THE APALACHICOLA BAY SYSTEM INITIATIVE (ABSI)

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ABSI funding is provided by Triumph Gulf Coast Inc. and Florida State University

Apalachicola Bay System Initiative (ABSI)

The Apalachicola-Chattahoochee-Flint River Basin is among the most ecologically diverse and significant natural areas in the southeastern United States.

The Apalachicola Bay serves as the central economic pillar of Franklin County, FL. It is now a system imperiled.

Florida State University is dedicated to reversing this trend through the **ABSI** funded in part by the Triumph Gulf Coast Inc.

ABSI Mission

The ABSI seeks to gain insight into the root causes of decline of the bay's ecosystem and the deterioration of oyster reefs. Ultimately, the ABSI will develop a management and restoration plan for the oyster reefs and the health of the bay.

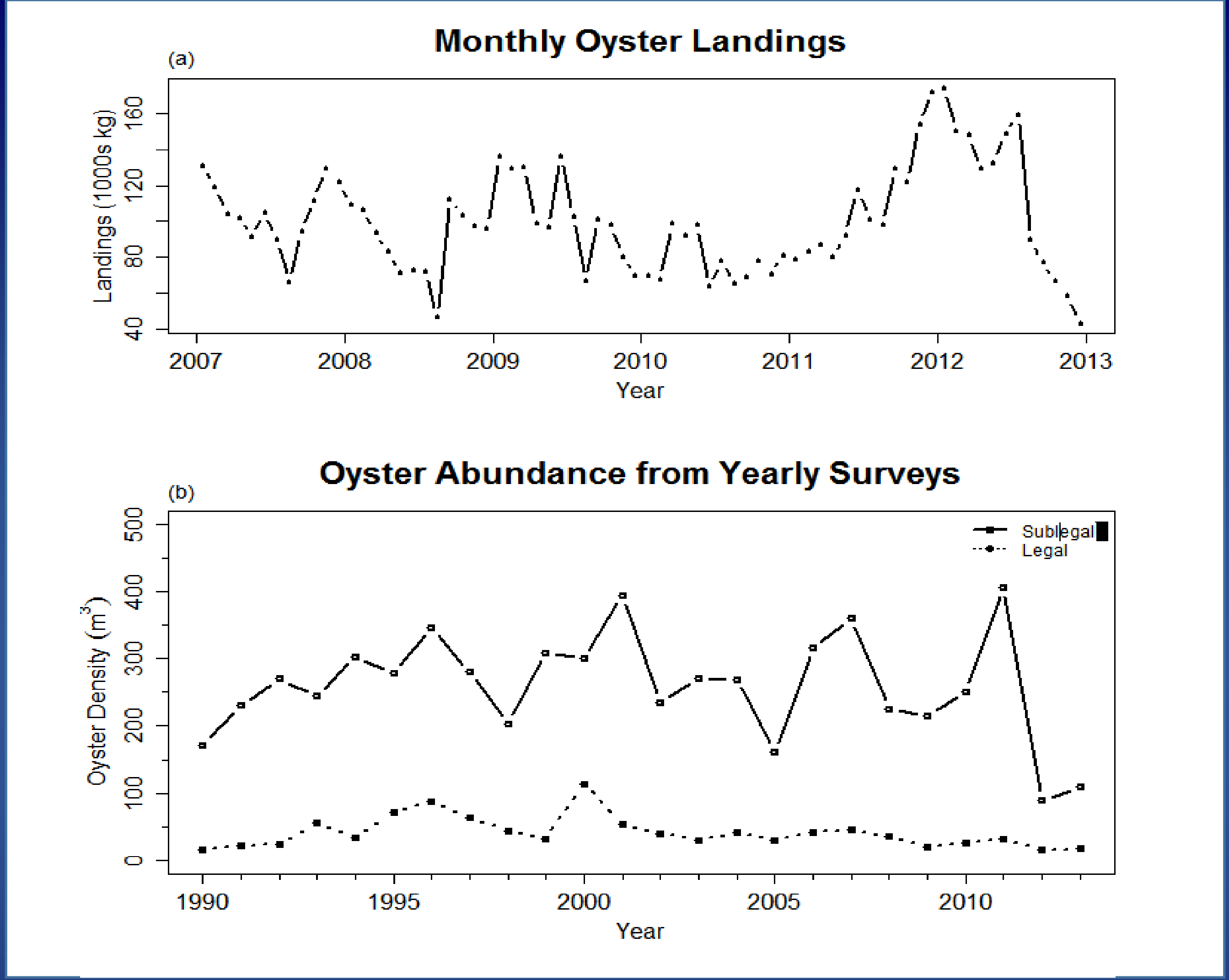
Apalachicola Bay System Initiative (ABSI)

Development and implementation of Management and Restoration Plan

- Engagement with stakeholders, agencies, and university partners
- Community Advisory Board (CAB)

Research

- Causes of decline of the bay's ecosystem and the deterioration of oyster reefs
- Restoration strategies
- Hatchery to produce larvae for laboratory and field experiments related to restoration



2010 (April 20): Deepwater Horizon Oil Spill

2013: Apalachicola Bay Oyster fishery declared a federal fishery disaster

2020: FWC closed Apalachicola Bay Oyster Fishery for 5 years

What Happened?

