Update on the Lone Cabbage Reef Restoration Project in Suwannee Sound

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University of Florida

Oyster Integrated Mapping and Monitoring Program Workshop

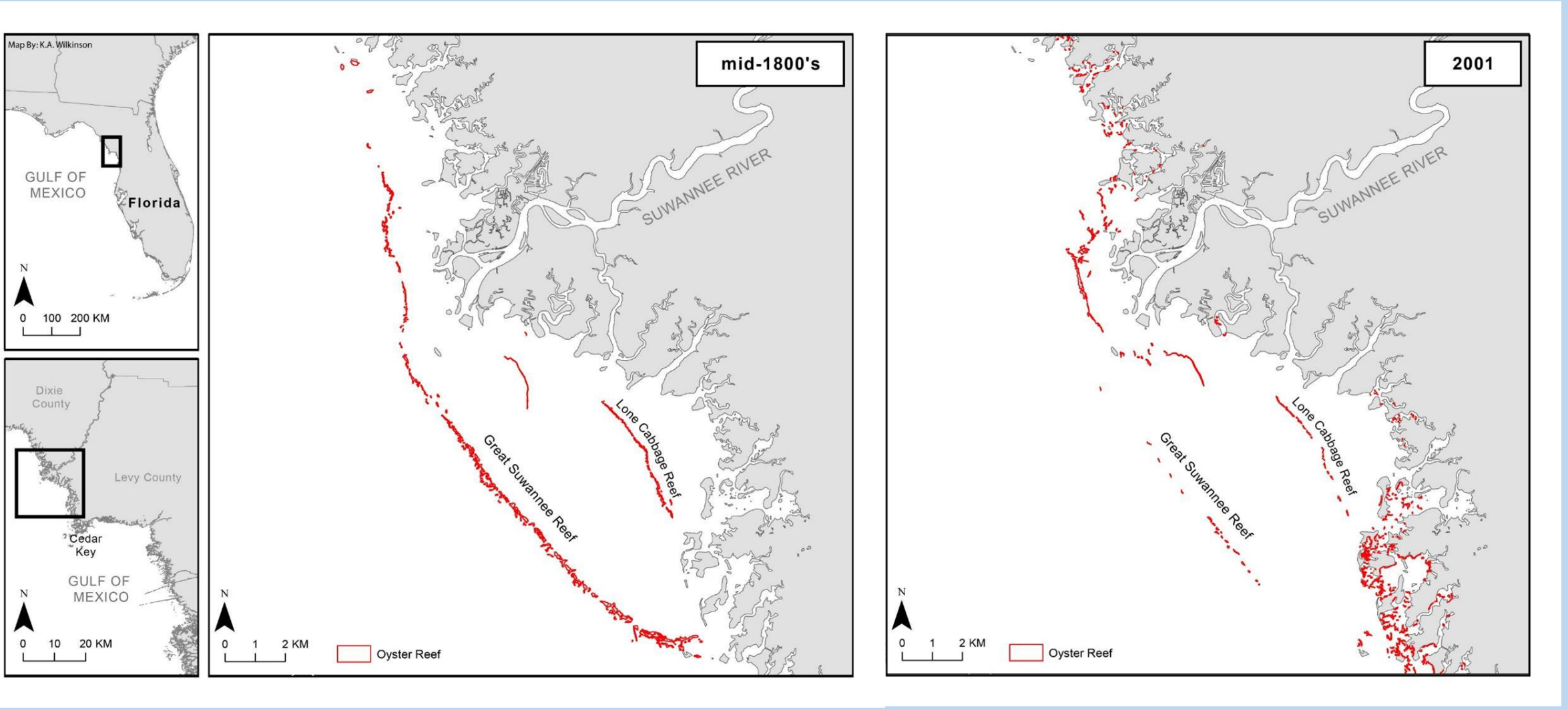
9-10 October 2019

NATIONAL FISH AND WILDLIFE FOUNDATION

NFWF

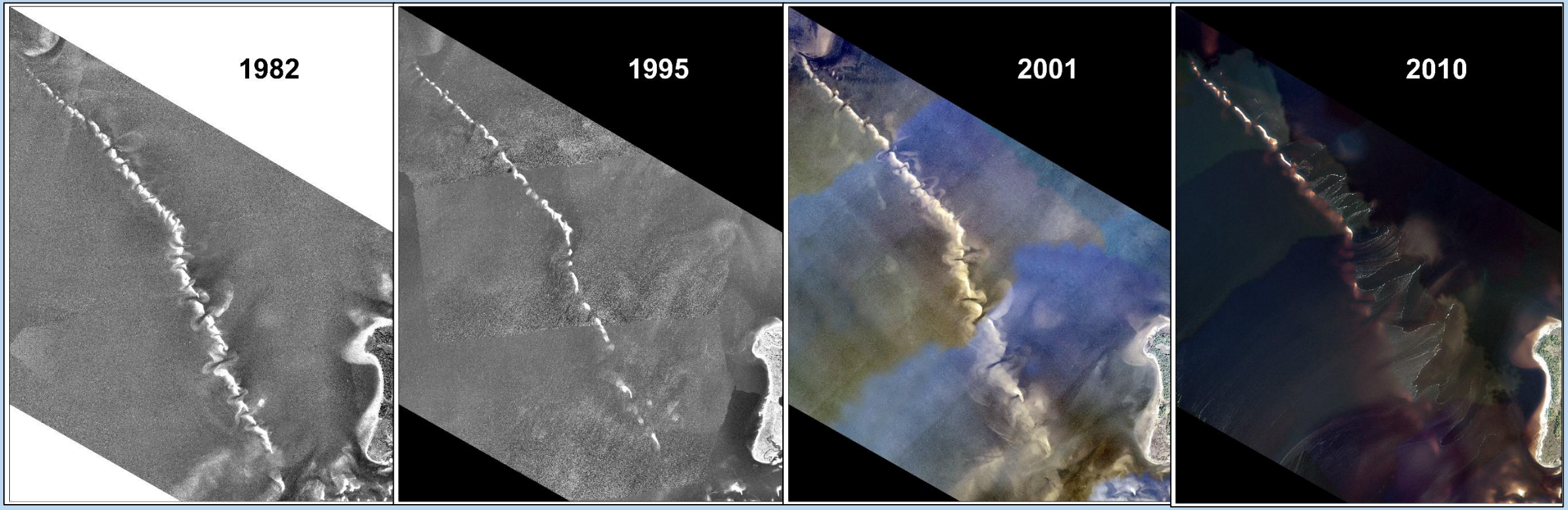
UF UNIVERSITY of FLORIDA IFAS

PROJECT AREA:



Raabe, E. A., A. E. Streck, R. S. Stumpf. 2004. Historic topographic sheets to satellite imagery: A methodology for evaluating coastal change in Florida's Big Bend tidal marsh. USGS Open File Report 02-211

Degradation of Lone Cabbage Reef: 70% lost from 1982-2010



Seavey, J. R., W. E. Pine, III, P. Frederick, L. Sturmer, and M. Berrigan. 2011. Decadal changes in oyster reefs in the Big Bend of Florida's Gulf Coast. Ecosphere 2(10):114. doi:10.1890/ES11-00205.1

