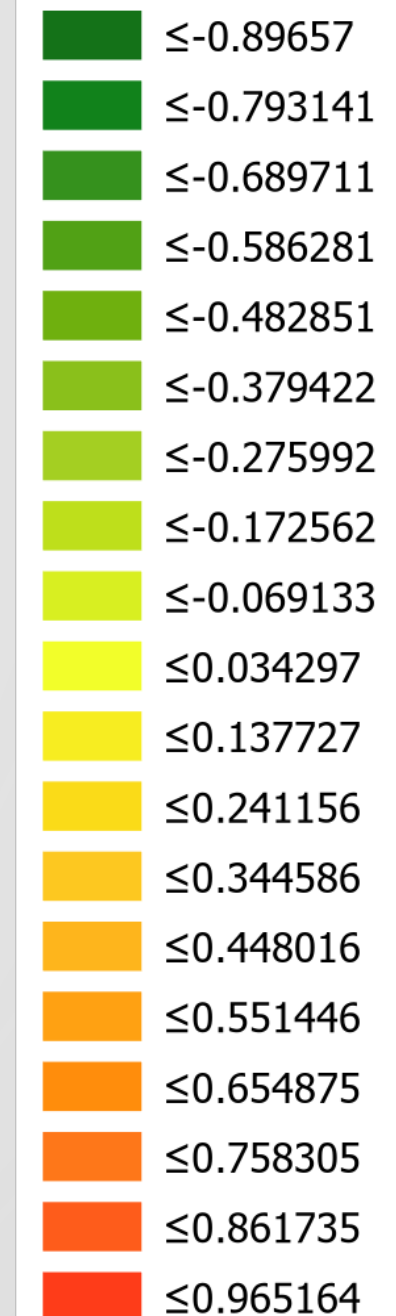
Blacklock Imagery – Normalized Difference Vegetation Index

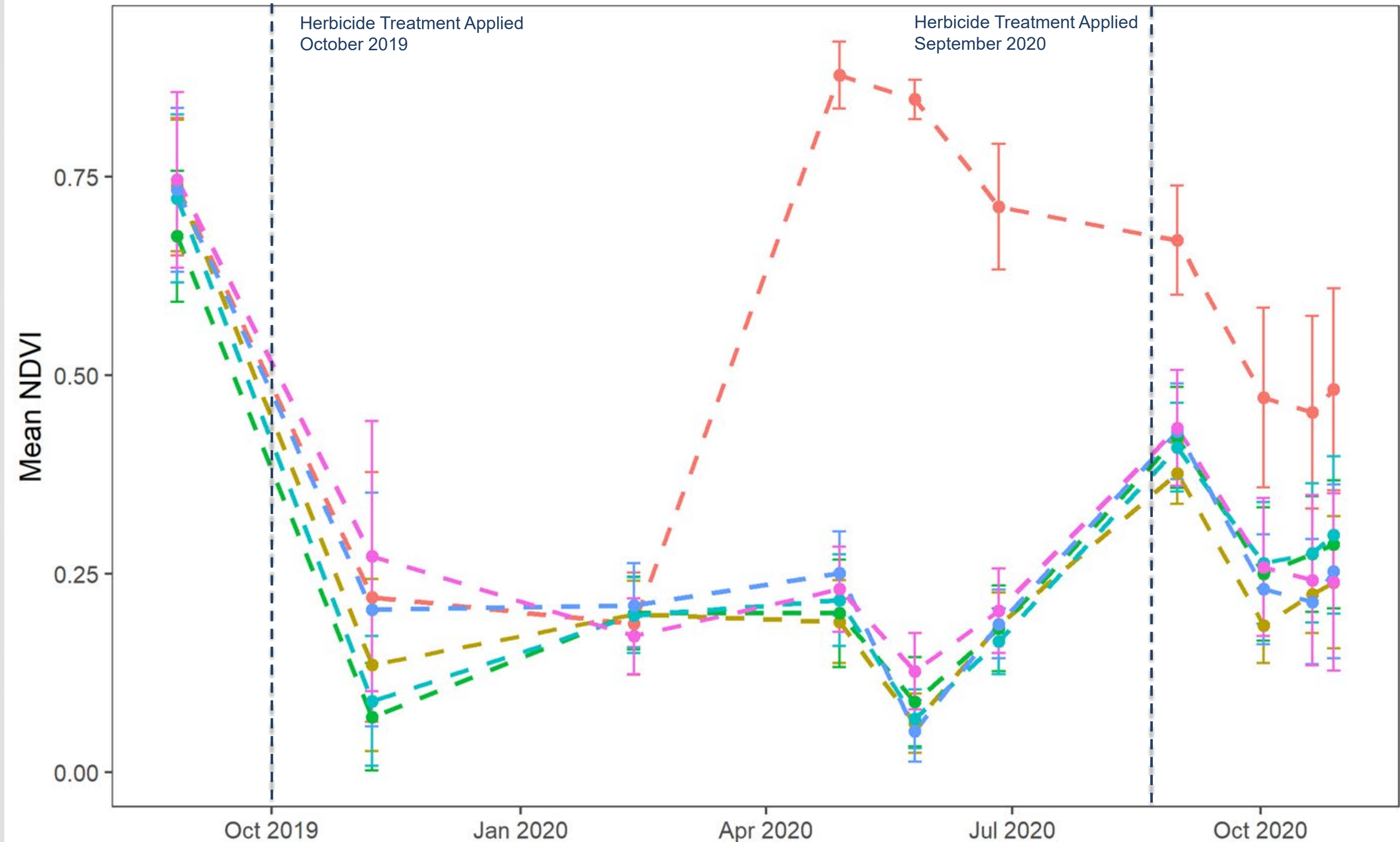
$$\text{NDVI} = \frac{(\text{NIR} - \text{Red})}{(\text{NIR} + \text{Red})}$$