Reduced River Flow

↓

Increased Salinity

↓

Increased Predators, Parasites and Disease

↓

Increased Mortality, especially juveniles

↓

Recruitment failure

Shell removal

↓

No re-shelling

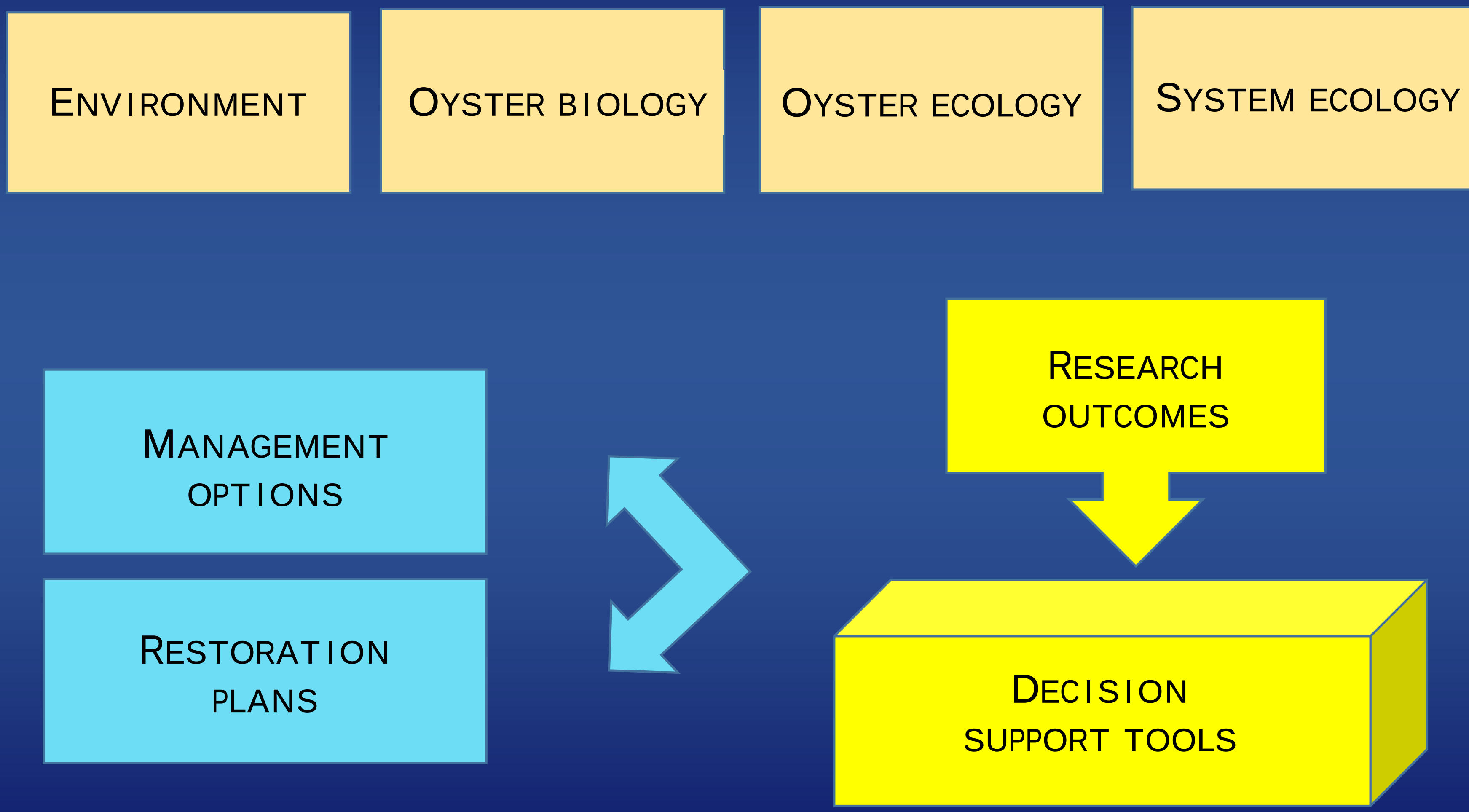
↓

Habitat limitation

Oyster population collapse

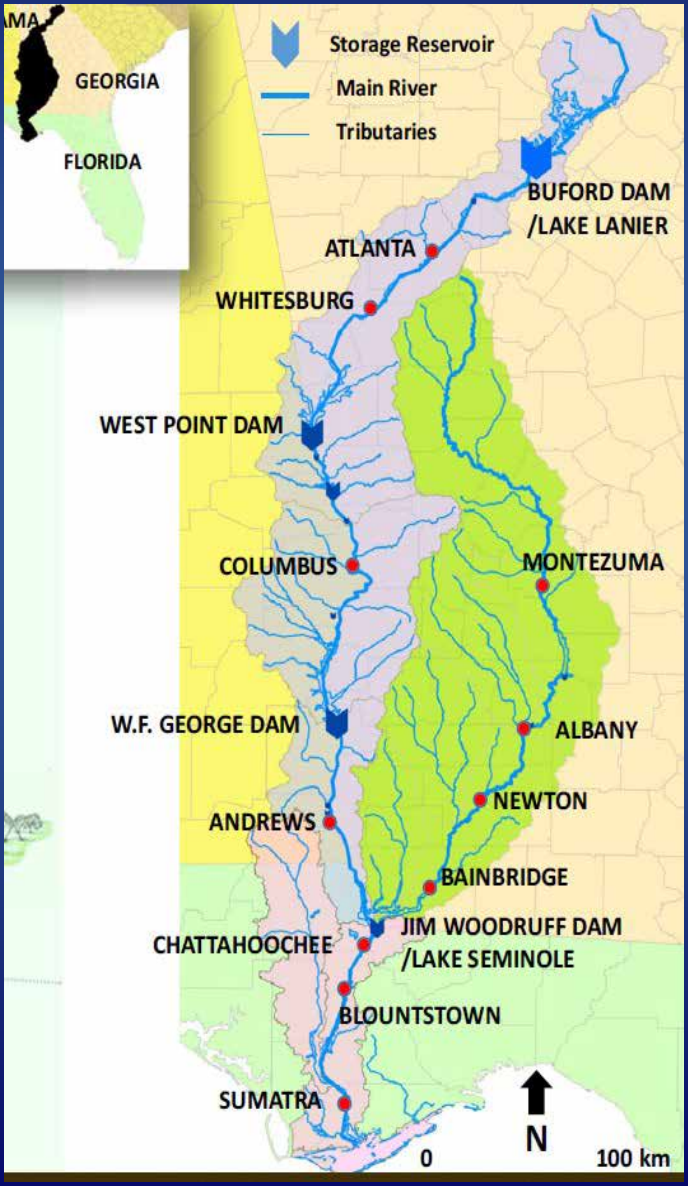
Lots of unanswered questions – no definitive conclusion