Offshore reef degradation

Upstream freshwater usage

Increased salinity

Increased Mortality

Degradation of substrate/ elevation

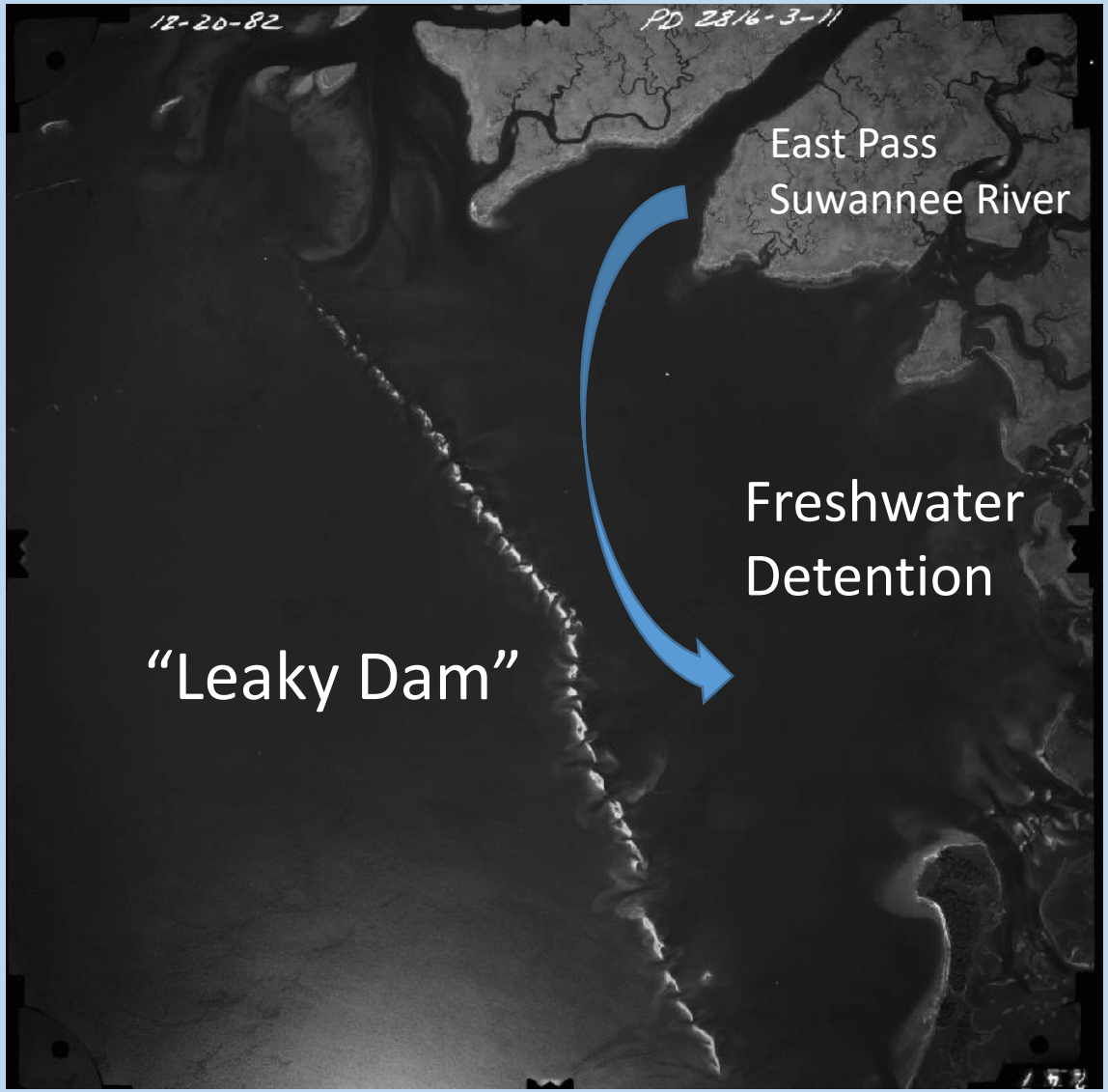
Recruitment Failure

-Seavey, et al. 2011

-Collapse threshold?
-Harvest effects?

Oyster reefs as barriers

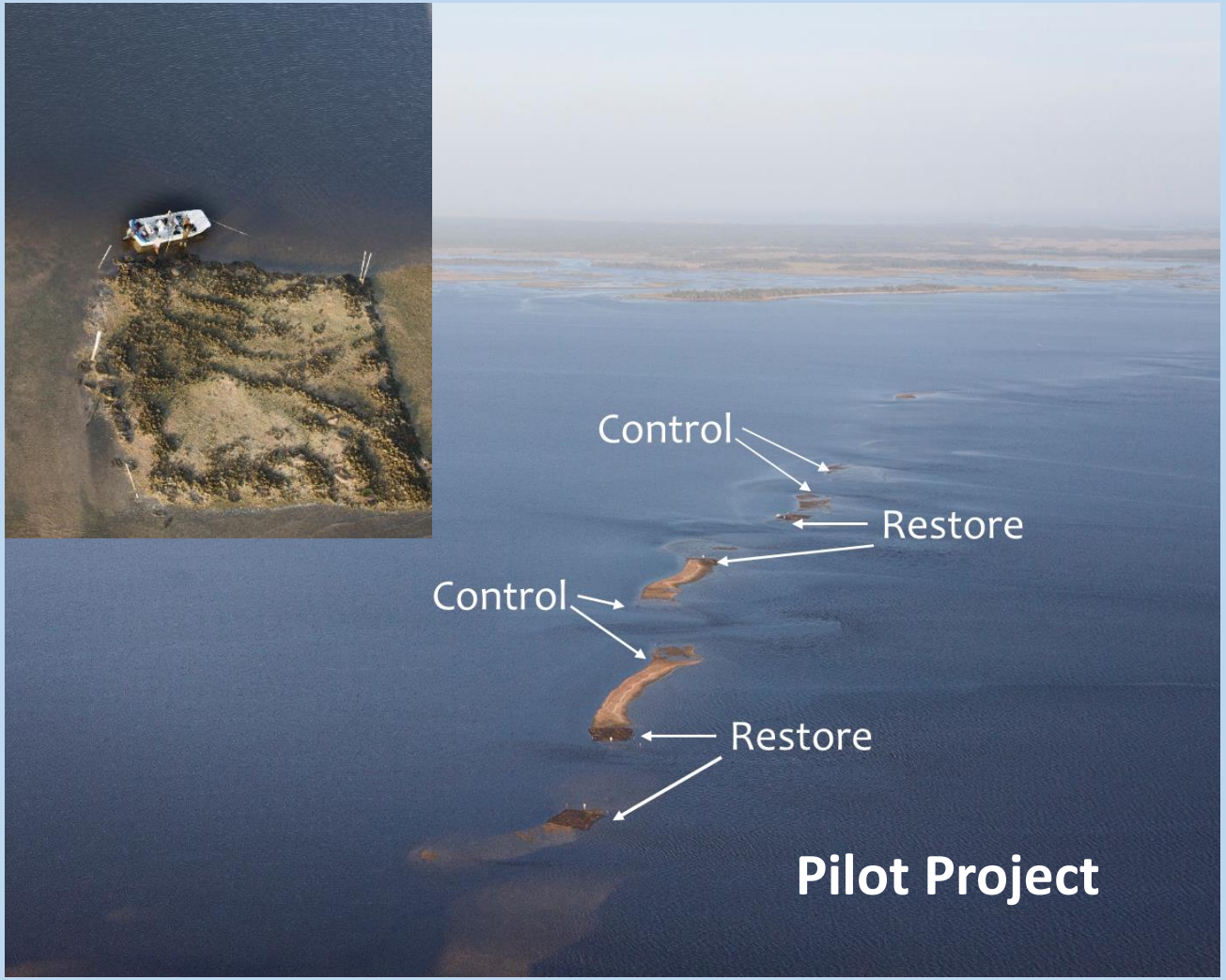
- **Maintain estuarine conditions**
- **Coastal protection**
- **Habitat**
- **WQ improvement**



Kaplan, D.A., M. Olabarrieta, P. Frederick, A. Valle-Levinson. 2016. Freshwater detention by oyster reefs: Quantifying a keystone ecosystem service. PLOS One.

Lone Cabbage Reef Substrate Limited

- **Pilot Project success**
  - **After 18 months:**
    - **9.2x increase in oyster density**

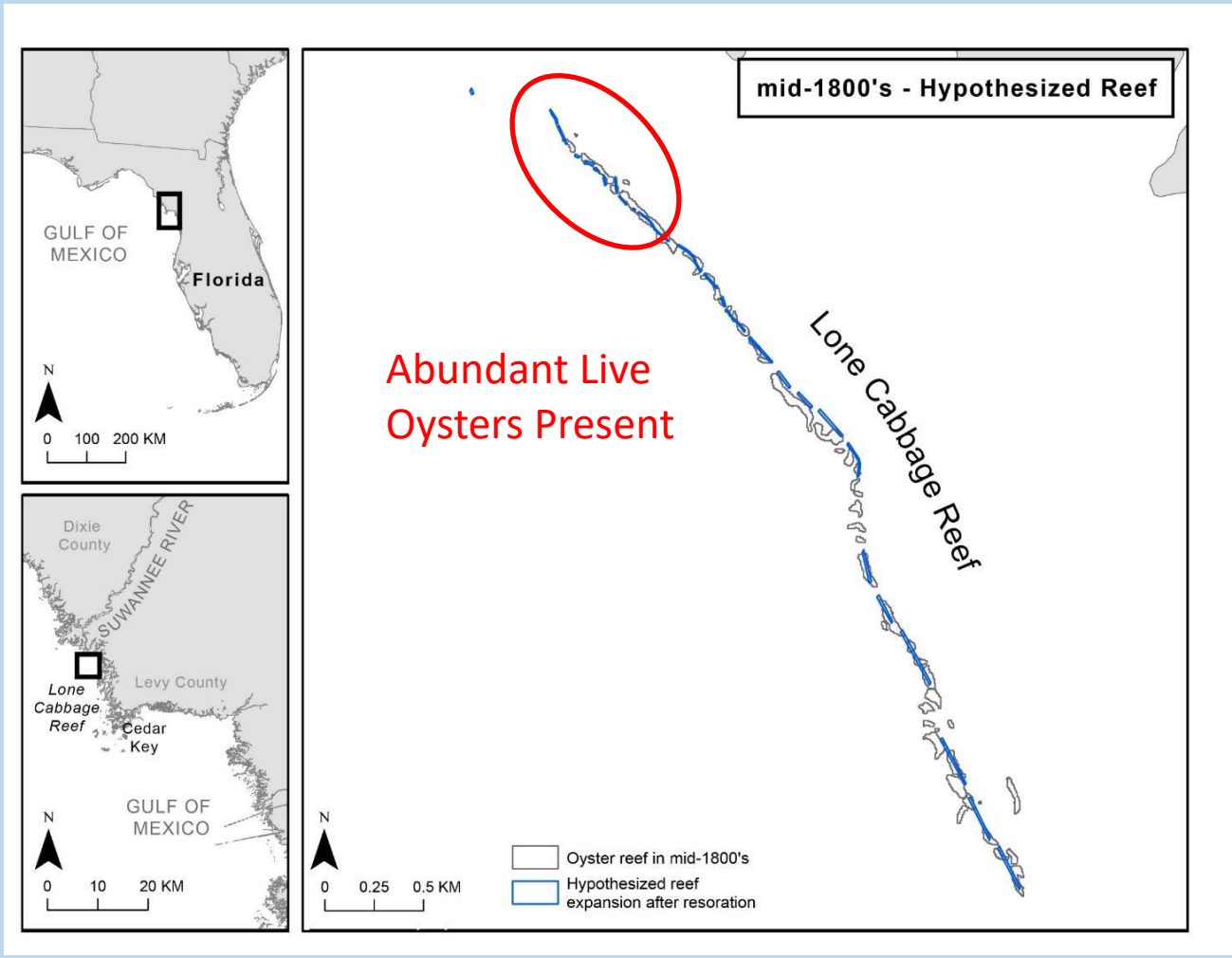


Frederick, P., N. Vitale, B. Pine, J. Seavey, L. Sturmer. 2016. Reversing a rapid decline in oyster reefs: effects of durable substrate on oyster populations, elevations, and aquatic bird community composition. Journal of Shellfish Research. 35(2):359-367.