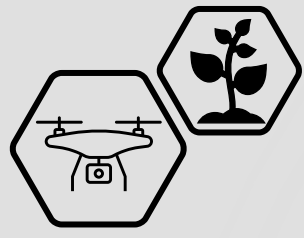


NDVI August 31, 2020

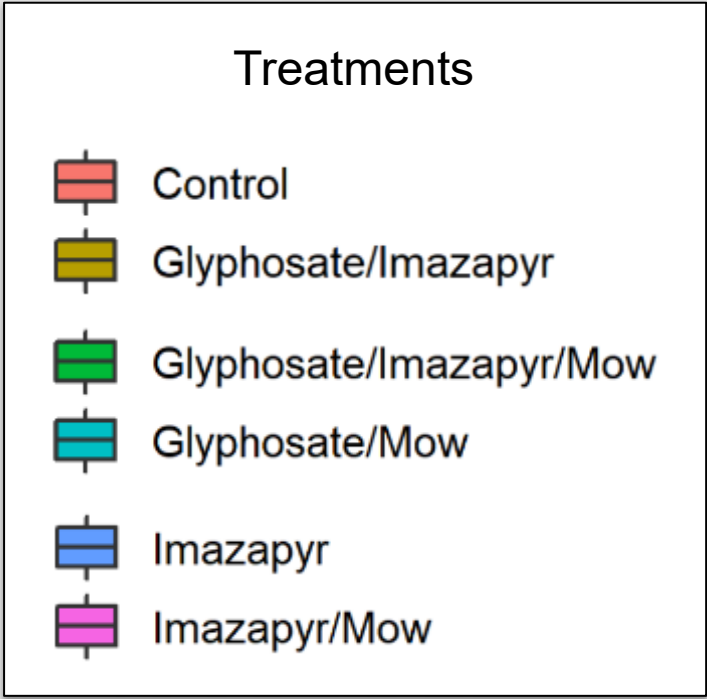
Value

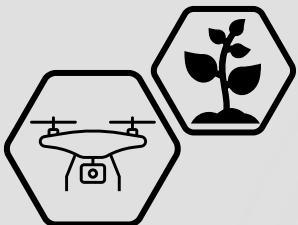






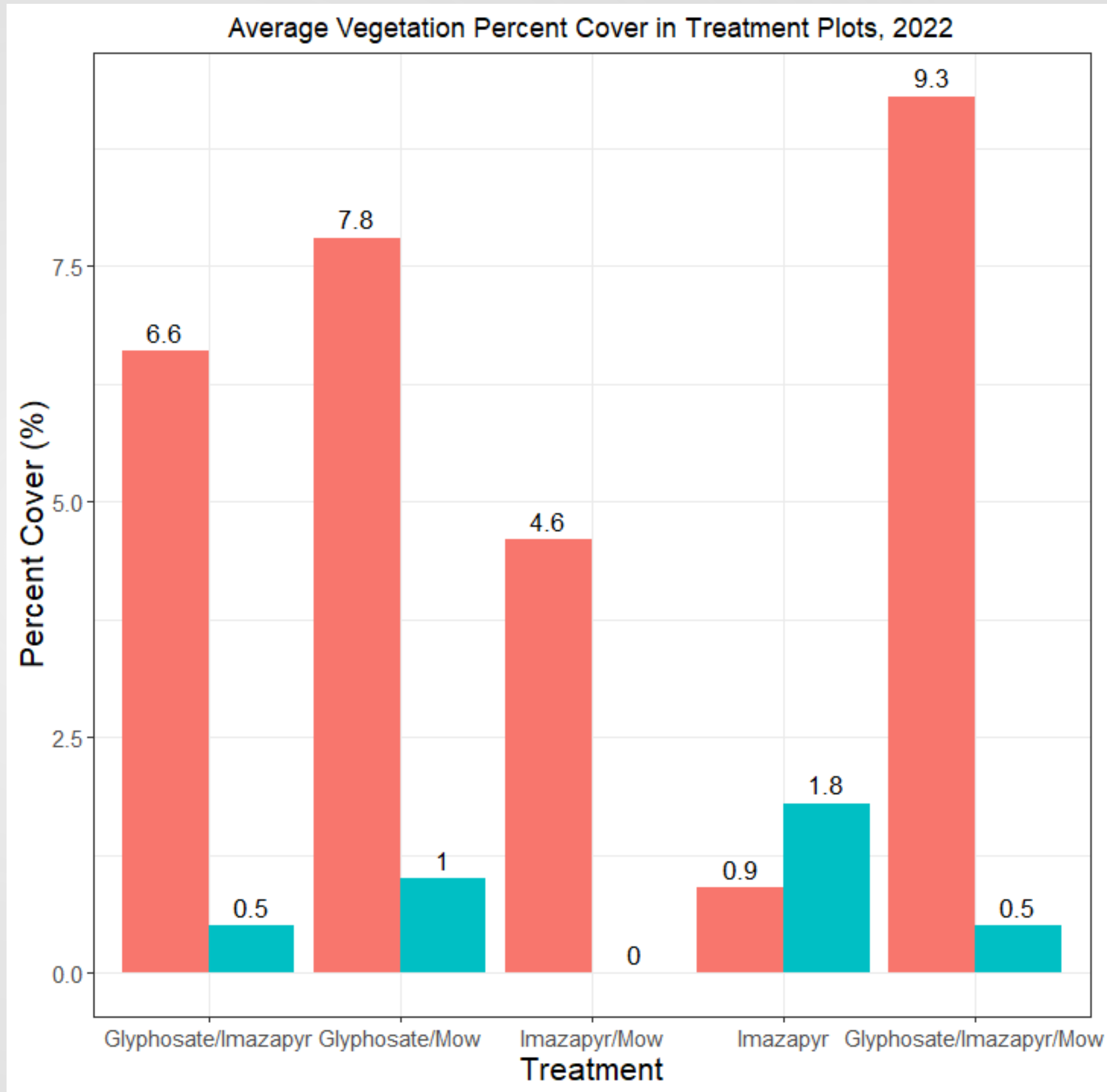
NDVI Results

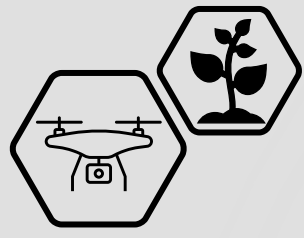




Native Vegetation
Phragmites australis

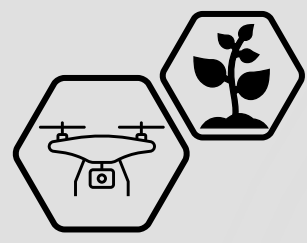
Non-target plants





Recruitment of Native Vegetation

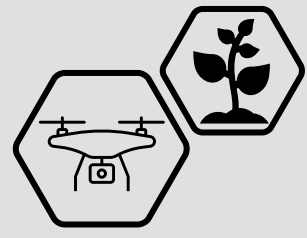




WQ Results



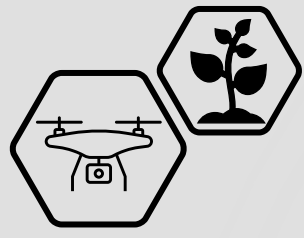
Herbicide	Total samples taken (2019-2021)	Positive Detections (2019-2021)	Maximum Detection (mg/L)	Average Detection (mg/L)	NPDES Receiving Water Limit/Monitoring Trigger (mg/L)
Glyphosate	196	0	NA	NA	0.7
Imazapyr	210	30	0.013	0.00127	11.2



