#33 RESTORE ACT COE: USING NOVEL TECHNOLOGIES TO ADVANCE COASTAL RESTORATION AND THE LOUISIANA COASTAL MASTER PLAN

Developing Methods to Measure Flotant Marsh Extent and Stability in the Barataria-Terrebonne Estuary System

The Coastal Center
Grand Opening
Fall 2025

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Thanks to Mason Dupre, DOTD
Thanks to Peter Jansen, Edison Chouest Offshore Companies

STATE OF THE COAST
MAY 21, 2025

Flotant Team

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Vegetation

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What is Flotant Marsh?

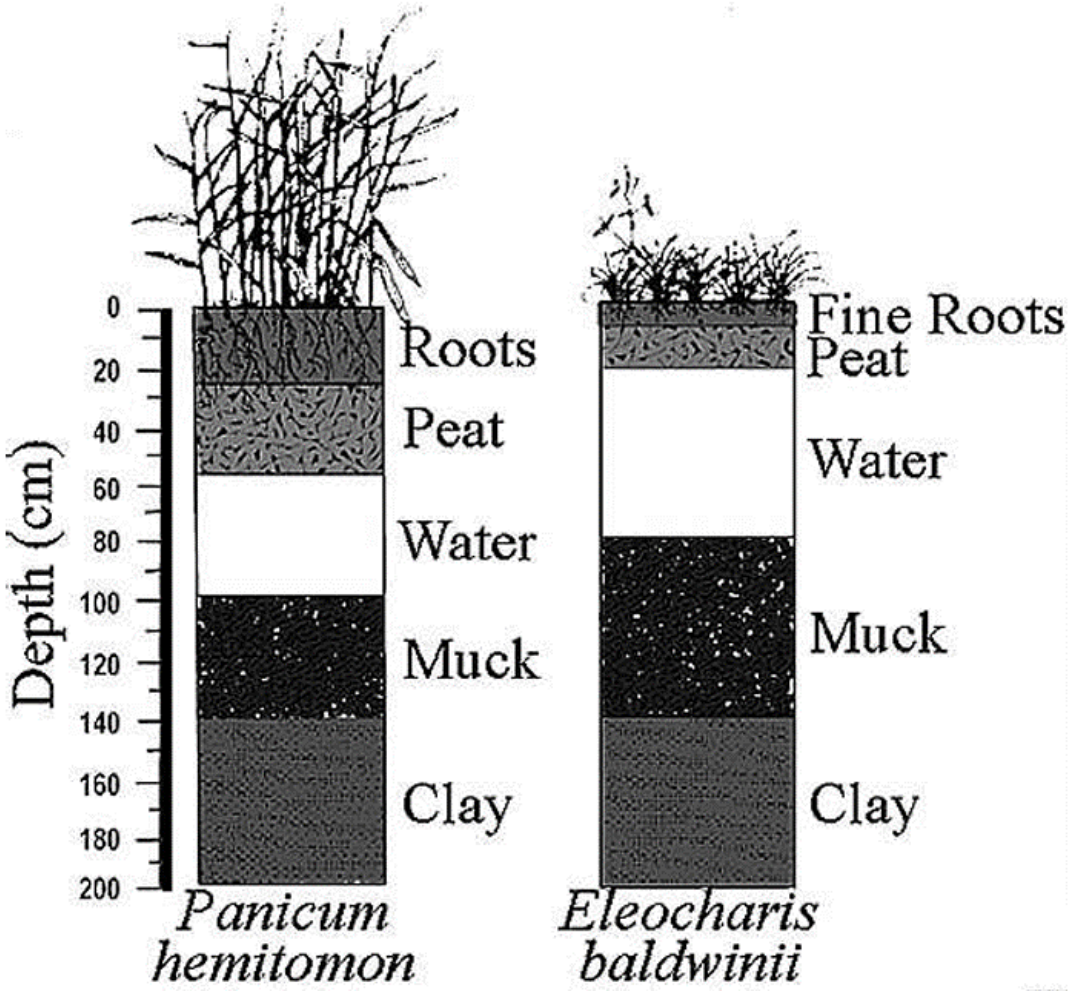
Flotant: wetland of emergent vegetation with a mat of live roots and associated dead and decomposing organic material and mineral sediments that moves vertically as ambient water levels rise and fall.

Flotant can avoid the stress of high water by floating

But flotant can become degraded leading to thinning and mat separation when exposed to high winds or flooding.

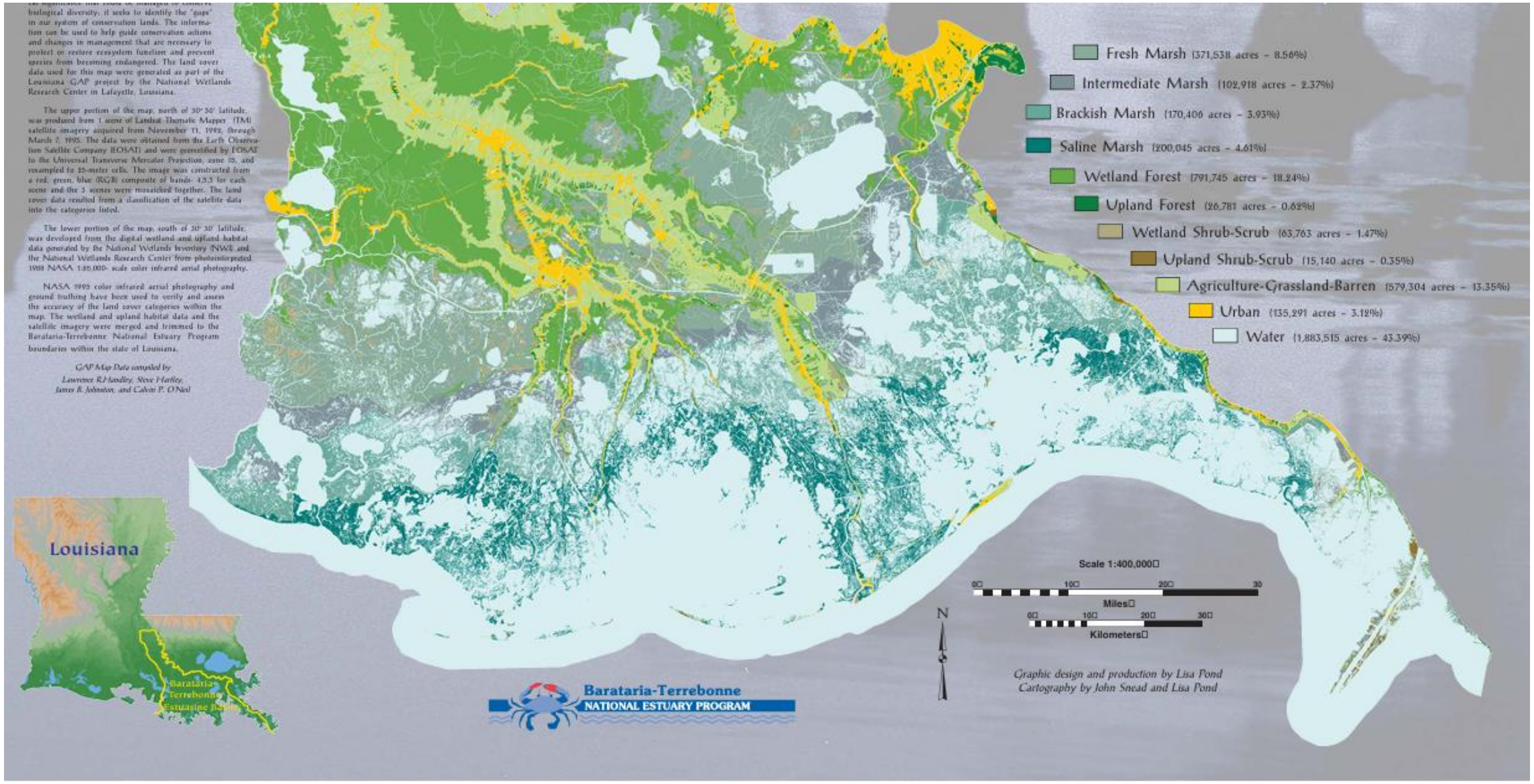
Flotant can be found in Louisiana's estuaries within the freshwater, intermediate, and brackish habitat zones.

(Sasser 1995; Sasser et al. 1995)



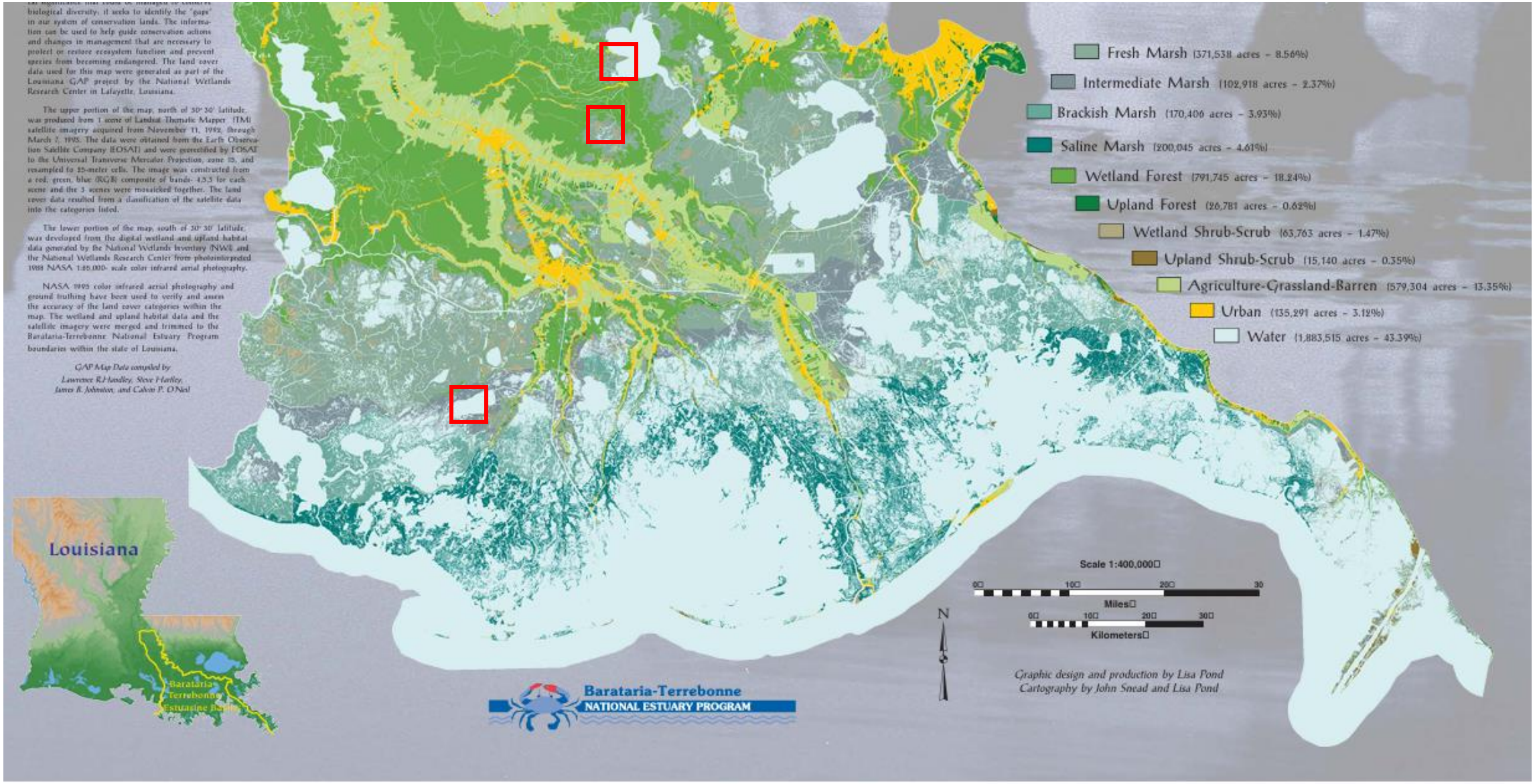
Modified from Izdepski et al. (2009)