Lone Cabbage Reef Restoration Project

- **Long, linear reef needed for best chance of hydrologic effect**
- **Restore reef to mid 1800's extent and elevation**

- **22 reef elements**
- **Large local Ocala limerock**
- **Topped with clam/oyster shell**
- **Construction cost: $3.6 M**



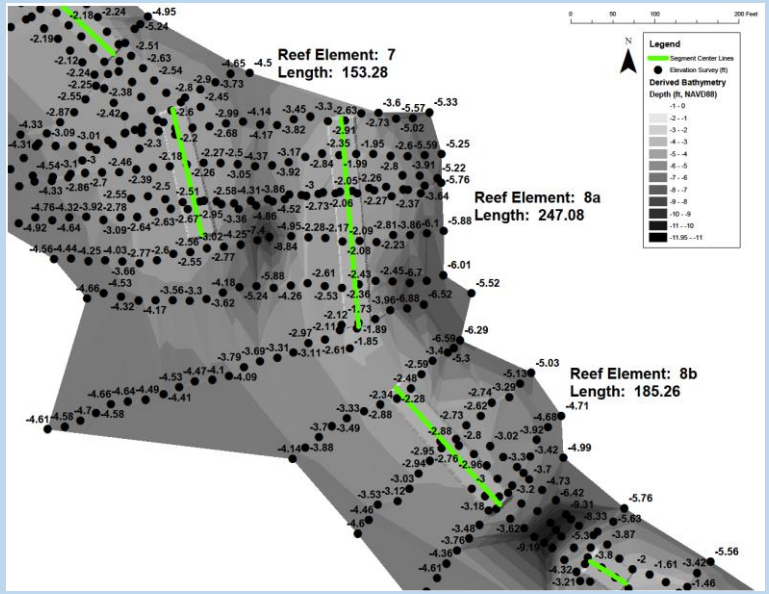
Project Start! Oyster Relocation: June 2018

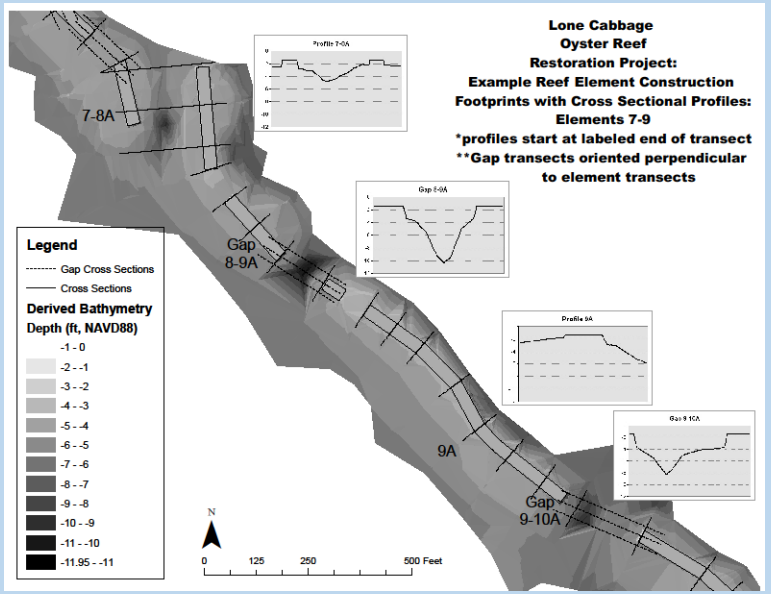
- **Move oysters from elements 2-11**
  - **Avoid burial/loss during construction**
- **Hired 69 local commercial fishermen/women**
- **Oysters returned post-construction**
- **Great community involvement**

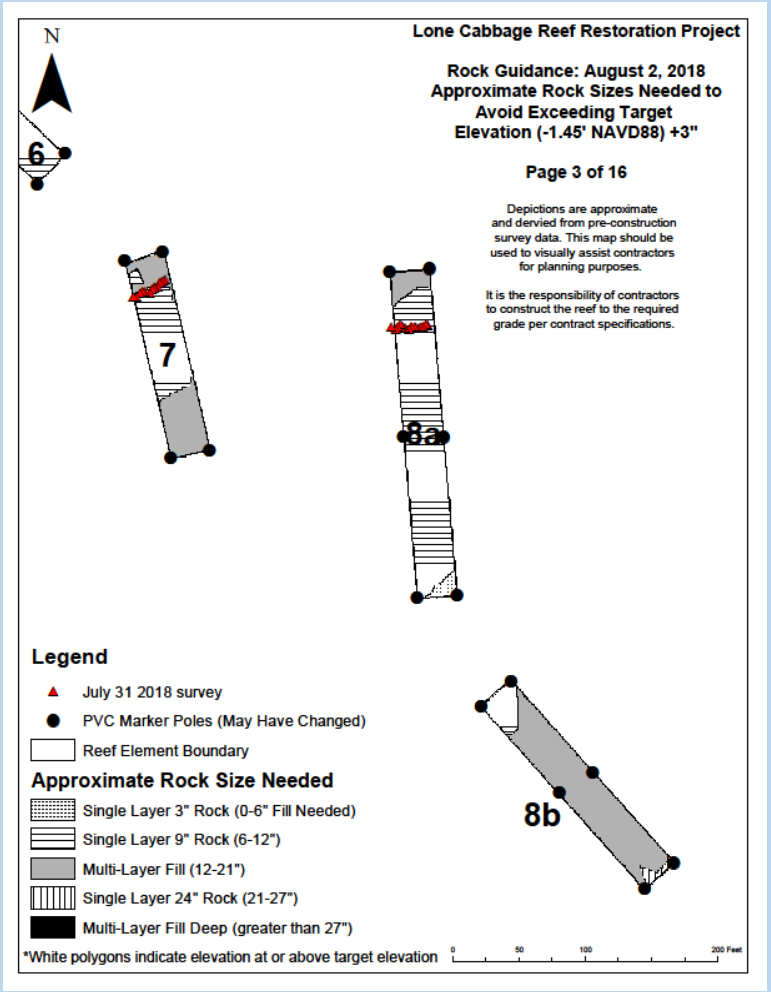
Construction Starts: July 12, 2018

Construction Guidance:

- **Derived from precon bathy survey:**
  - **Volume rock per element**
  - **Rock size/amounts within each element**





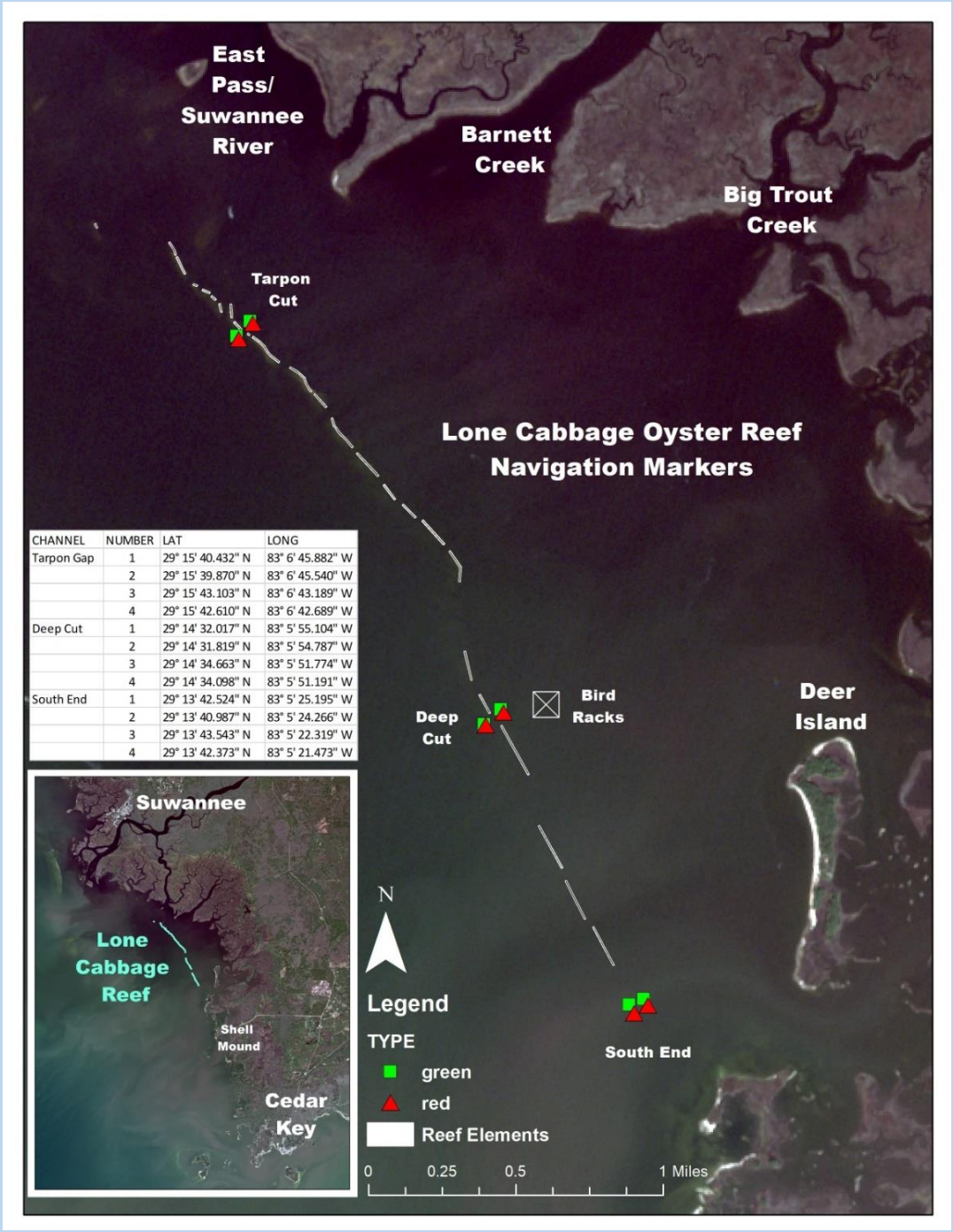


Construction Completed: July-October 2018

- **Elevation surveys and shell addition conducted as elements completed**

Public Outreach:

- **Numerous Public Meetings**
- **Informational brochures to local business**
- **Educational signs at boat launches**
- **Project website**
- **Navigational markers installed**

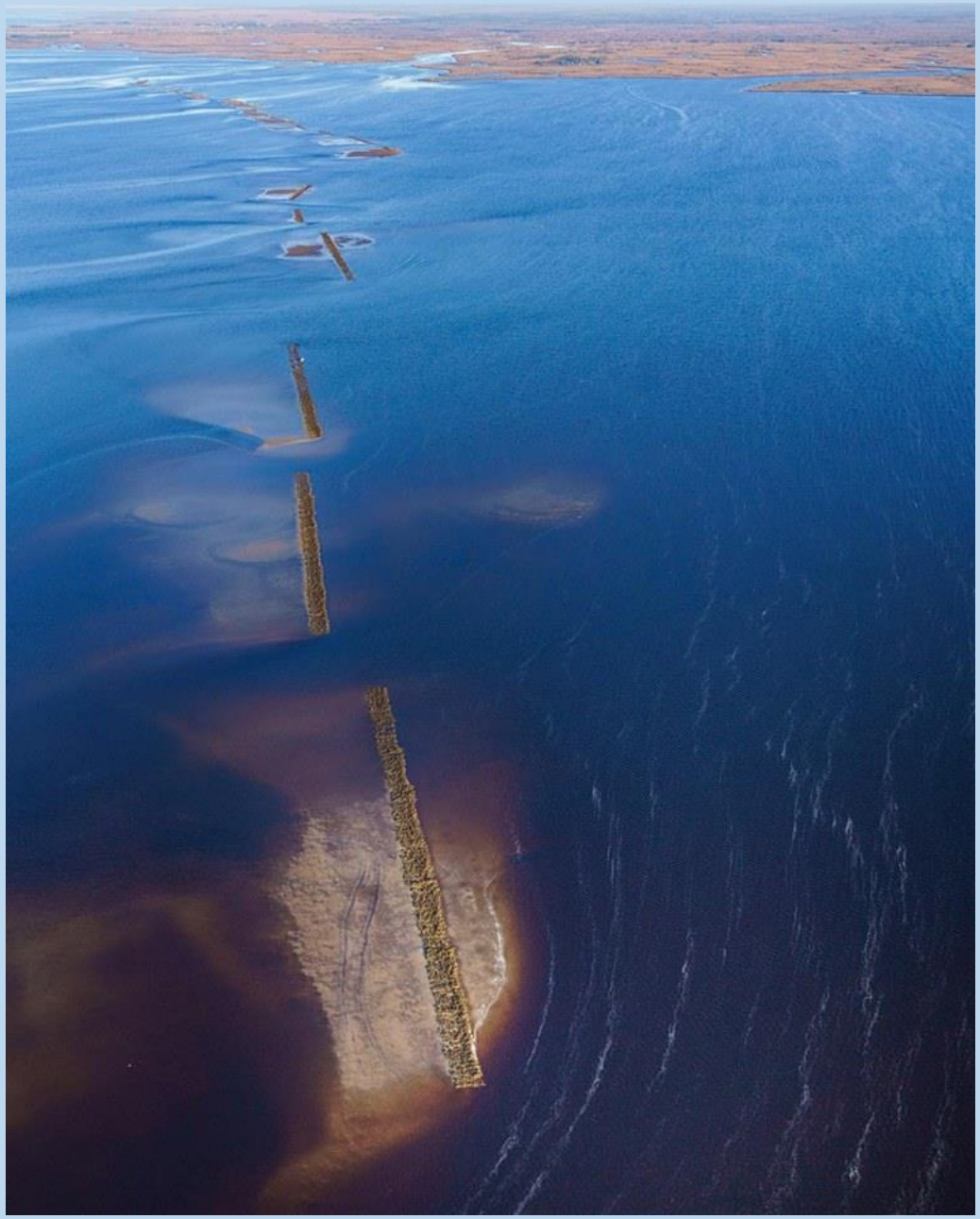


CHANNEL	NUMBER	LAT	LONG
Tarpon Gap	1	29° 15' 40.432" N	83° 6' 45.882" W
	2	29° 15' 39.870" N	83° 6' 45.540" W
	3	29° 15' 43.103" N	83° 6' 43.189" W
	4	29° 15' 42.610" N	83° 6' 42.689" W
Deep Cut	1	29° 14' 32.017" N	83° 5' 55.104" W
	2	29° 14' 31.819" N	83° 5' 54.787" W
	3	29° 14' 34.663" N	83° 5' 51.774" W
	4	29° 14' 34.098" N	83° 5' 51.191" W
South End	1	29° 13' 42.524" N	83° 5' 25.195" W
	2	29° 13' 40.987" N	83° 5' 24.266" W
	3	29° 13' 43.543" N	83° 5' 22.319" W
	4	29° 13' 42.373" N	83° 5' 21.473" W

Construction Summary

- **17,000 cubic yards of rock**
- **1,090 cubic yards oyster shell**
- **~3 miles long (~2 miles actual reef)**
- **7.26 acres**
- **$3.6 million direct payments to local economies**

- **$150,000 under budget**
- **Finished 1 month/year ahead of schedule**



Restoration Predictions

1. **Improved Oyster Population Resilience:**
   - -Rock will provide durable substrate
   - -Positive feedback loop of freshwater detention

2. **Decreased salinities in Suwannee Sound and landward reefs/marshes**

3. **Shifts in community composition:**
   - -More freshwater influence
   - -Reef presence

Water Quality Monitoring

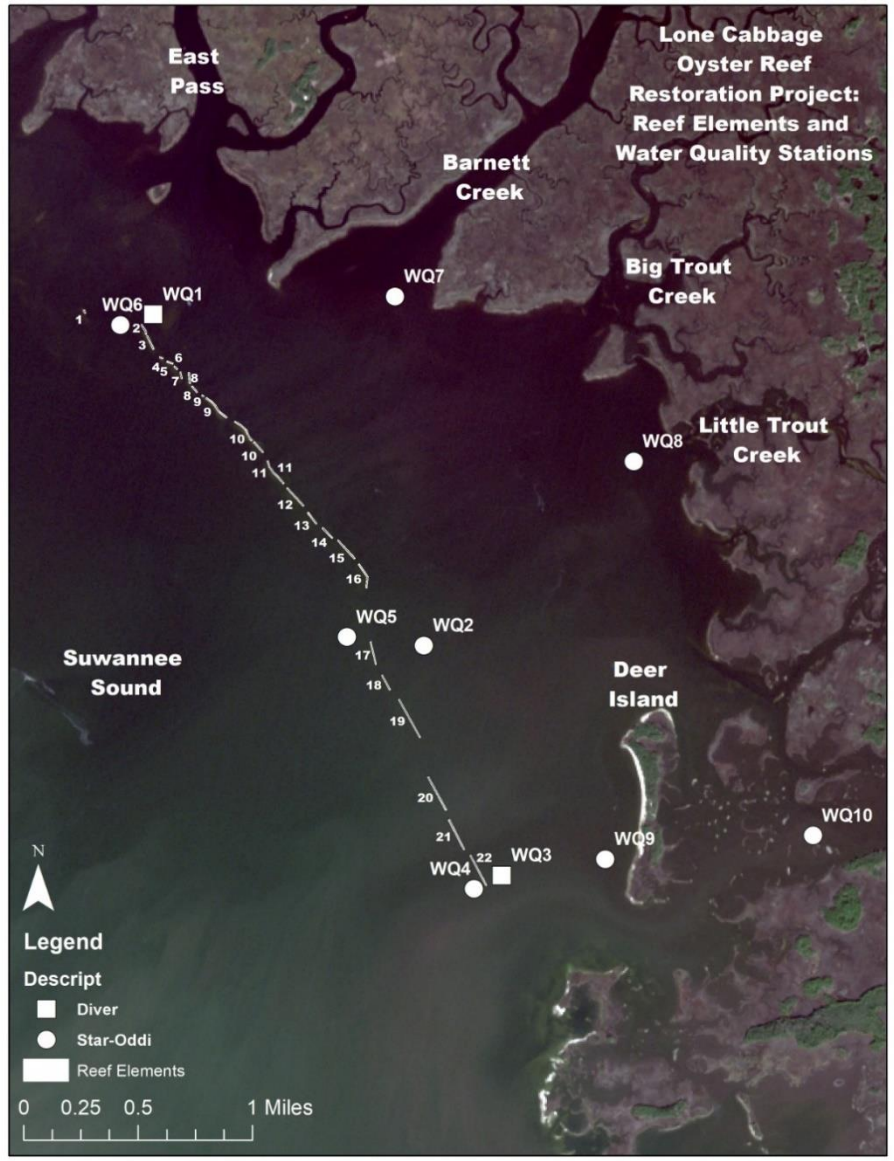
- **Did reef construction affect salinity regime?**