Future of Blacklock

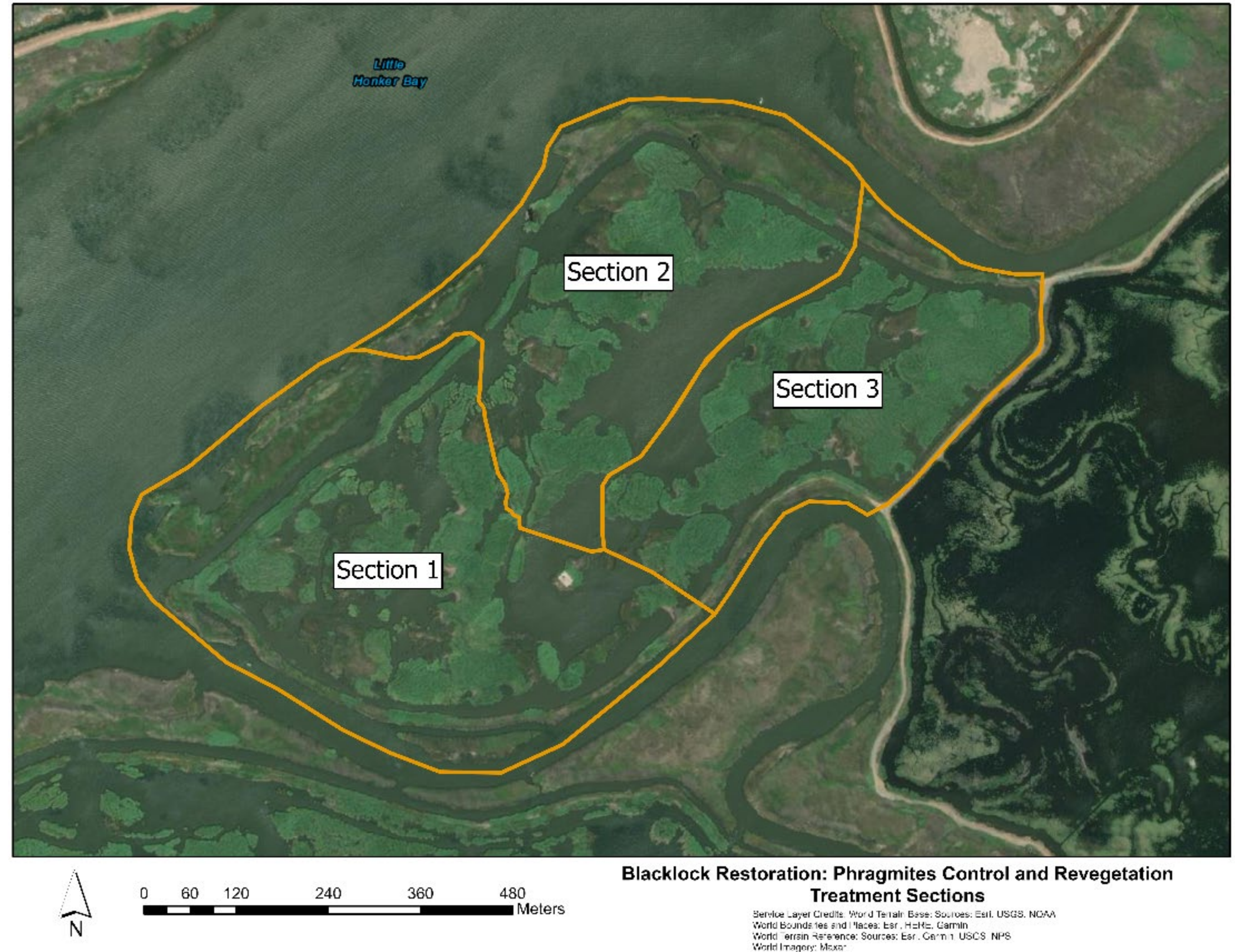
- Lessons learned from Blacklock Study
- Finetune methods and monitoring
- Full sitewide implementation
- Facilitate permitting

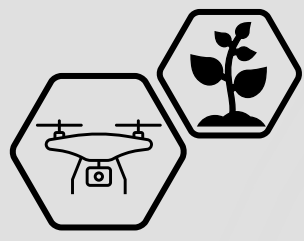




Site-wide Treatment

- Phased Treatment starting September 2023
- UAV herbicide application
- Mowing, as needed
- Buffer Mason's lilaeopsis
- Spot spray
- Active revegetation
- Monitoring





Thank you!

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Any Questions?