Where is Flotant Marsh?



Flotant can be found in Freshwater, Intermediate, and Brackish Marsh

(Handley, Hartley, Johnston, and O'Neil, 1993)



For our study we are concentrating on Three separate lakes:
Lac Des Allemands, Lake Boeuf, and Lake de Cade
(Handley, Hartley, Johnston, and O'Neil, 1993)

Three Sites

Lac Des Allemands
Upper Barataria Basin
tidally influenced

Lake Boeuf
Upper Barataria Basin

Lake de Cade
Terrebonne Basin tidally influenced
with occasional brackish salinities

- Hyperspectral + Lidar Survey to document vegetative species, spectrum, and geomorphic elements
- Fauna and pore water through conventional sampling
- Flora using gill nets, crab traps, minnow traps, plus scat observation
- eDNA to characterize fauna and flora, especially invasive species such as Chines Tallow, Nutria, Apple Snail

Lake Boeuf
-Accessed through Grand Bayou
-Reports from Public on SAV
-Apple snail infestation since 2010
-Diversity of Invasive Species
-Break up apparent on edges

Lake Des Allemands
-Accessed through Bayou Boeuf
-*Sagittaria* blooming through *Panicum*, March

Some influence from invasive morning glory
Some break up here

Lake De Cade
-Accessed through Falgout Canal
-*Sagittaria* thriving through April
-Very little break up

Bulltongue

Curly Dock

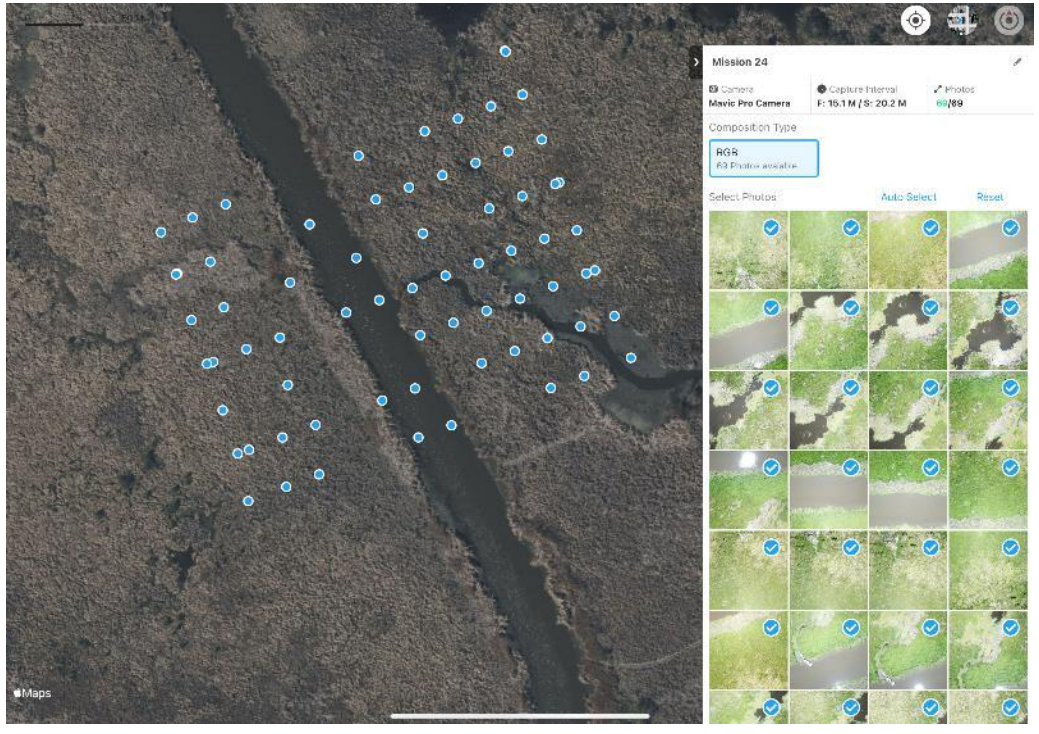
Hibiscus

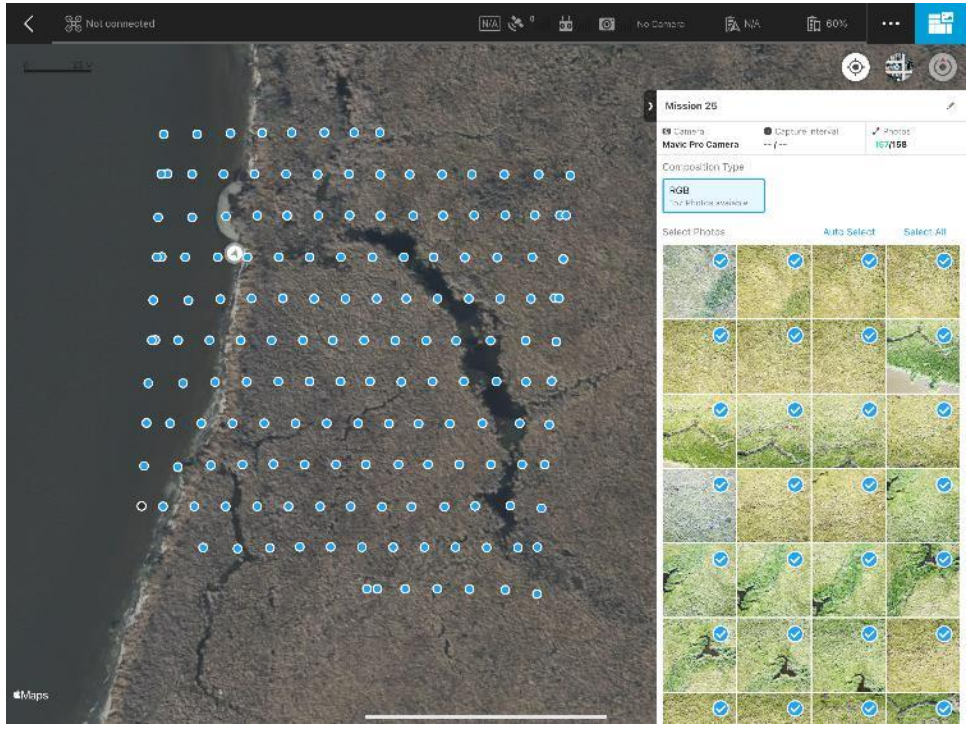
Morning Glory

Lake de Cade Fauna reflects brackish ecology
Alligators,
Pig Frogs, Bronze Frogs, Cricket Frogs
Grass Shrimp, Bayou Killifish, and Goby
No evidence of Apple Snail at this site

Occupy monument “Ivy” for RTK

UAVs are piloted by Peter Jansen, with program that flies pre-loaded KML of site, with slight overlap for each flight line



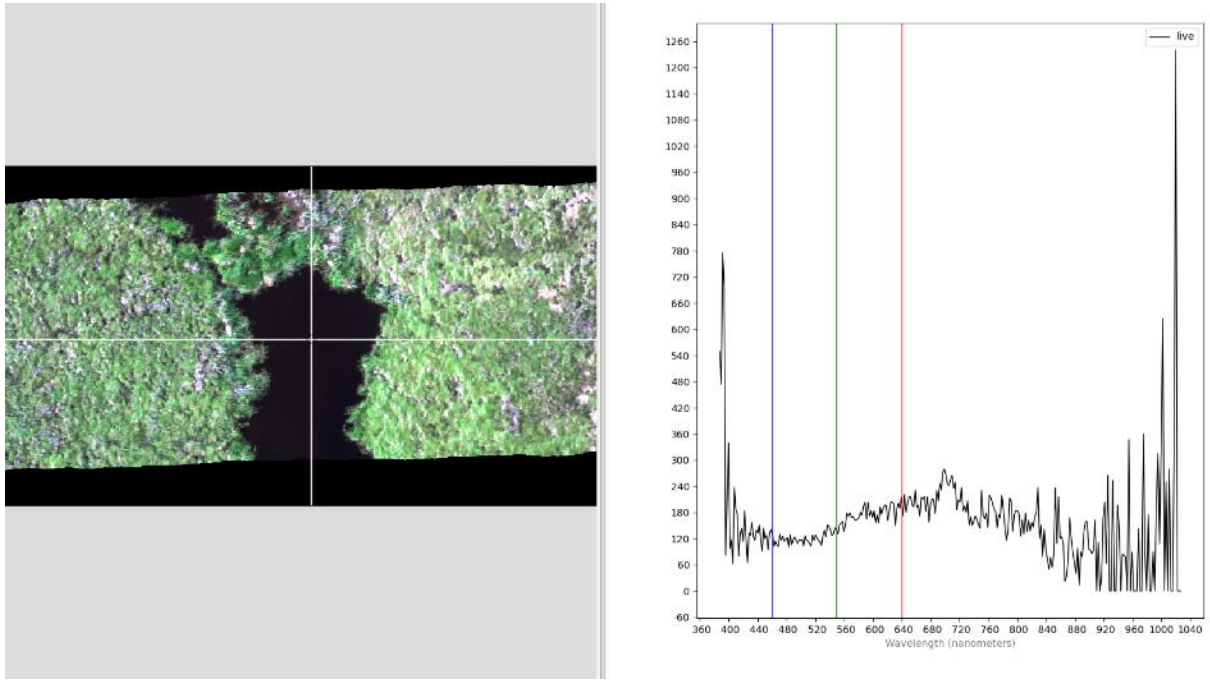


Resonon Pika-L with DJI M600 airframe	
Spectral Range (nm)	400 - 1000
Spectral Channels	281
Spectral Sampling (nm)	2.1
Max Frame Rate (fps)	249
f/#	2.4
Objective Lens FOV	17.6 mm
Gimbal	Gremsy H-16
IMU/GPS	SBG Ellipse - Dual