- **<u>Continuous Salinity Recorders:</u>**
  - Nine sensors deployed August 2017
  - Hourly: Salinity, Temperature, Depth

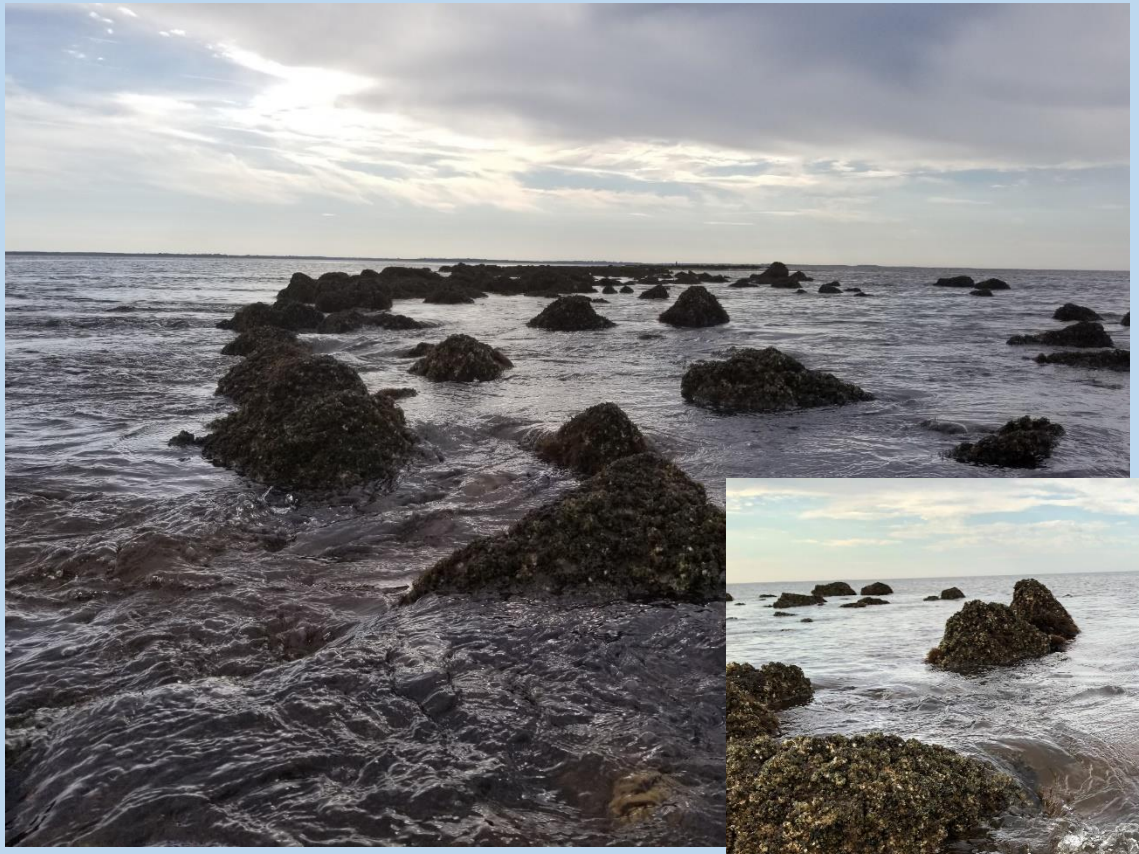
- **<u>Water Chemistry (UF funded):</u>**
  - Monthly: chlorophyll, N, P, color, turbidity

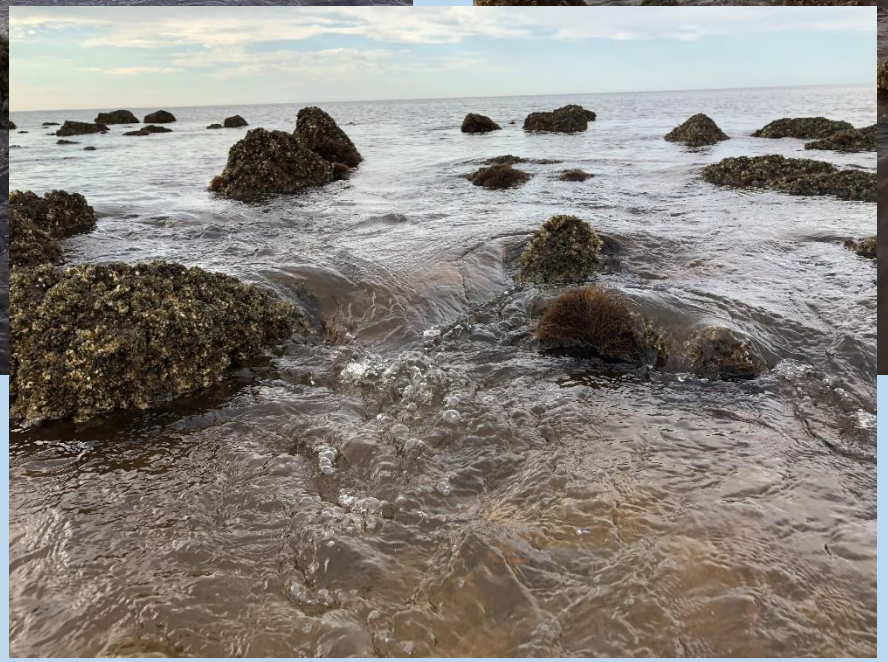
- **<u>Effects of River Discharge on Salinity/FW Detention Effect:</u>**

  <u>Analysis in development with USGS:</u>
  - Cooperator Data
  - River Discharge
  - Wind/Tide/Circulation patterns