Research applications



Habitat and Environment

Fresh-water flow dynamics

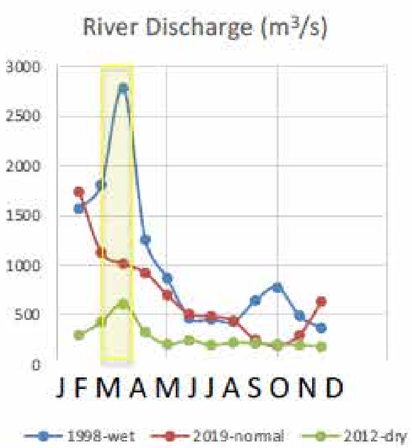


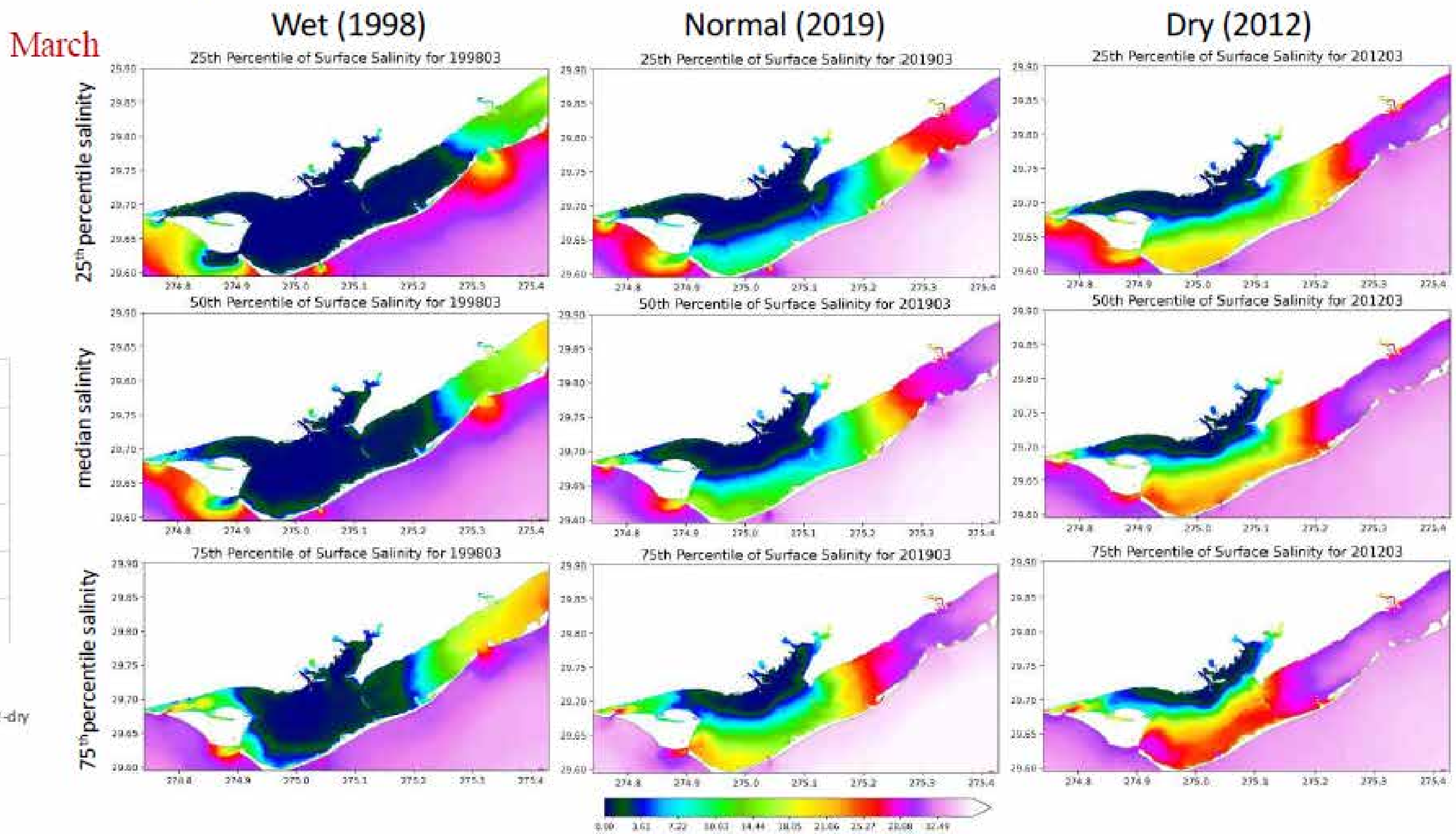
- ACOE water control manual does not consider flows into the estuary
- ACF Stella model used by Dr. Steve Leitman to model fresh-water flow into Apalachicola Bay
- Model has been calibrated with ACOE model
- Effects of future climate on river flows assessed and manuscript close to submission
- Storage and flow analyses indicate there is sufficient storage capacity for management to improve river flow into AB.
- Metrics being developed to define flow regimes that optimize benefit to oyster populations in AB

HABITAT AND ENVIRONMENT

Bio-physical model of the Apalachicola Bay System (Steve Morey & colleagues FAMU)

Maps of salinity quantiles (median, 25th percentile, 75th percentile) corresponding to wet, normal, and dry March.