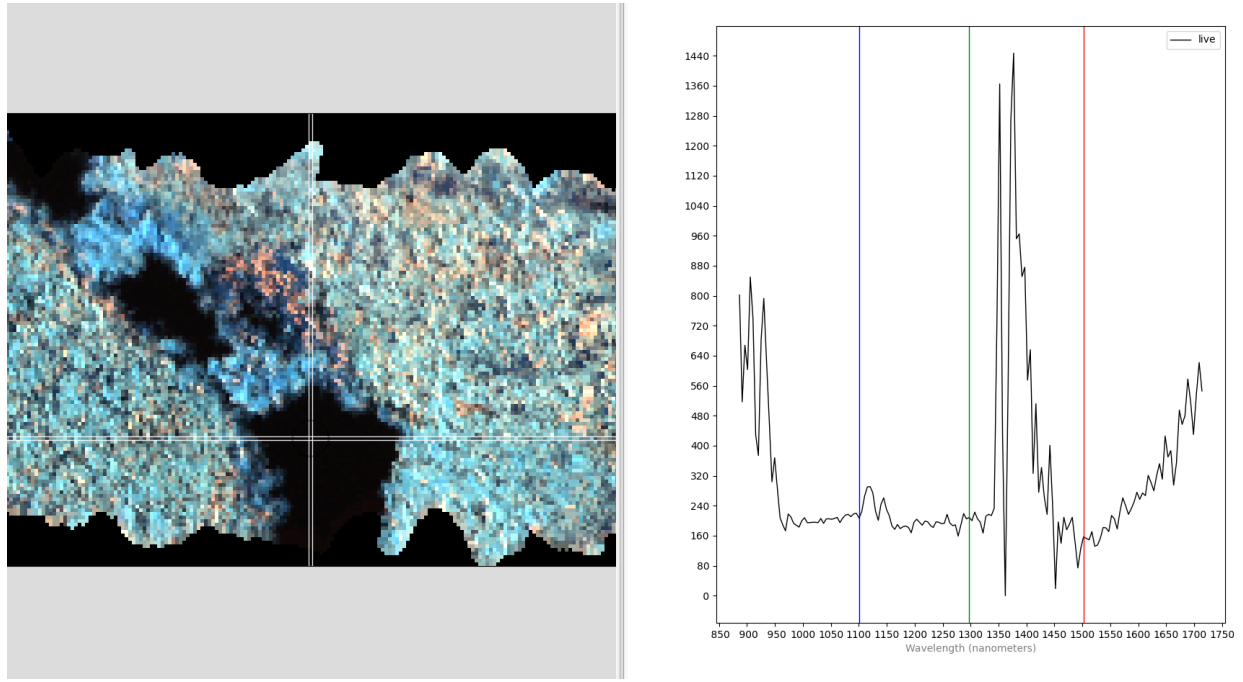
Two Hyperspectral Sensors

North side of Lake De Cade
Cohesive Flotant

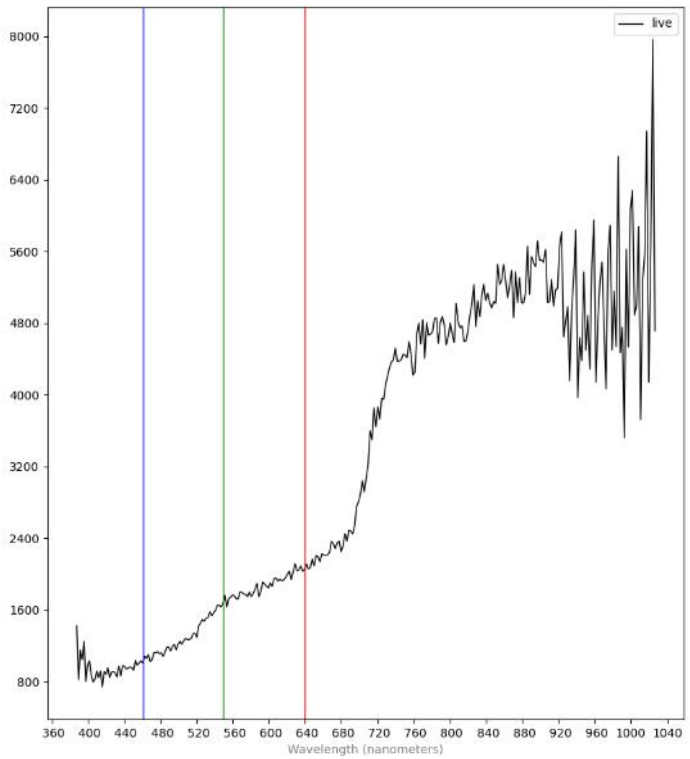
South side of Lake De Cade
Seams and Potholes apparent

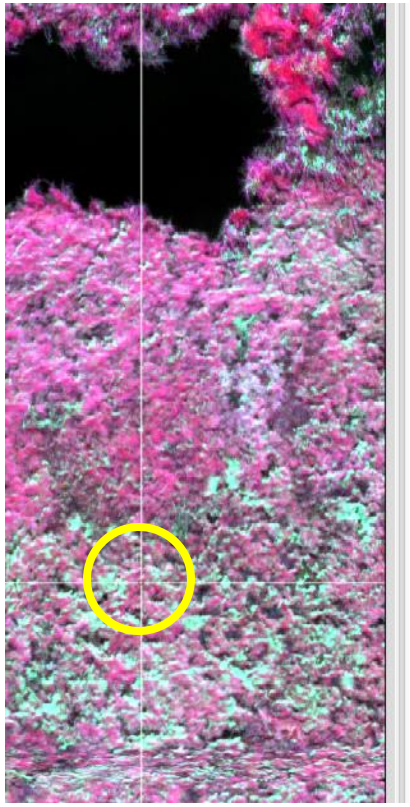


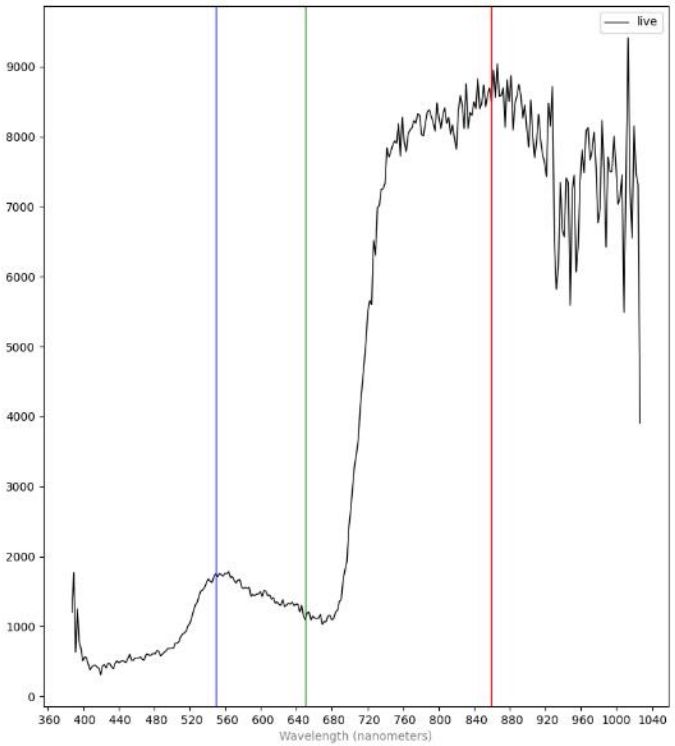
Hyperspectral 1
360-900 nm
Signal for water surface



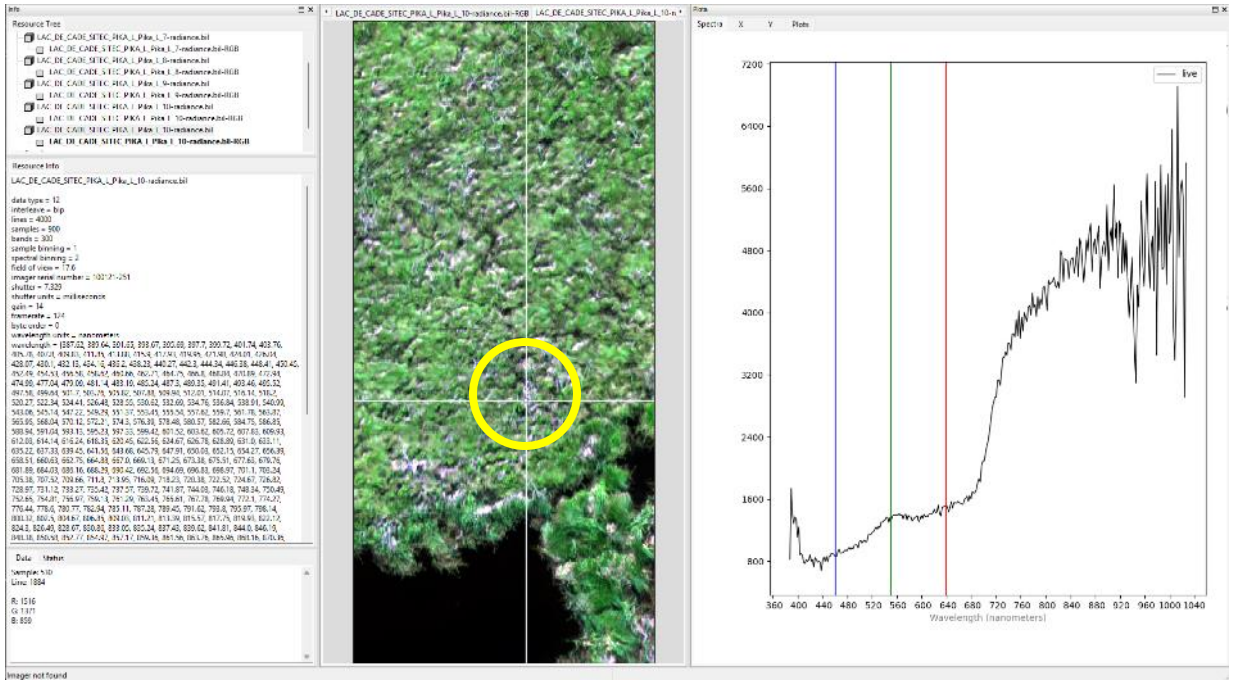
Hyperspectral 2
900-1700 nm
Signal for water surface