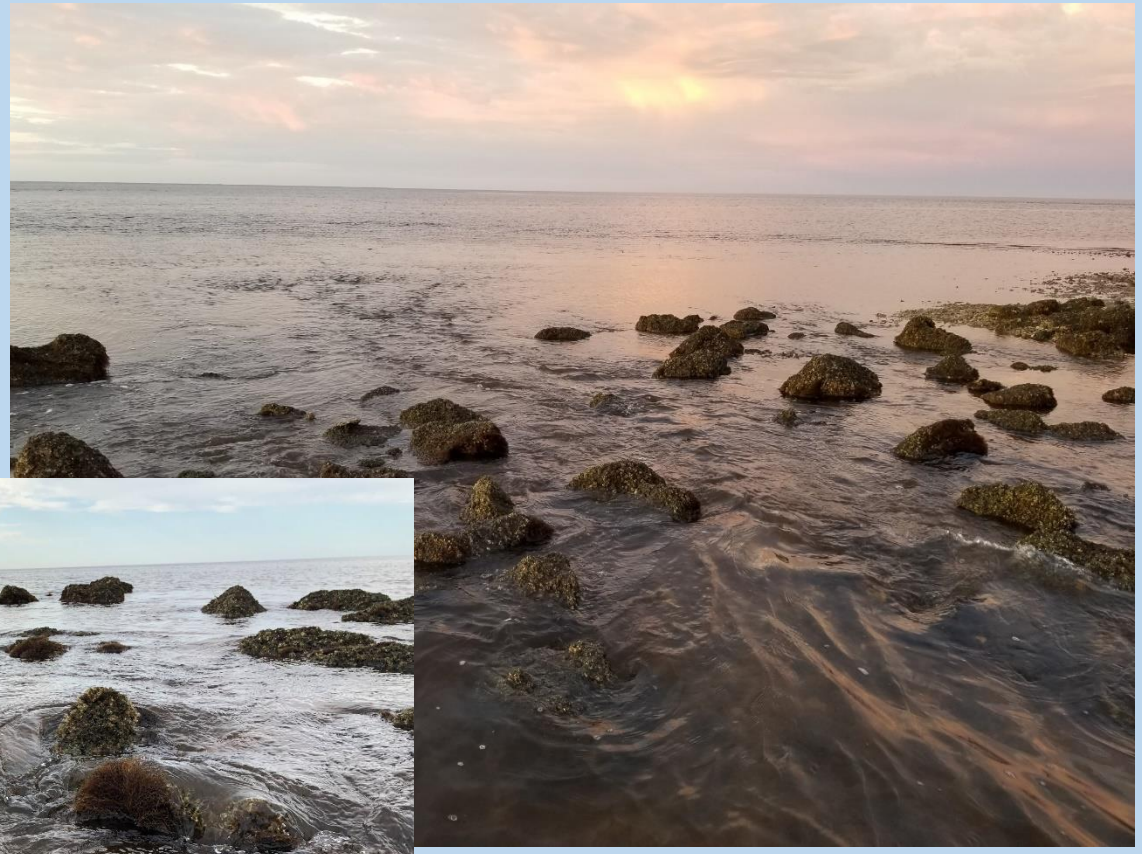


- **Rising Tide**





- **Falling Tide**

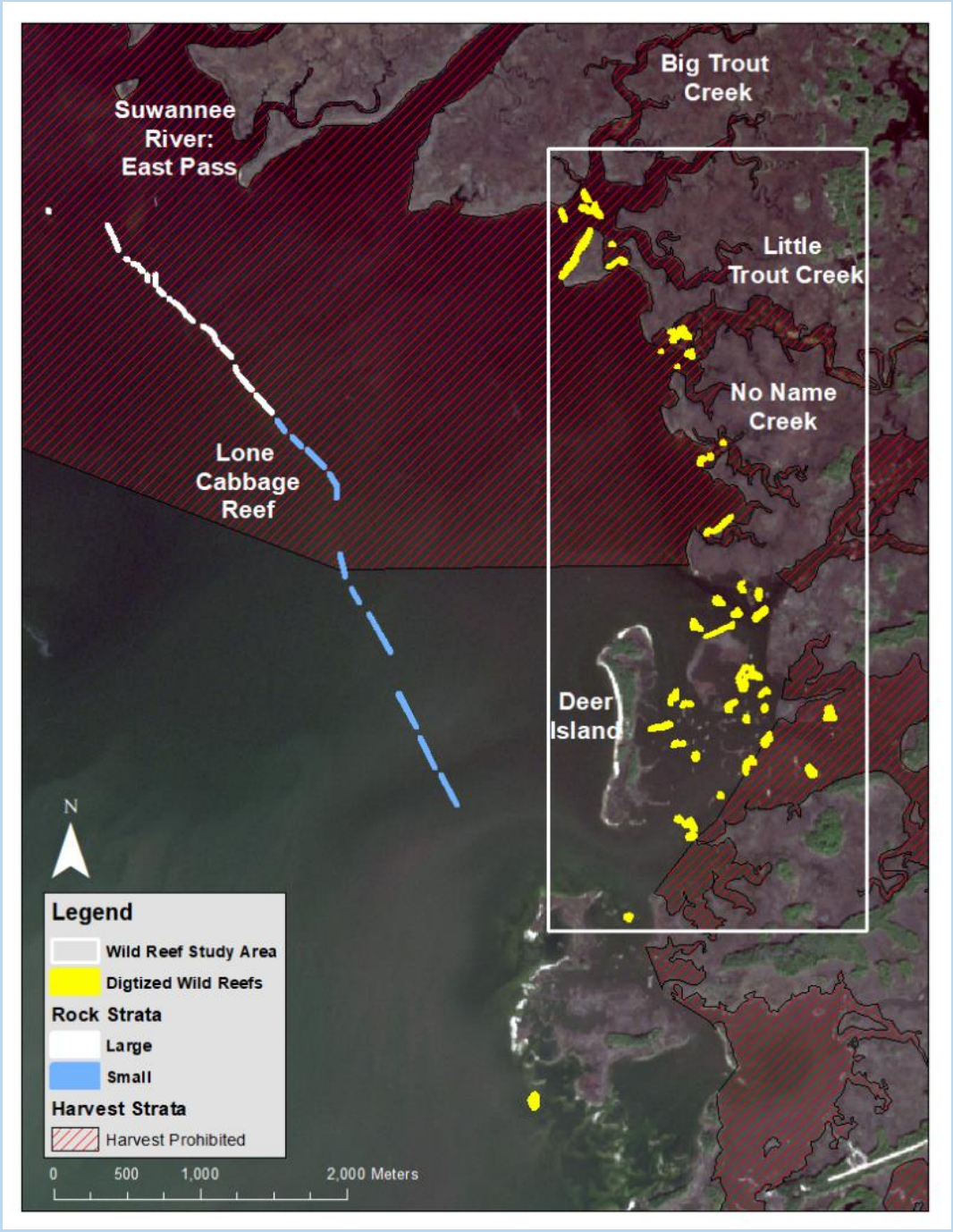


Oyster Monitoring: Design

- **Gear: Intertidal Belt Transects**
  - **0.15m (6”) wide**
  - **Power analysis: total transect length needed**
  - **Total length proportional to strata reef area**
  - **Wild reef digitization**
    - Labins 2013 imagery
    - Random selection: 2x2m N-S, E-W grid
  - **Reef elements:**
    - Parallel to reef
    - Random selection: 20m lengths/2m widths

- **Rock Size Strata:**
  - Large rocks (>24”)
  - Small rocks (<24”)
  - No Rocks (wild reef)

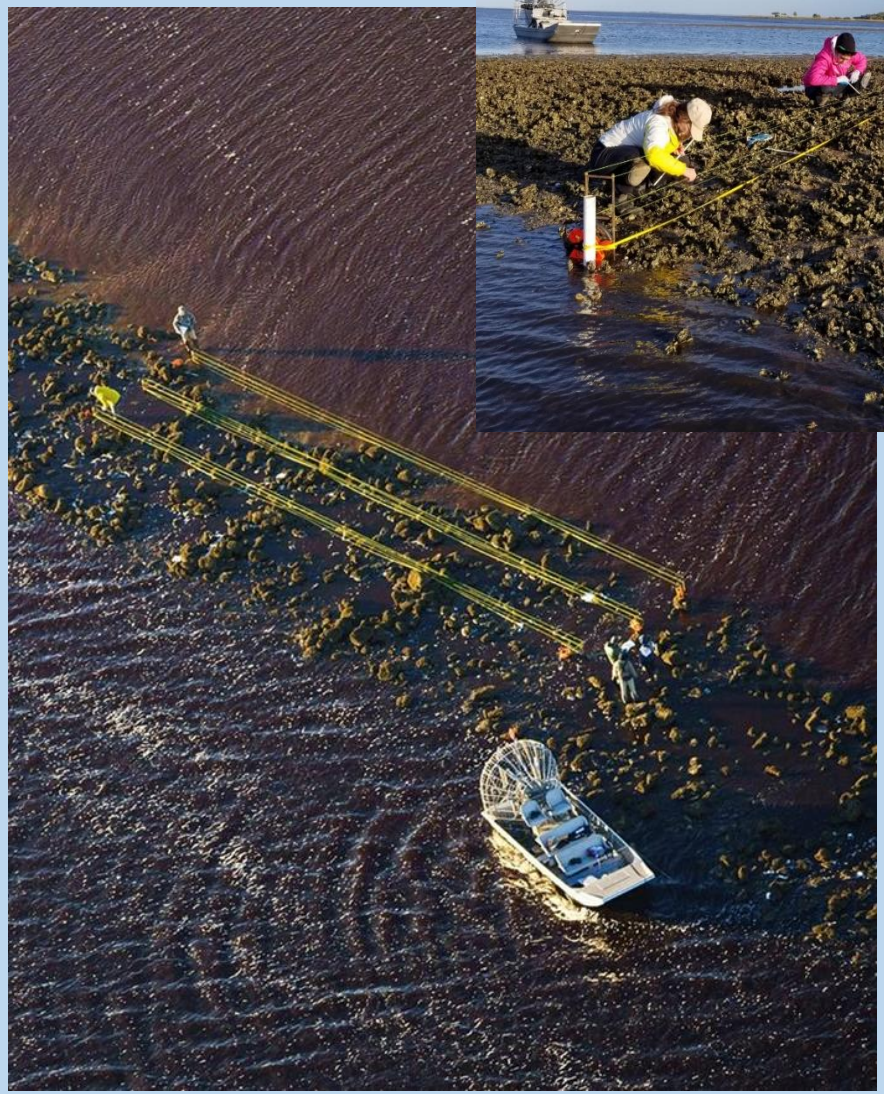
- **Harvest Strata:**
  - Harvestable
  - Harvest Prohibited



Oyster Monitoring: Winter 2018/19

- **<u>Intertidal Reef Metrics:</u>**
  - Live/Dead oyster density
  - Oyster height distribution

- **<u>Summary:</u>**
  - 61 reefs/elements sampled
  - Total transect length =2639 m (1.6 miles)
  - Data processed near real-time
  - Transplant/Hurricane Michael deposited oysters onto reef
  - Successful colonization of reef