Habitat and Environment

Predictive habitat suitability model for oysters run under current and projects climate scenarios

Simulation modeling of oyster population dynamics with fisheries scenarios
 (Ed Camp, UF)

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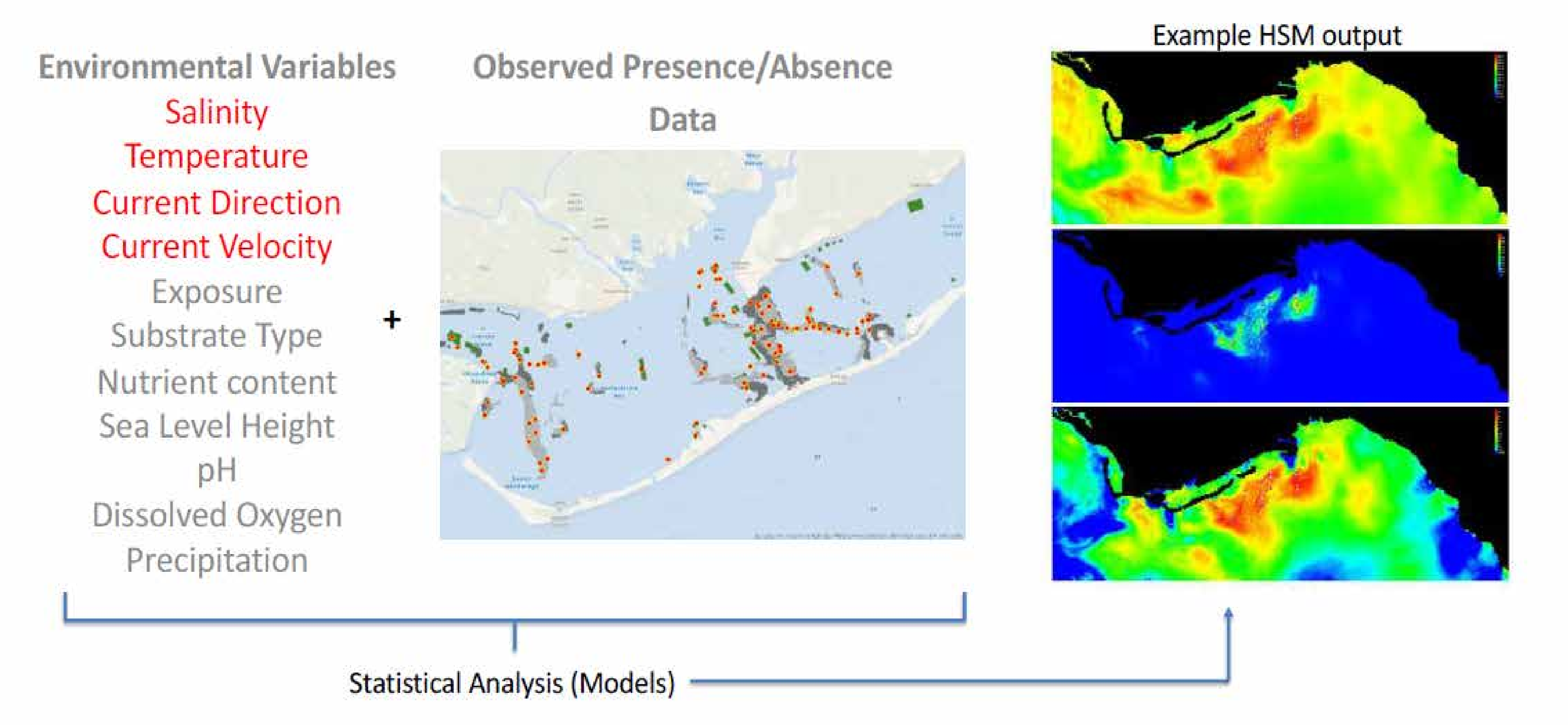