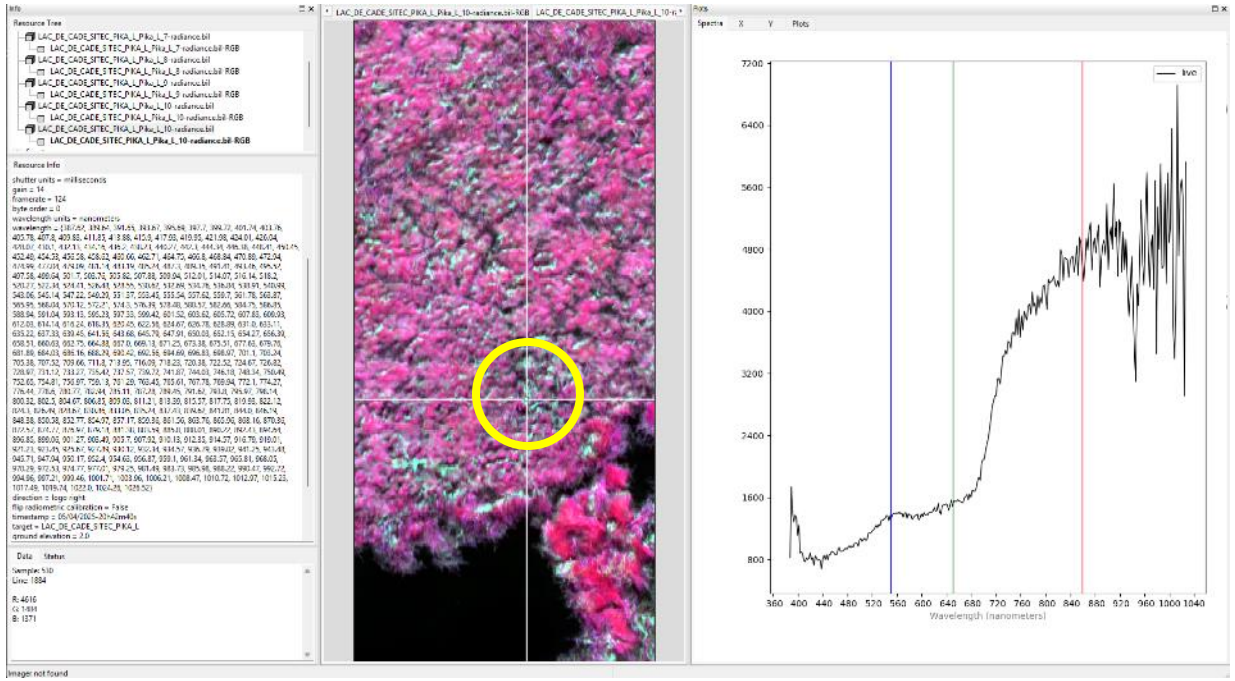






Hyperspectral allows us to compare different points, such as containing tall vegetation (*Sagittaria*) and shorter vegetation (Curly dock) and documenting the optimum signal in order to train the computer classification

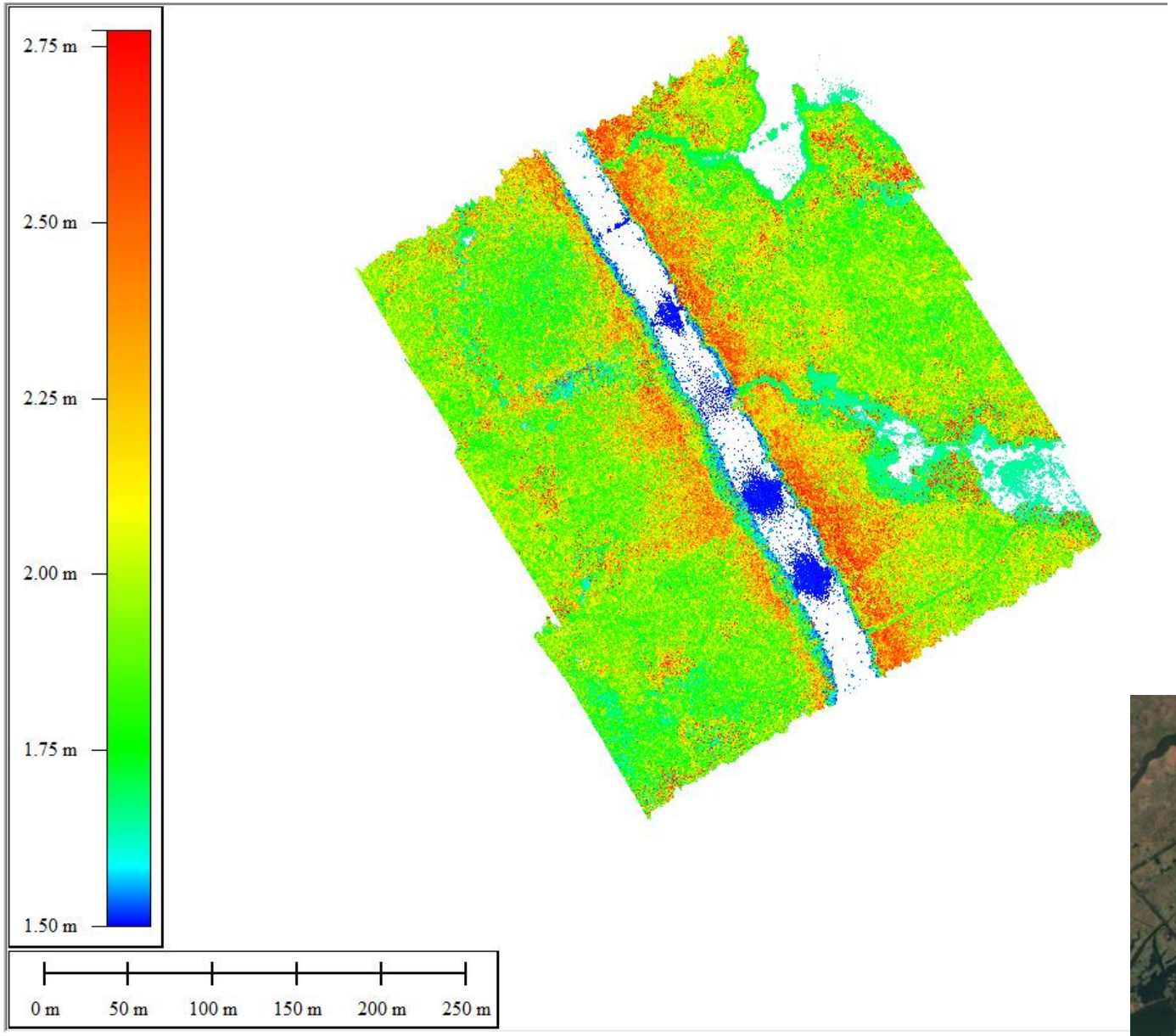




Hyperspectral allows us to probe a single point
and search for signature signals at different wavelengths

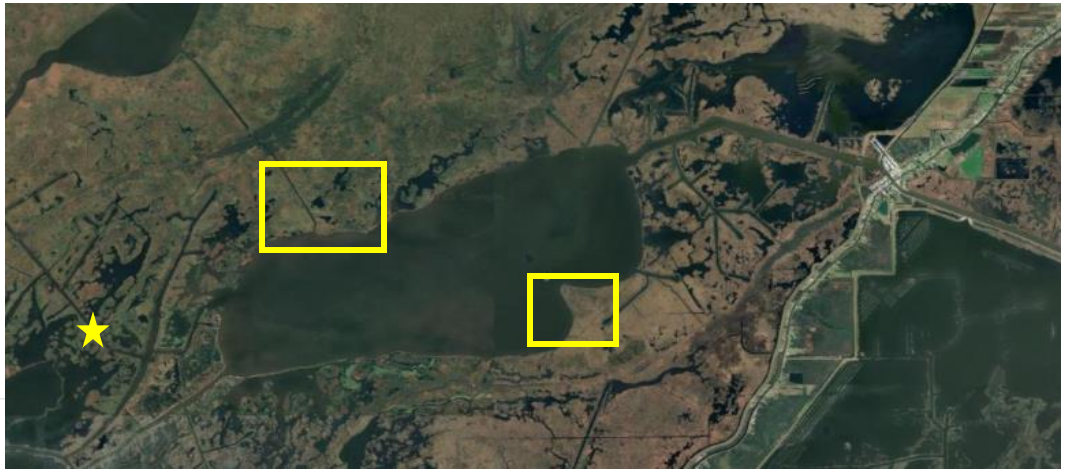
RIEGL VUX-1UAV with Microdrone mdLiDAR 3000 LR	
Accuracy	10 mm
Operating Altitude	800 m
Field of View	116 deg (360 deg)
Laser pulse repetition rate	1200 kHz
Laser Wavelength	Near Infrared
Echo Signal Intensity	16 bit
IMU/GPS	Trimble Applanix – APX 20
Multiple Target Echos	15 @50Hz to 7 @1200Hz