Oyster Monitoring: Results

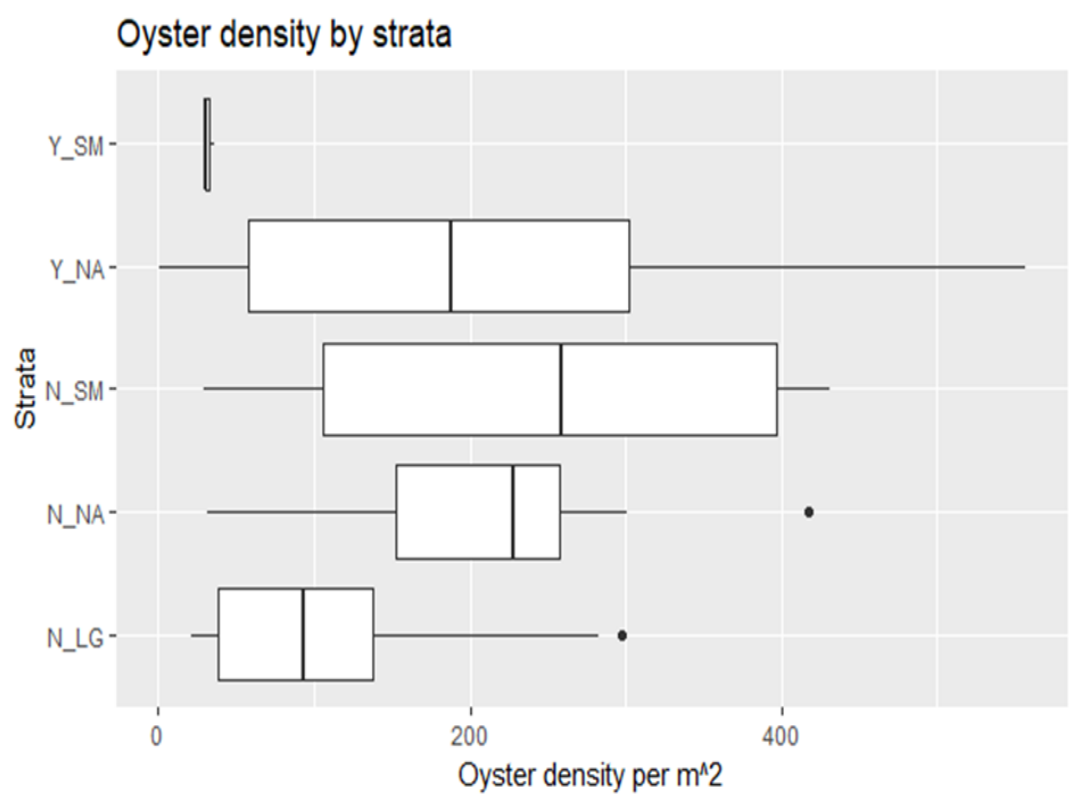
Harvest Small Rock

Harvest Wild Reef

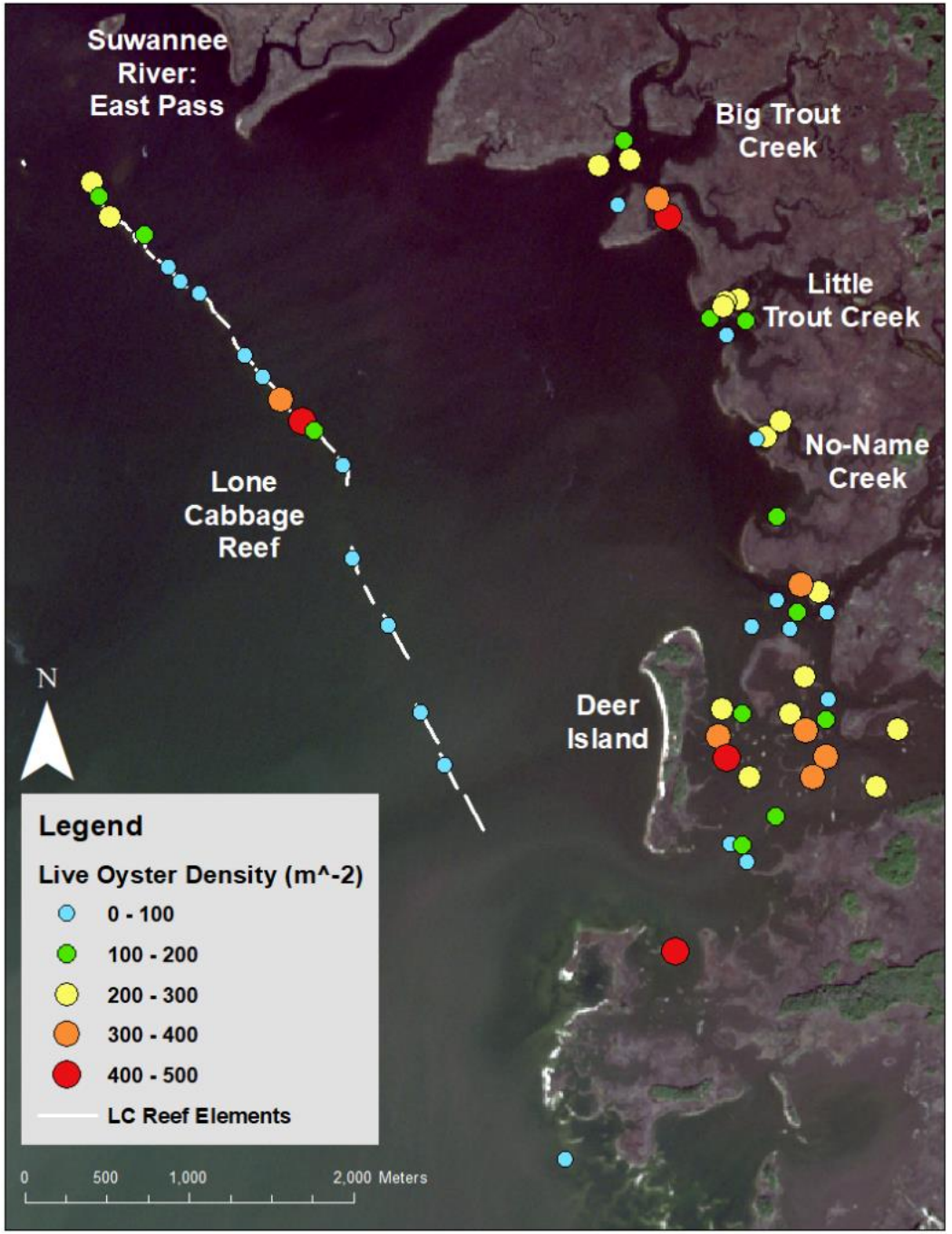
No Harvest Small Rock

No Harvest Wild Reef

No Harvest Large Rock

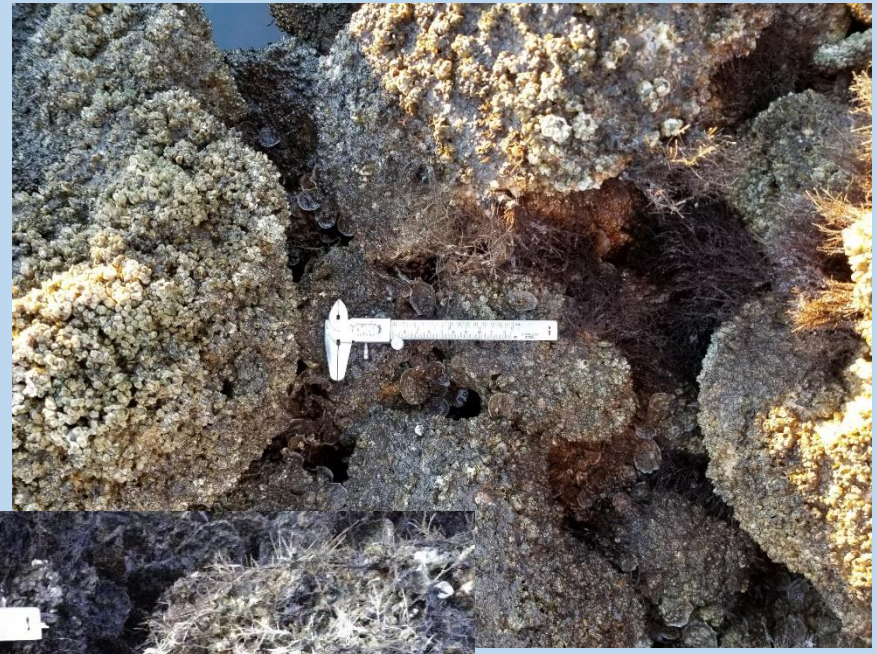


Power analysis underway to guide Winter 2019/20 sampling



July 2018

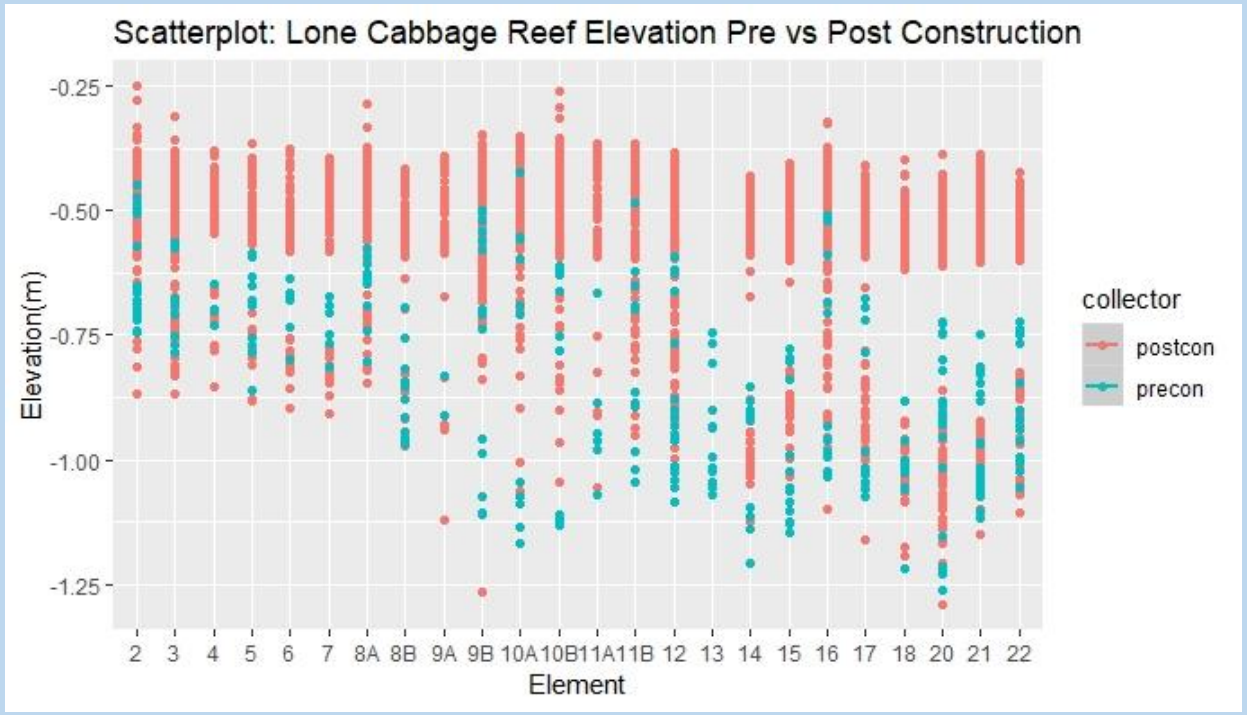
December 2018

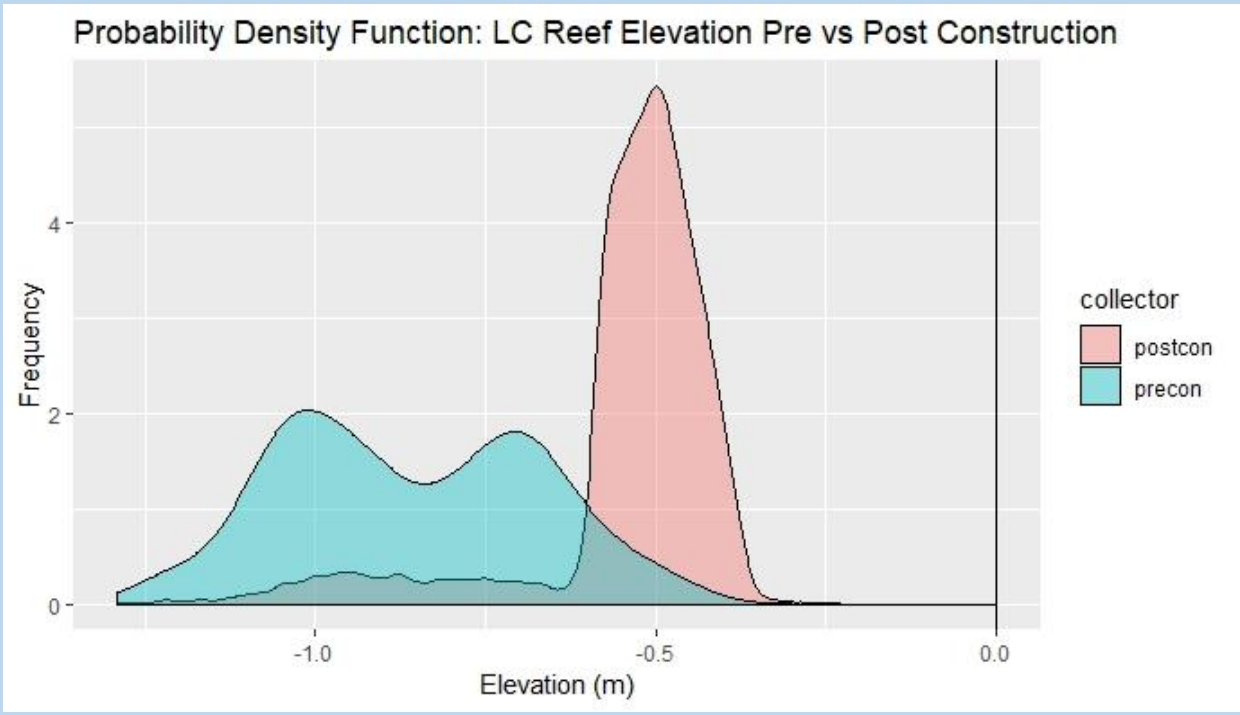


July 2019

Monitoring Efforts: Elevation

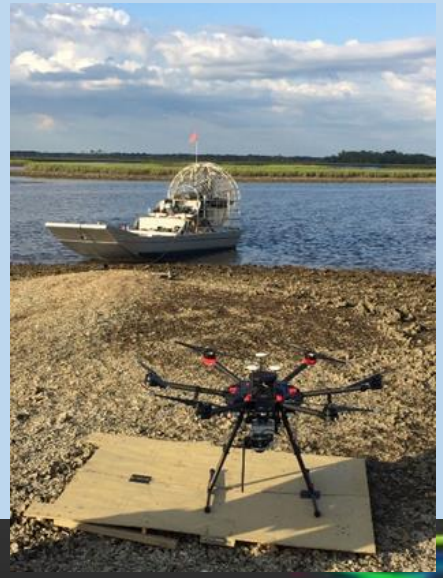
- **Project Target Elevation: -0.44 m (-1.45 ft) NAVD88**
- **Contracted RTK Survey (As-Built Report)**

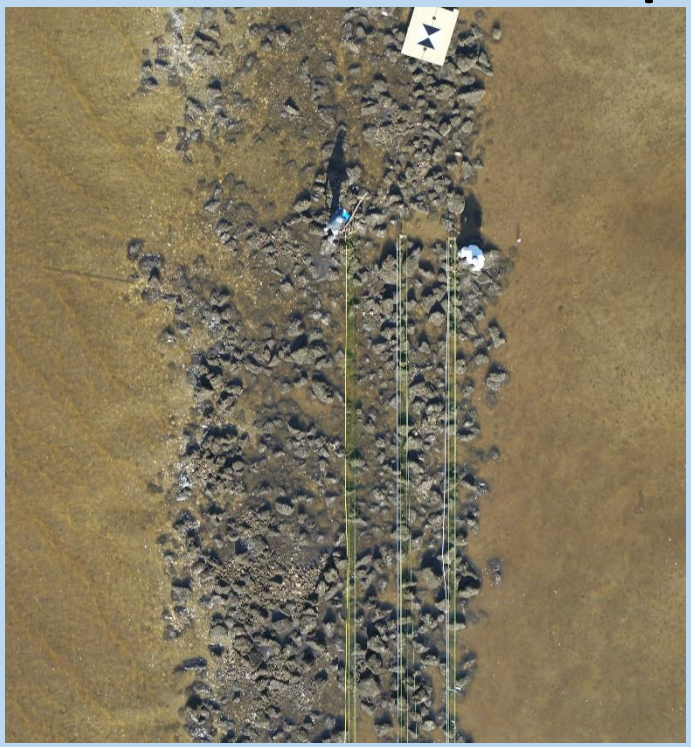


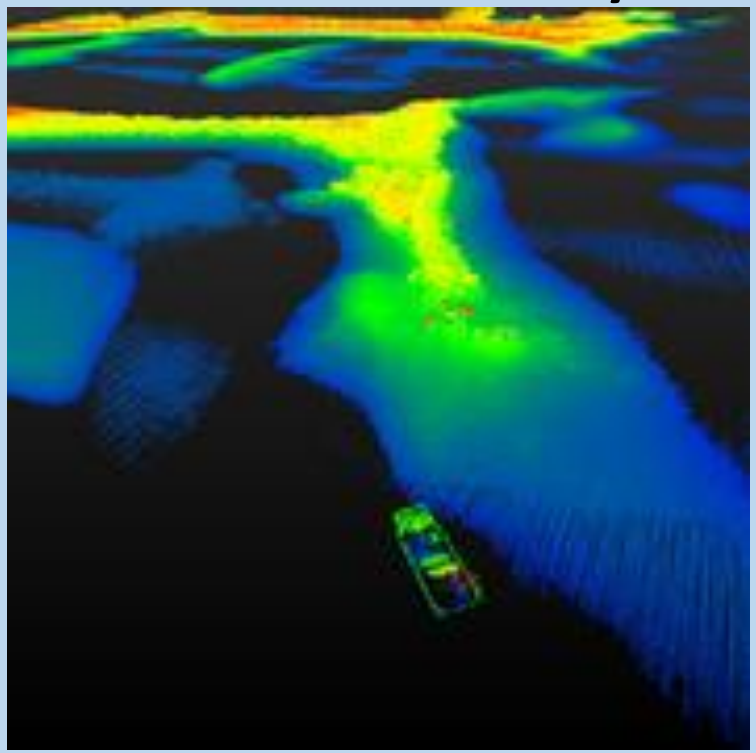