ABSI Mapping

National Oceans and Applications Research Center

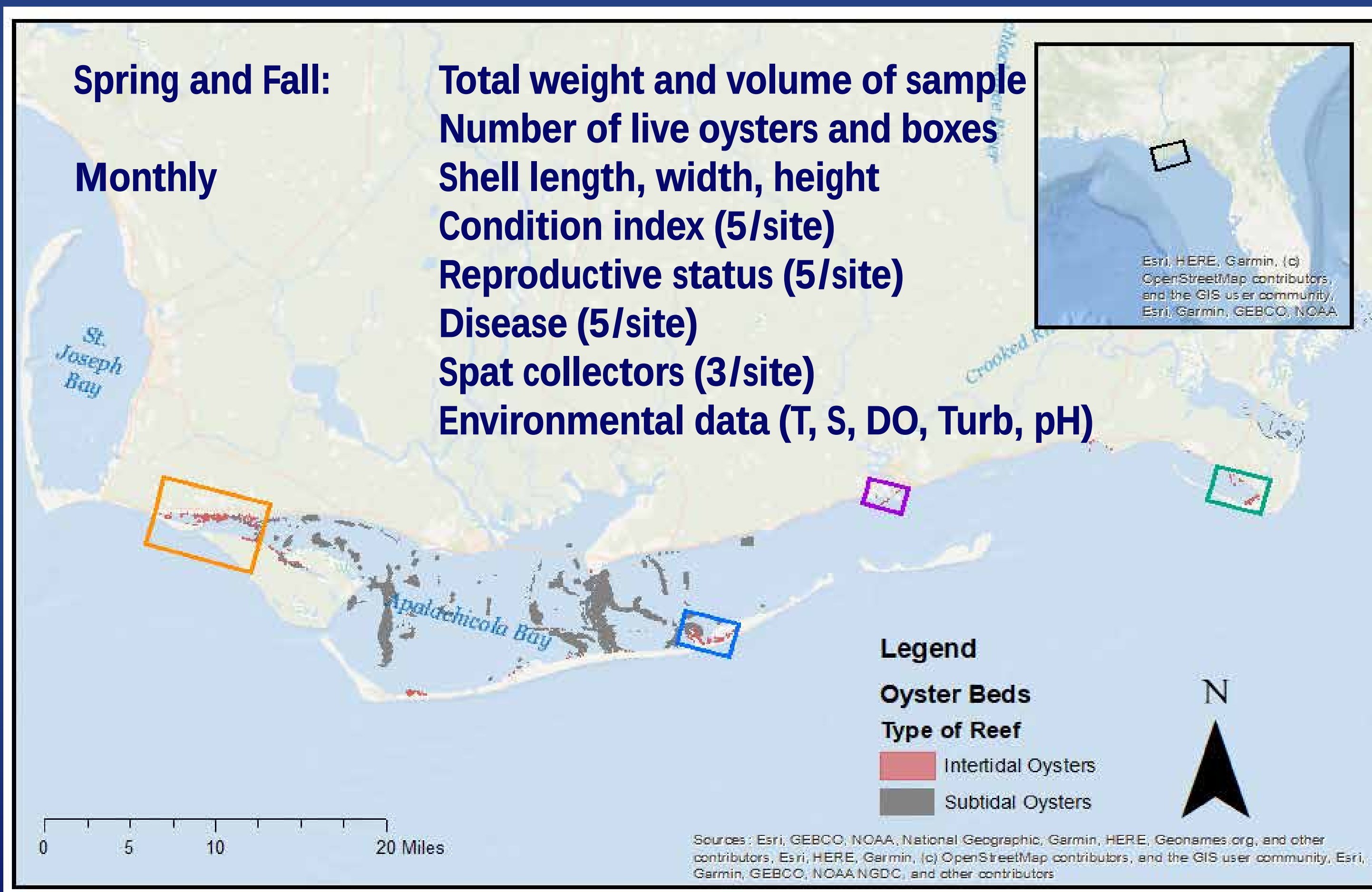
- 1600 acres mapped at low resolution using an Autonomous survey vehicle that takes simultaneous sonar and depth data with overlapping swaths
- 400 acres to be mapped at high resolution (5cm)

Monitoring intertidal habitats

Indian Lagoon, East Cove, Carabelle, Alligator Harbor
Five x 0.25 m^2 quadrats per site

Spring and Fall: Total weight and volume of sample
Number of live oysters and boxes

Monthly Shell length, width, height
Condition index (5/site)
Reproductive status (5/site)
Disease (5/site)
Spat collectors (3/site)
Environmental data (T, S, DO, Turb, pH)



Spat collector

Monitoring intertidal habitats

Indian Lagoon, East Cove, Carabelle, Alligator Harbor
Five x 0.25 m^2 quadrats per site

Spat collector

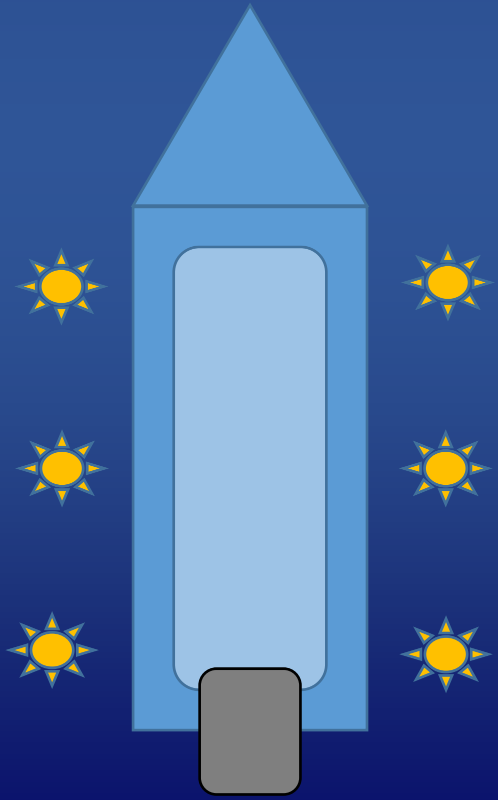
Oyster ecology

Subtidal recruitment - 26 locations in Apalachicola Bay and St George Sound

Oyster ecology

Sub-tidal oyster populations

Subtidal surveys using tongs (Sandra Brooke FSU)
6 samples per site
Volume: Rock, dead shell, live oysters
Counted: spat, adults, market, boxes
Measured: live oysters (<25, 25-76, >76)