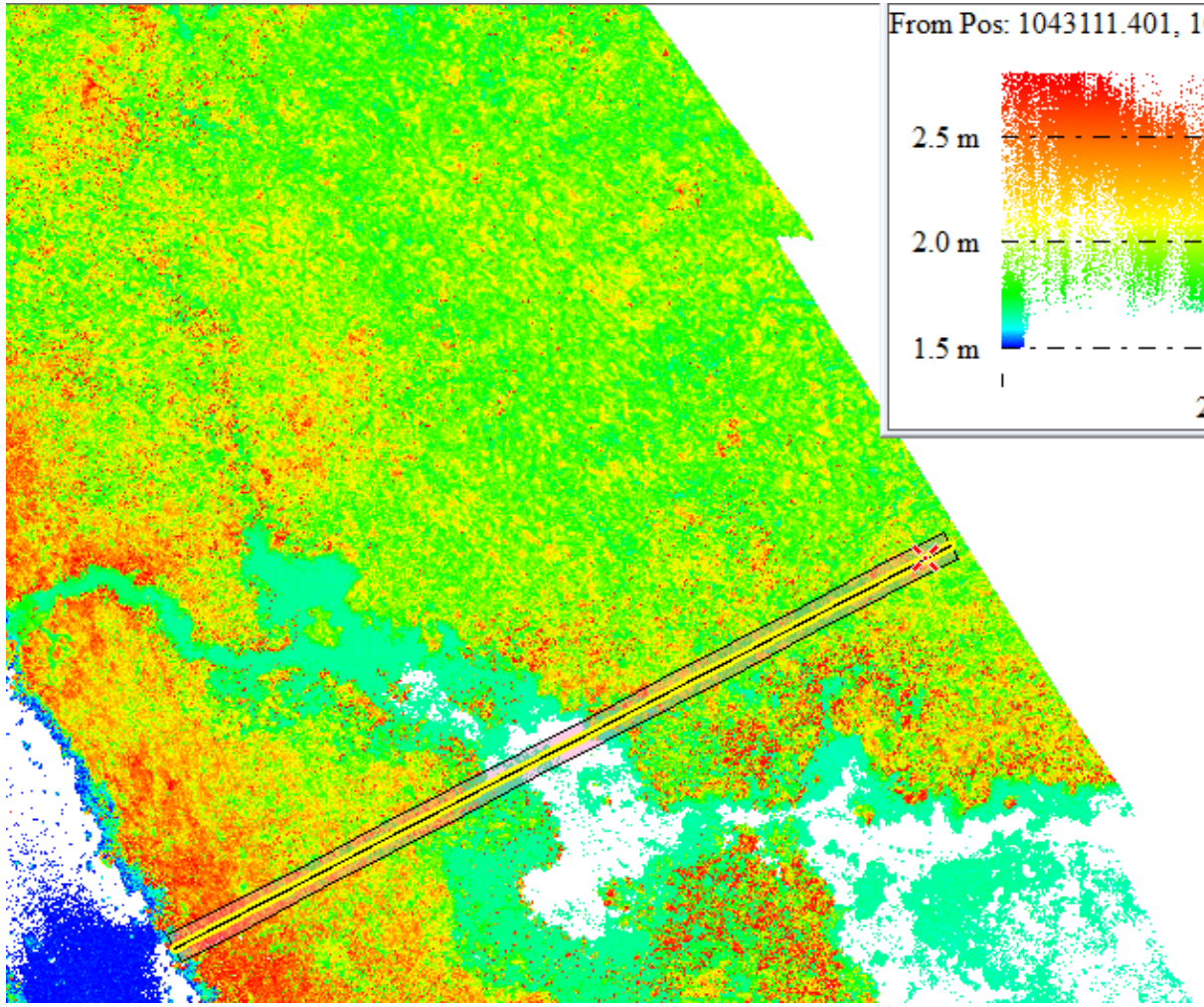
LiDAR Sensor

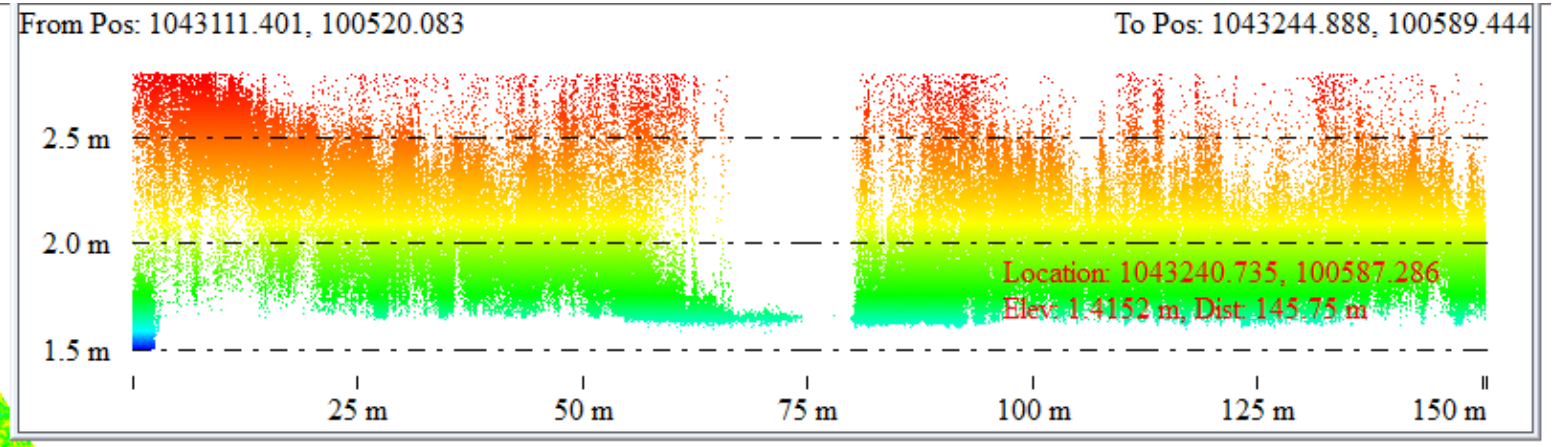


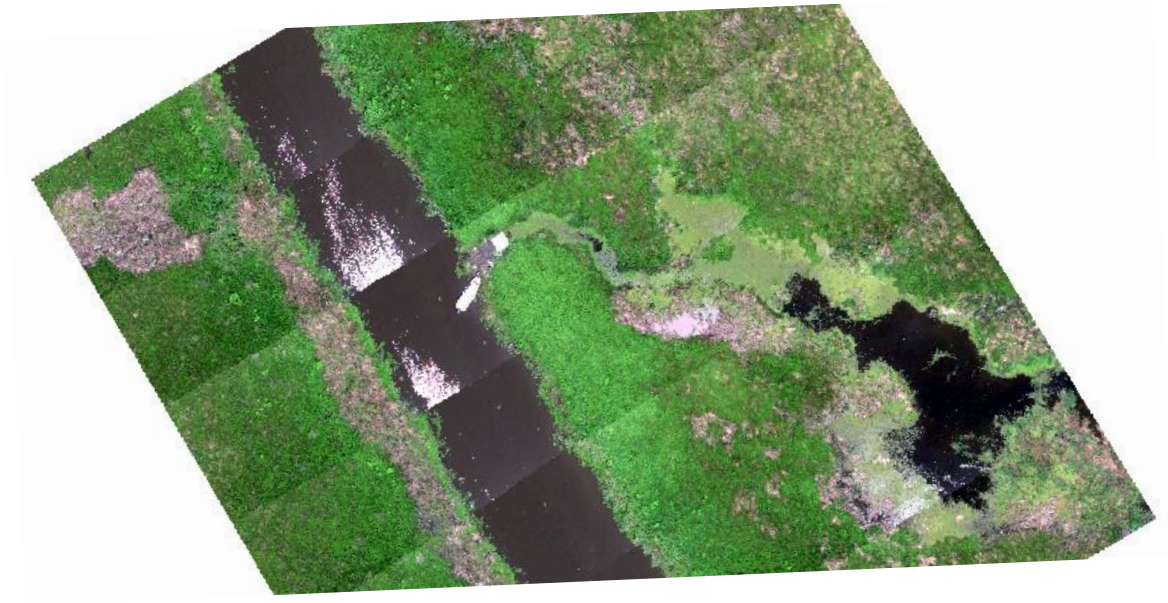
North Lake de Cade
processed point cloud
colorized based on elevation

Confirms
highest elevation near Canal (red)
Middle elevation (yellow)
Lowest elevation (green)
Base water surface (blue)