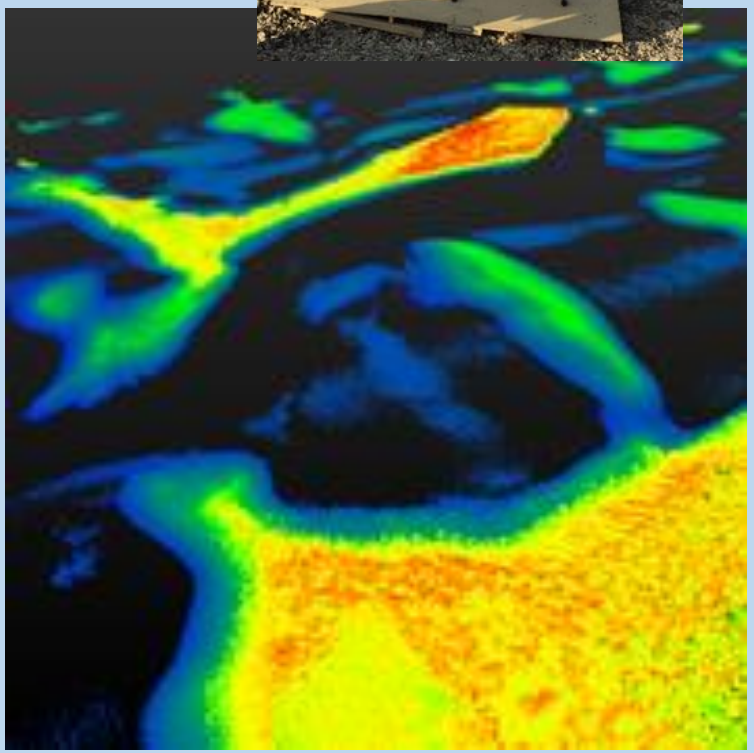
Monitoring Efforts: Elevation

- **Drone Surveys: RGB and Lidar Photogrammetry**
- **Characterize rugosity**
- **Oyster density/elevation relationships**
- **Chose not to proceed with sonar survey**









In Summary:

- **Possibly the longest oyster reef constructed in FL**
- **Completed on-time/under budget**
- **Rapid oyster colonization**
- **Increased reef elevation**
- **Potential for oyster restoration to be used for hydrologic alteration**
- **4 more years of monitoring**

Questions?

More Information:
http://www.wec.ufl.edu/oysterproject/restoration.php

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