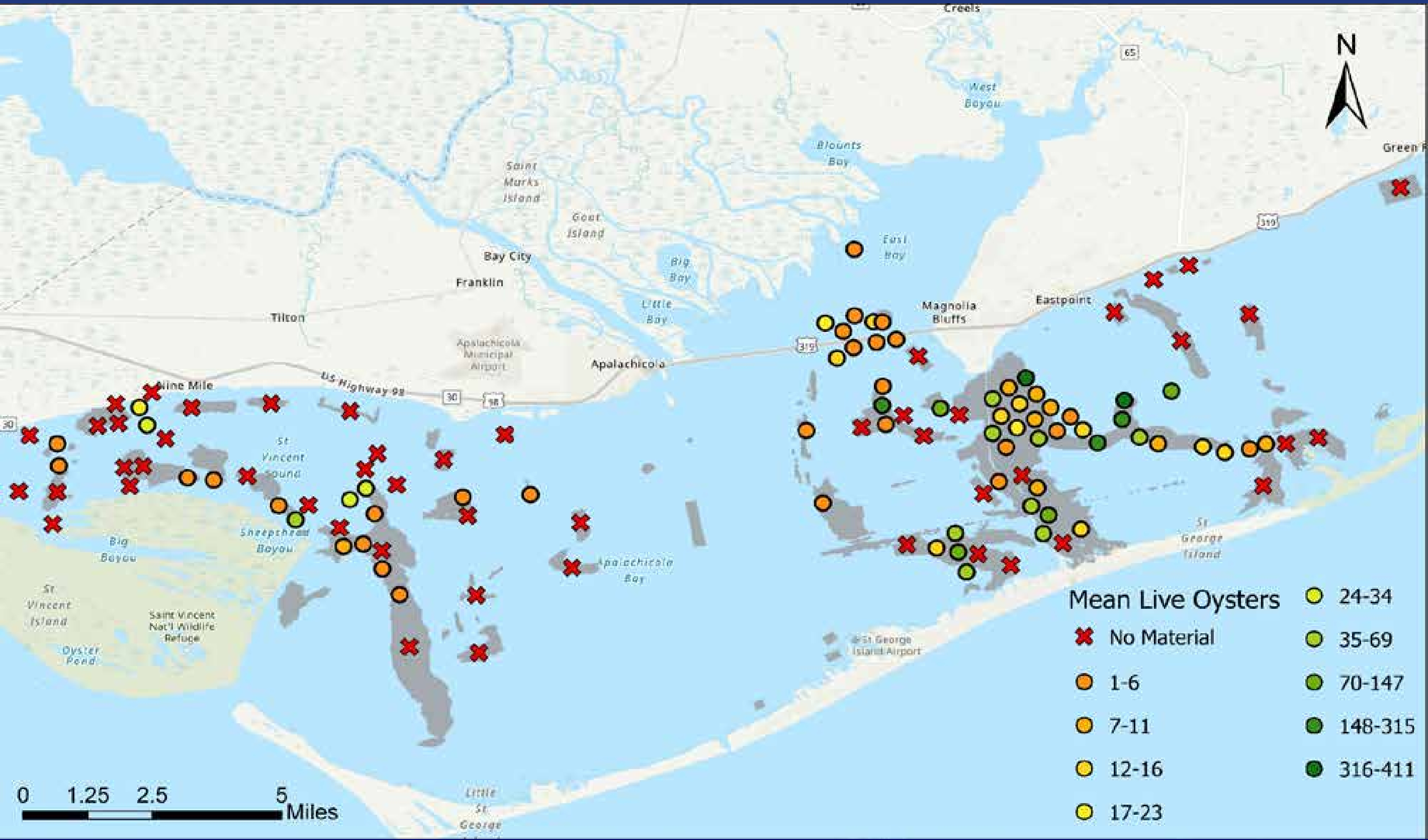


Sub-tidal Monitoring (2020-2021)

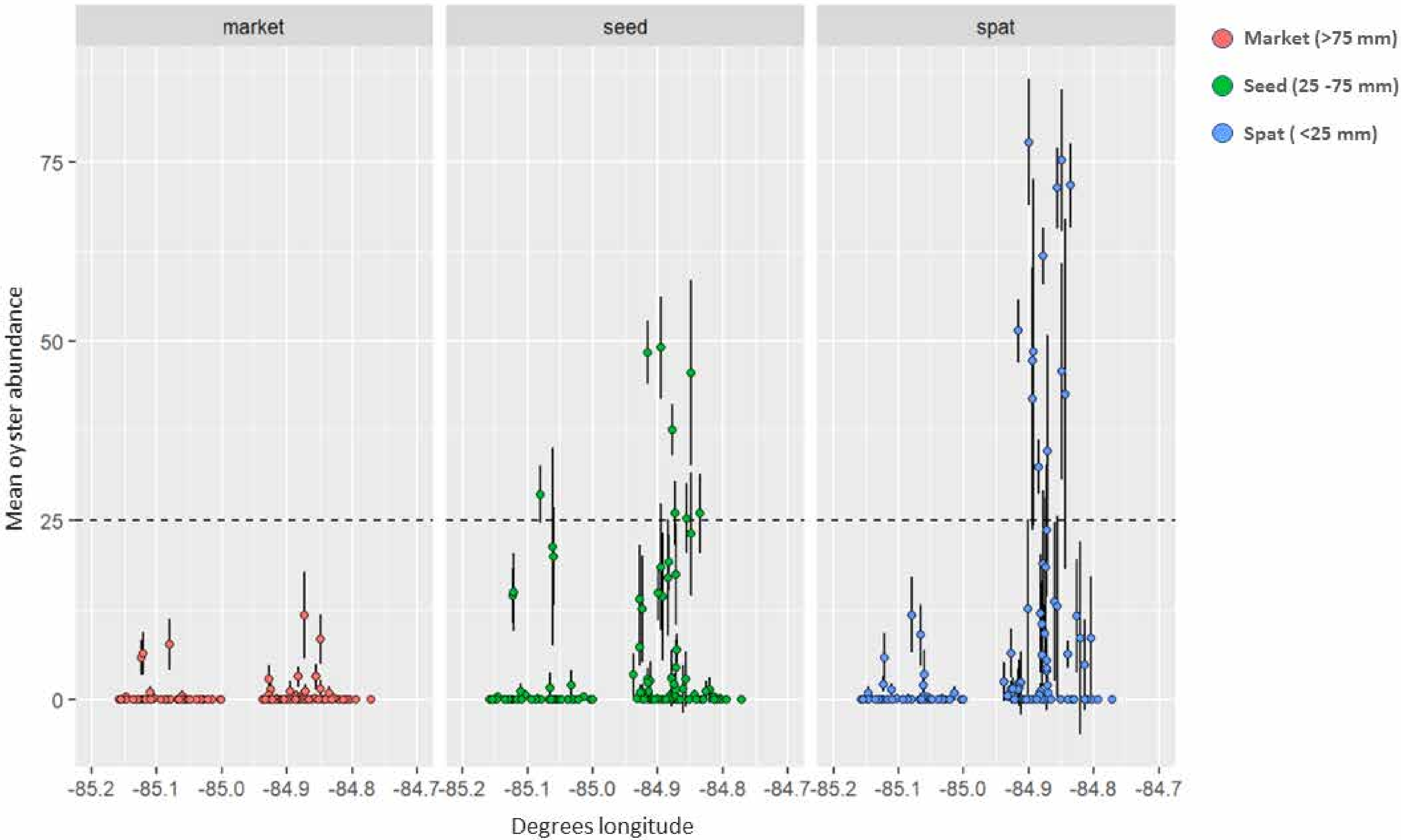
Sampling with hand tongs to cover wide spatial extent
Six replicate samples per site (3 each side of the vessel)
Total volume of material/per tong sample
Mean # live oysters, # boxes, # in each size class (<25, 25-75, > 75 mm)