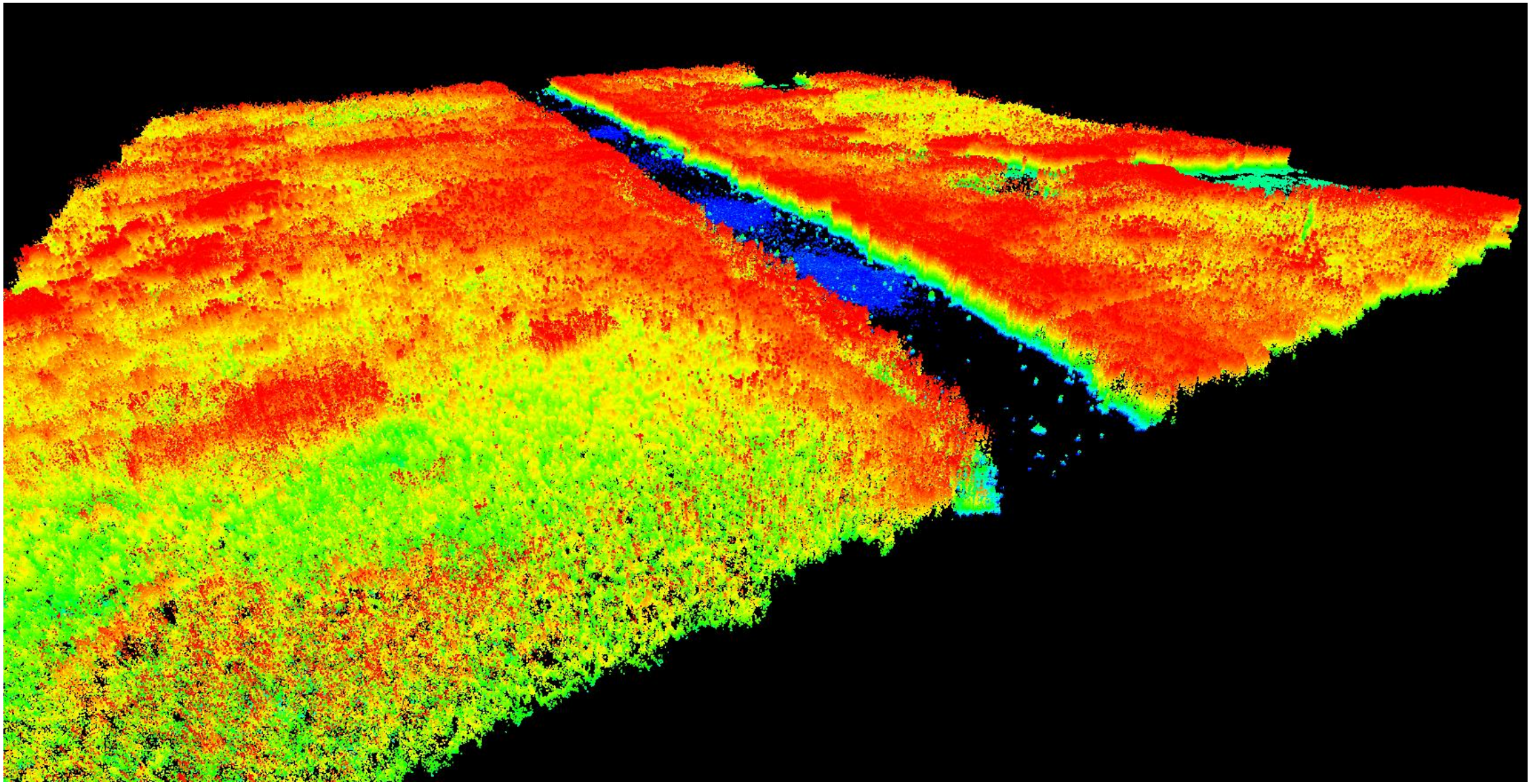




Detailed Cross-Section of distinct transects

Comparing Lidar Signal with Hyperspectral Signal allows us to associate vegetative species with geomorphic features

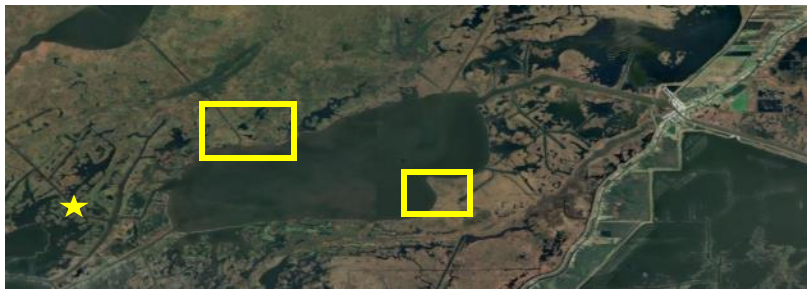
Documenting the top of the canopy as well as the elevation of the sediment

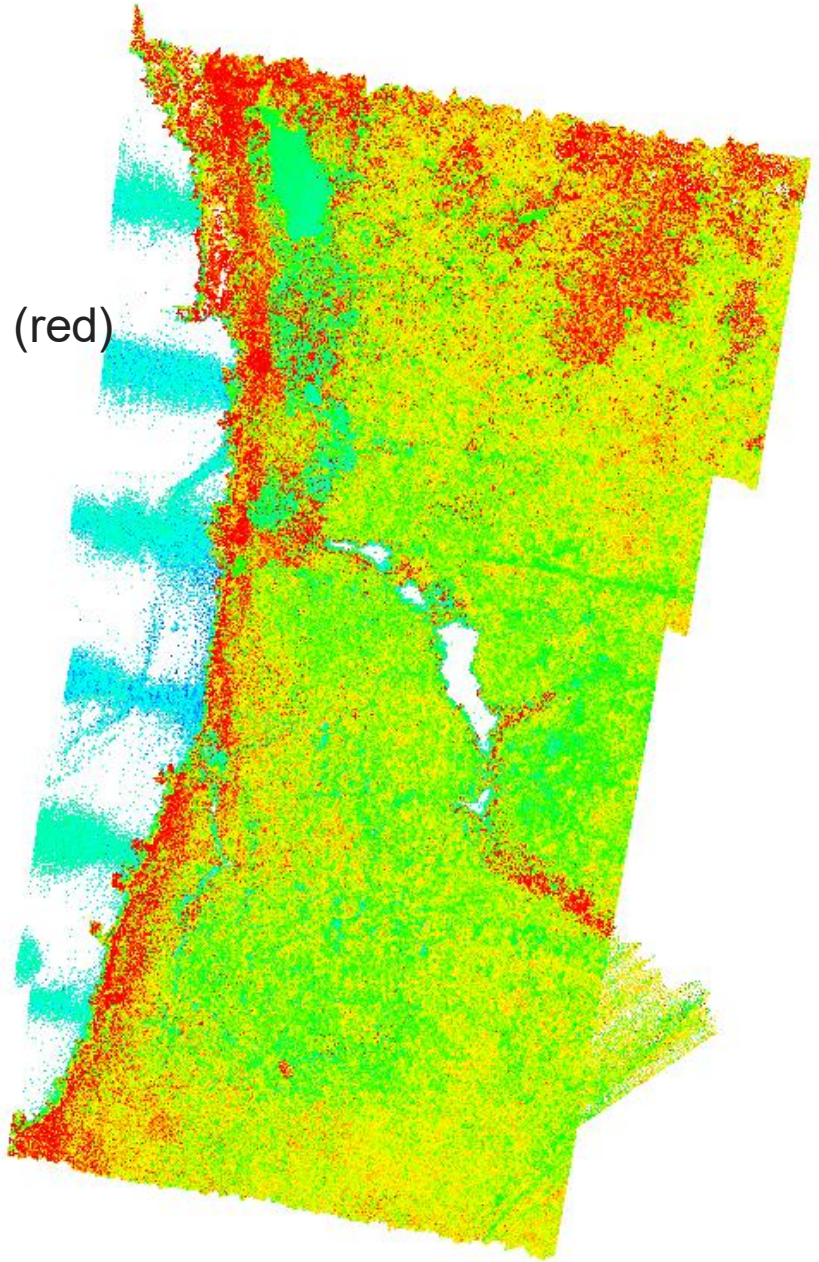


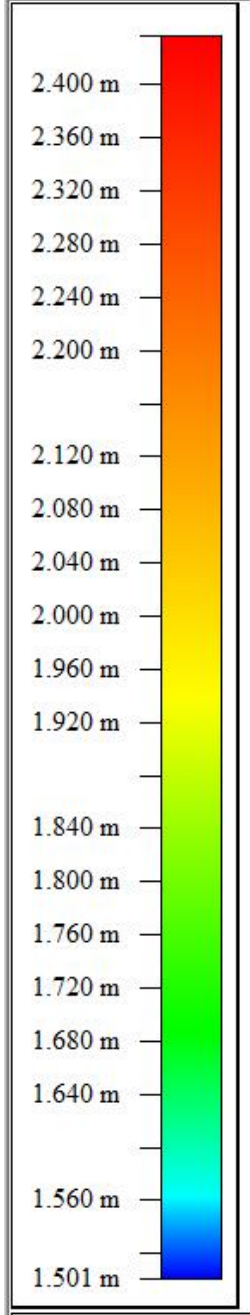
3D point cloud allows the visualization of slight changes in elevation highlighting micro ridges and micro seams and comparisons over time

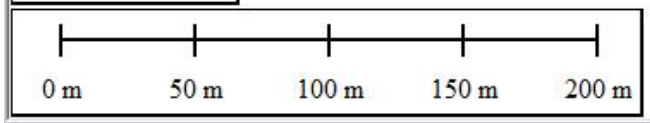
South Lake de Cade
processed point cloud
colorized based on elevation

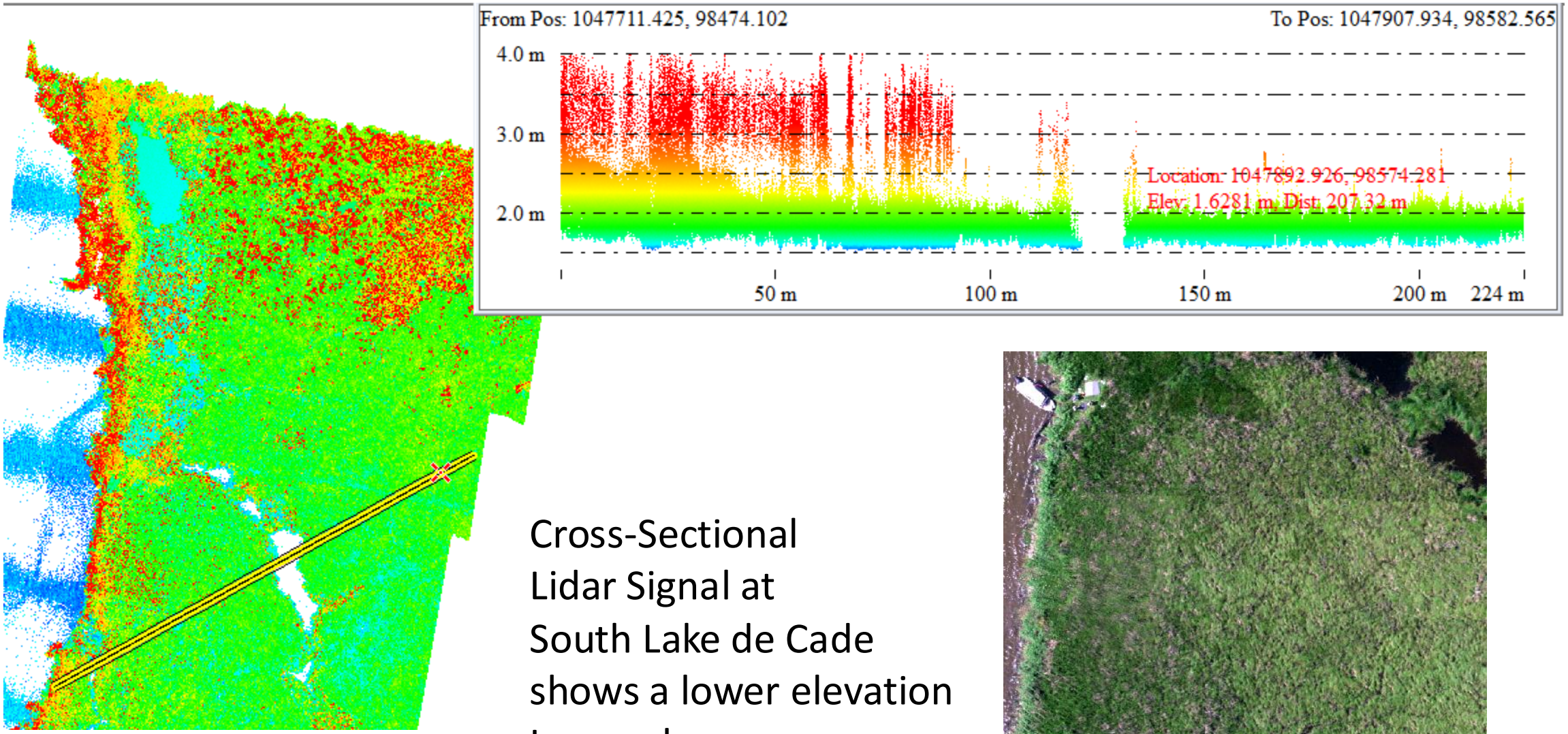
Confirms
highest elevation near Canal (red)
Middle elevation (yellow)
Lowest elevation (green)
Base water surface (blue)