Sub-tidal Monitoring (2021-2022)

Sampling with hand tongs to cover wide spatial extent
Six replicate samples per site (3 each side of the vessel)
Total volume of material/per tong sample
Mean # live oysters, # boxes, shell height of first 100 individuals



Sub-tidal Monitoring (2021-2022)



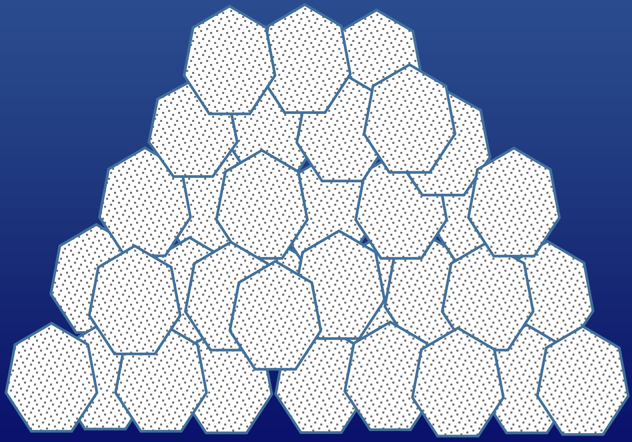
Restoration Experiments 2021

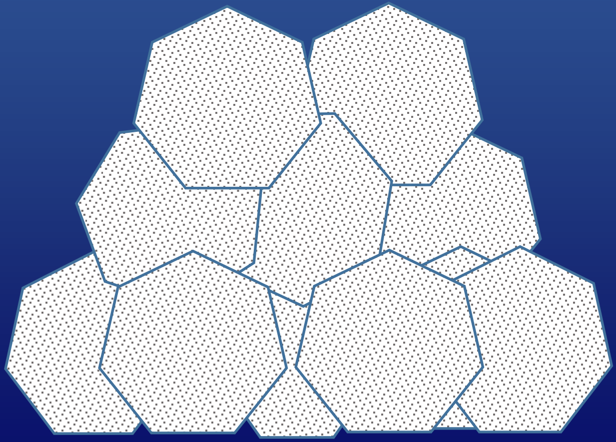
Reef design

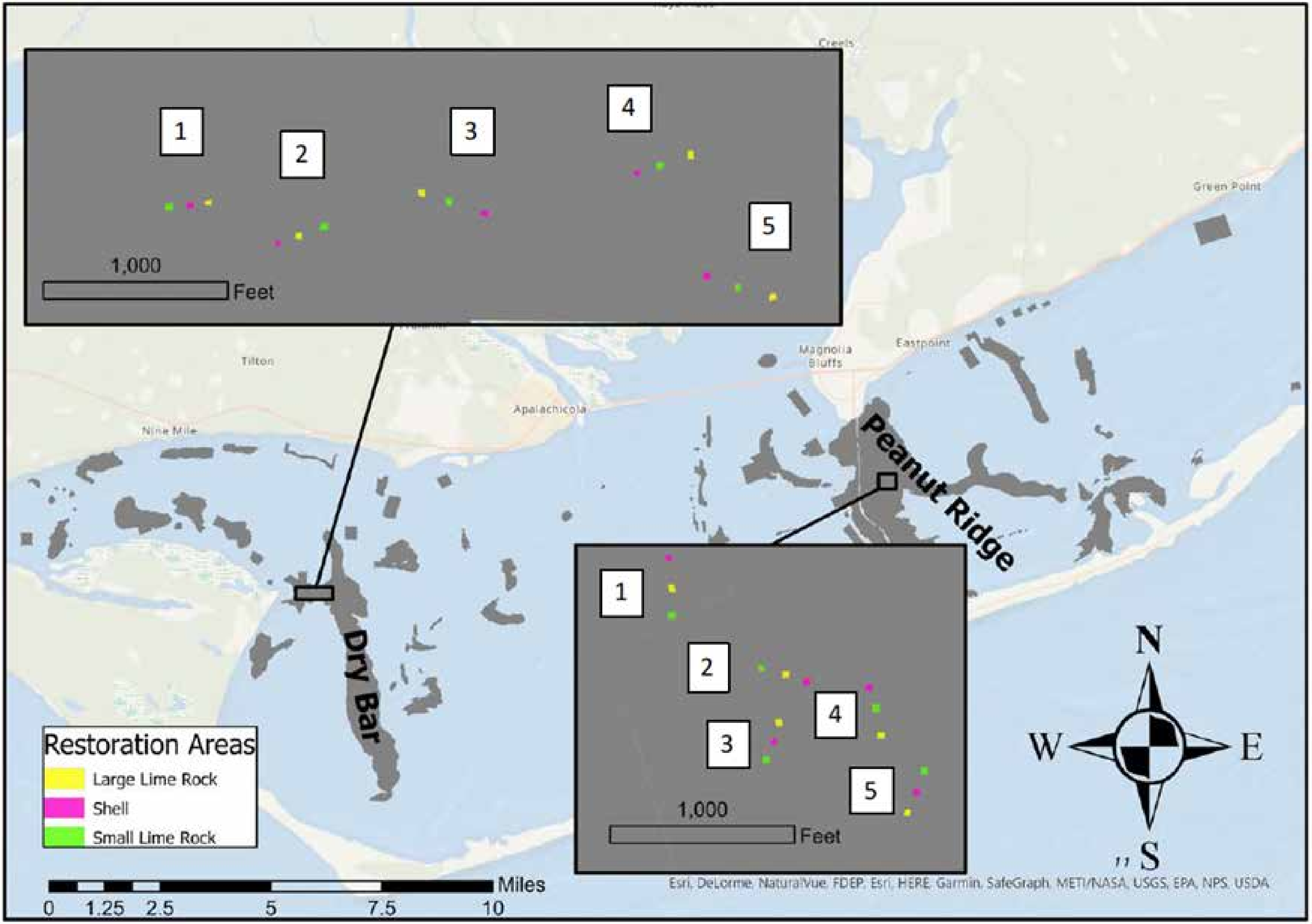
30 ft x 30 ft x 1.5 ft = 50 cubic yards of material

Materials

- Natural oyster shell – good for spat settlement, can be harvested with tongs
- Small Limerock (2”) creates mound, can be harvested with tongs
- Medium Limerock (6-8”) – creates stable structure, good for habitat development, can be harvested once oysters develop.