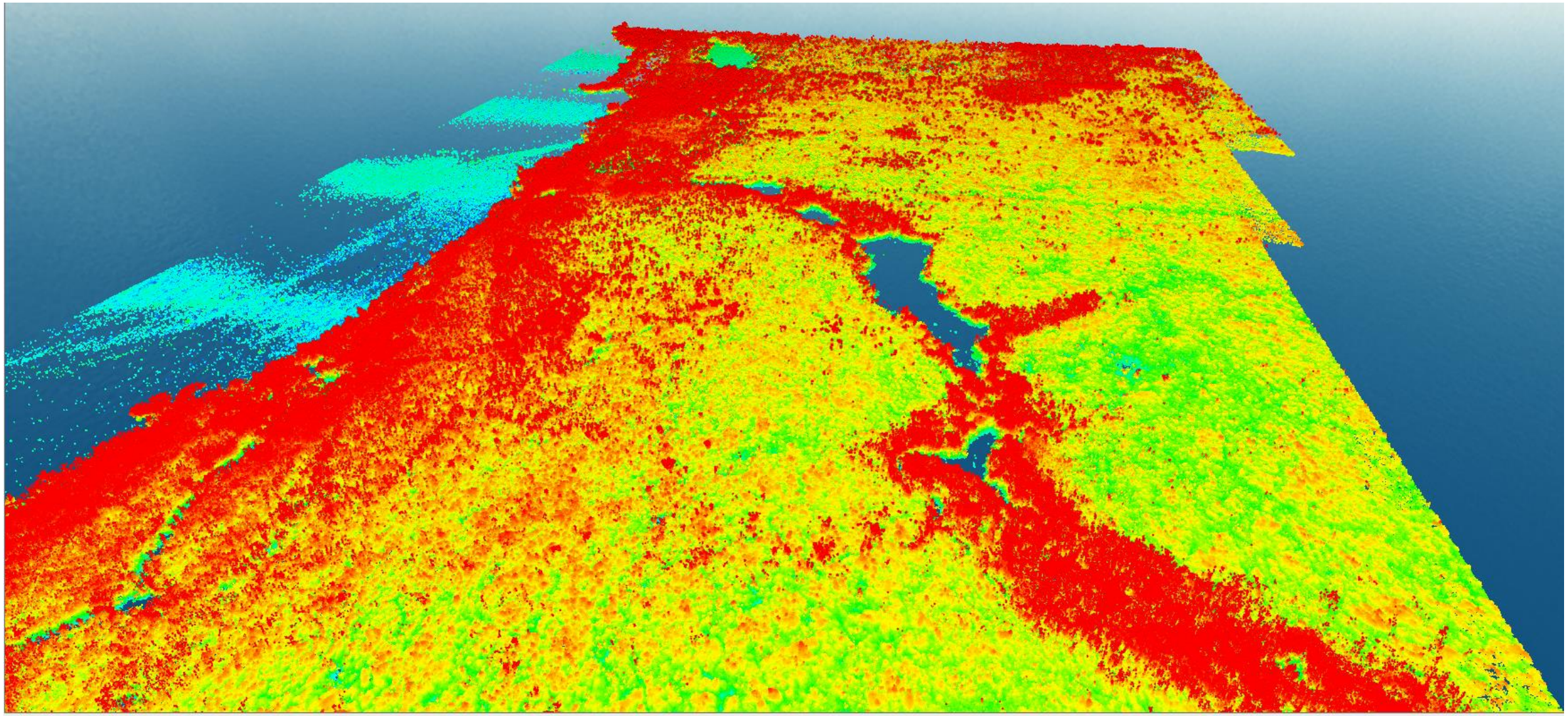








Cross-Sectional
Lidar Signal at
South Lake de Cade
shows a lower elevation
Less red, more green



3D point cloud allows the visualization of slight changes in elevation highlighting micro ridges and micro seams and comparisons over time

Developing Methods to Measure Flotant Marsh Extent and Stability in the Barataria-Terrebonne Estuary System

The Coastal Center

The Center for Bayou Studies
Nicholls State University

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Summary:
Using two Hyperspectral Sensors provides a much larger range of spectra for classification of a diversity of flotant vegetation species.

LiDAR enhances visualization of flotant mat by documenting geomorphology, canopy height, and the presence of seams that may lead to further degradation of flotant mat.

eDNA and sampling methods expected to document flora and fauna assemblages associated with mat cohesion

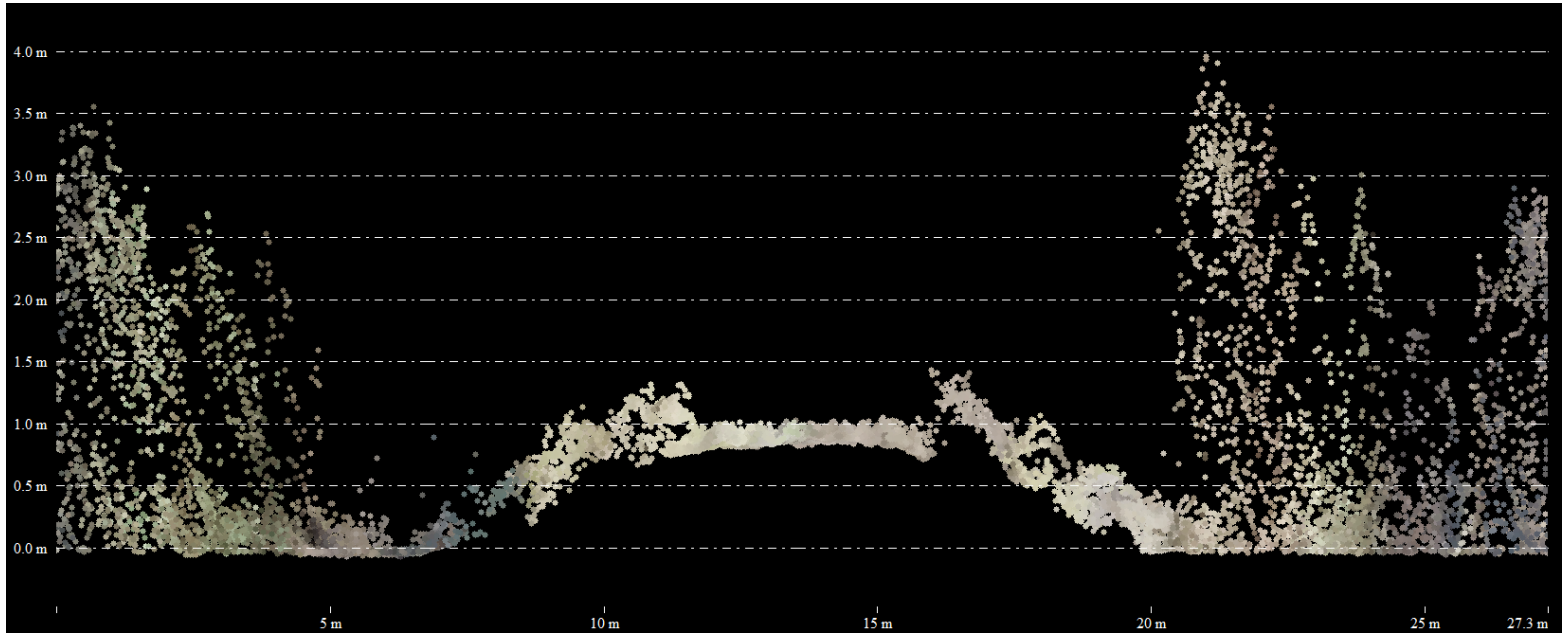
State of the Coast
May 21, 2025

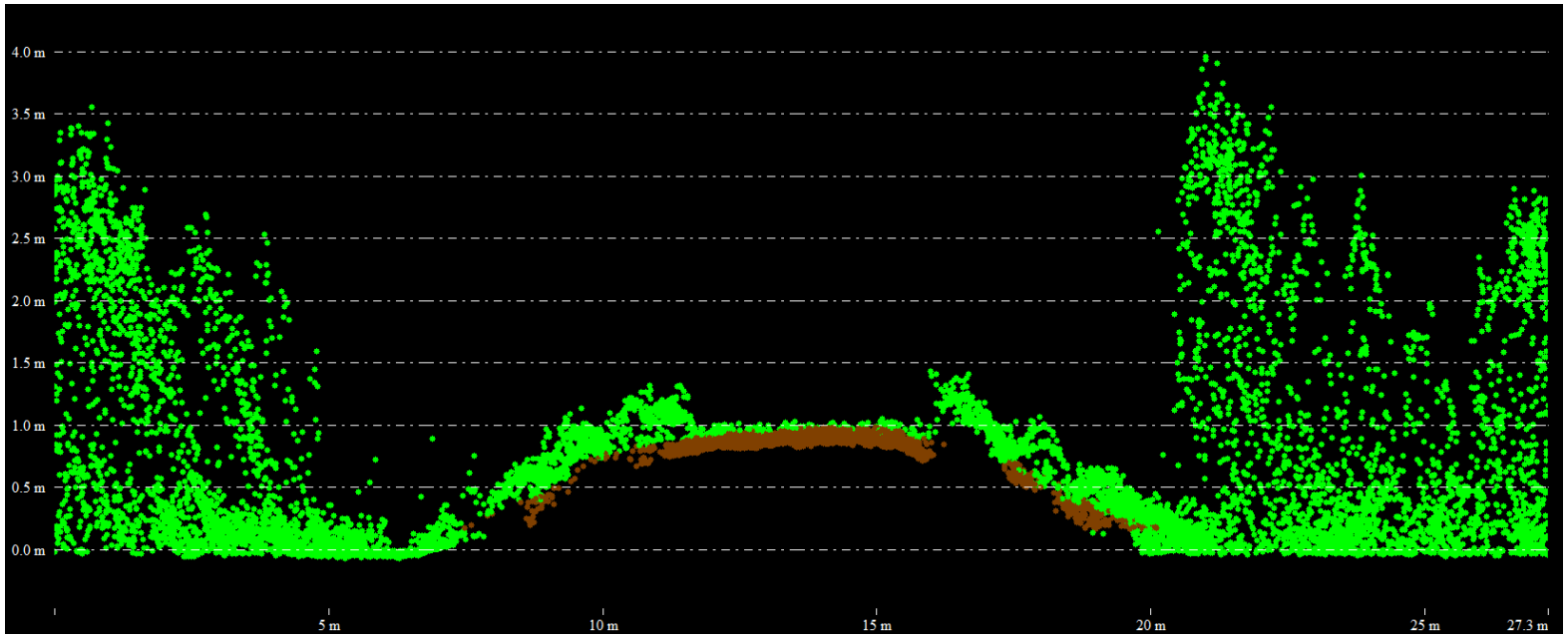
Training includes:
Swamp Navigation
Conventional sampling
Water Quality
UAV mission prep
UAV launch from loating platform

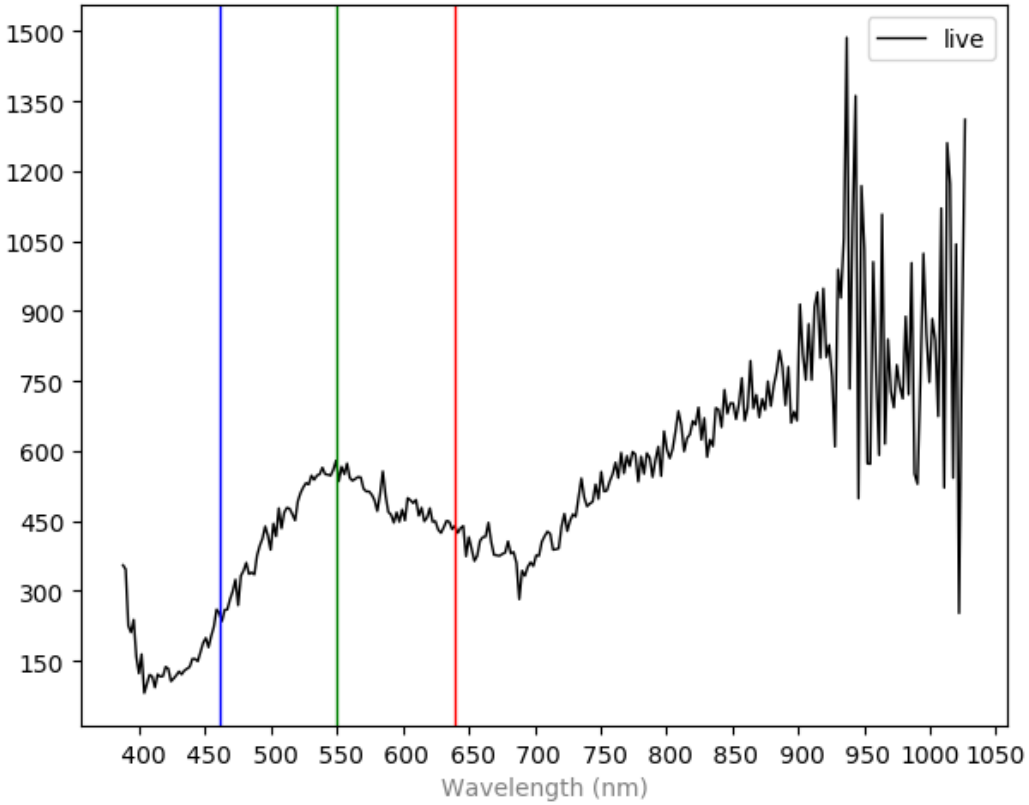
LiDAR Sensor will allow us to document the canopy as well as land / water interface

Terrace crown: + 1 meter
Shoulder Veg: + 0.5 m
Channel Veg: + 4 meter

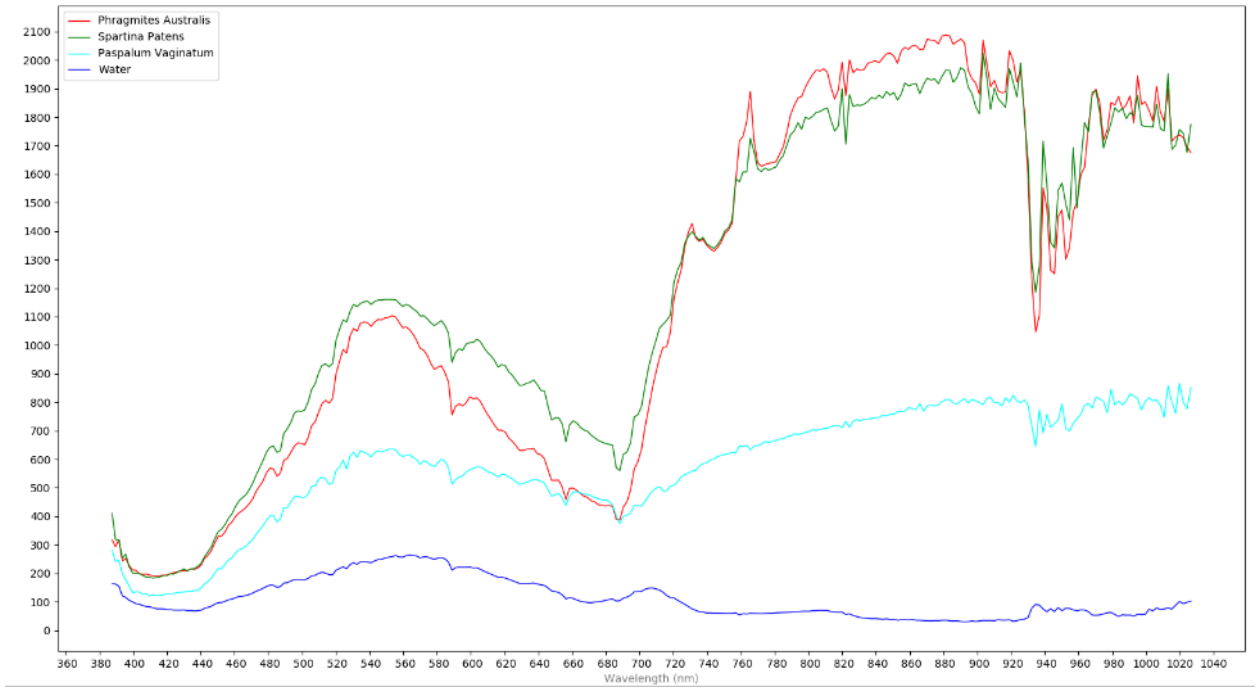
Crown: *Paspalum vaginatum*
Shoulder: *Spartina patens*
Channel: *Phragmites australis*





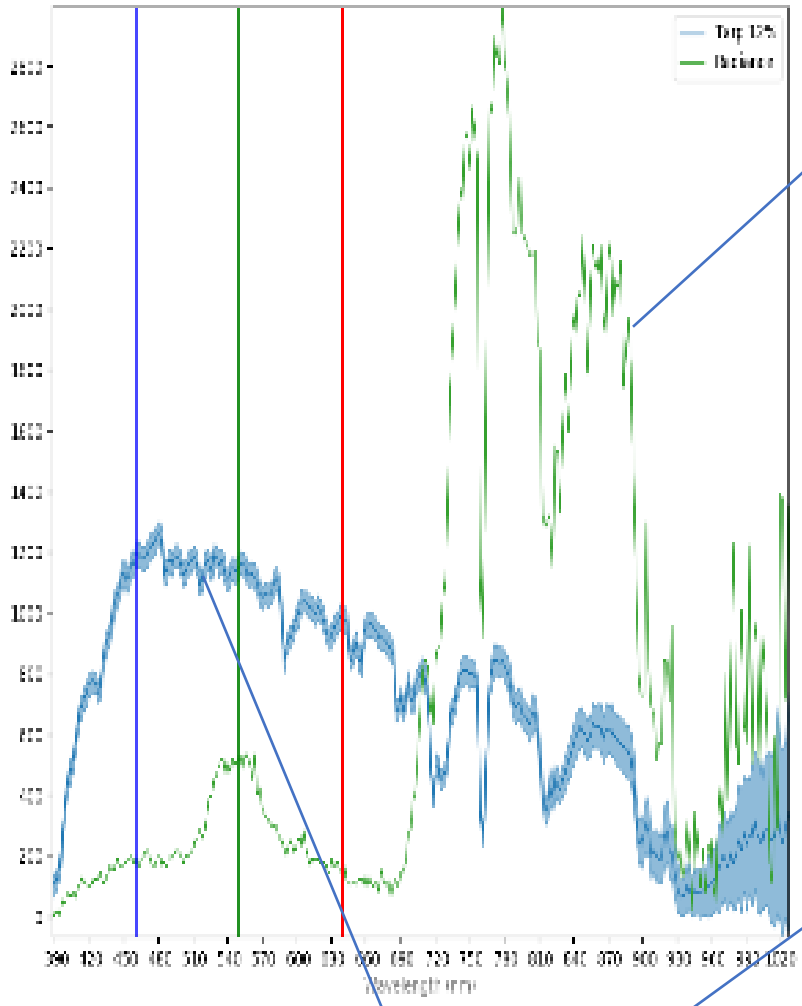


Optimal Spectra RES site
400 – 900 nm



From December data:
Spectra of *Phragmites* and *S. patens* very similar

- **Hyperspectral image cube showing raw radiance values, allowing correction with gray tarp**



Radiance values for plant

Reference spectrum for calibration tarp with 12% reflectivity