Creels
Green Point
Tilton
Magnolia Bluffs
Eastpoint
Apalachicola
Nine Mile
Peanut Ridge
Dry Bar
1
2
3
4
5
1,000
Feet
Restoration Areas
Large Lime Rock
Shell
Small Lime Rock
N
S
W
E
Miles
0
1.25
2.5
5
7.5
10
Esri, DeLorme, NaturalVue, FDEP, Esri, HERE, Garmin, SafeGraph, METI/NASA, USGS, EPA, NPS, USDA

Oyster ecology

Oyster colonization and community experiments Dr. A Shantz and ABSI core team

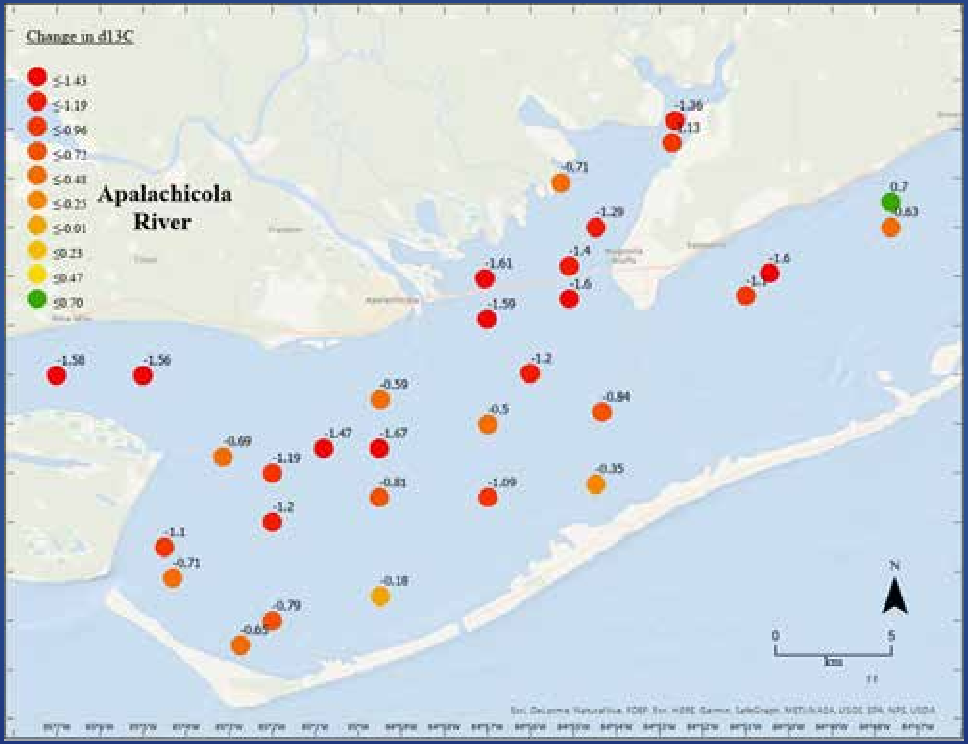
Oyster colonization
10 locations across the Bay
4 units of each type at each location
Current meter and temp, salinity, oxygen data loggers
Recovered and replaced with new unit
Development assessed using photogrammetry

Community development (invertebrates and fishes)
Trays placed at experimental site
Lined with mesh screen which is closed before recovery

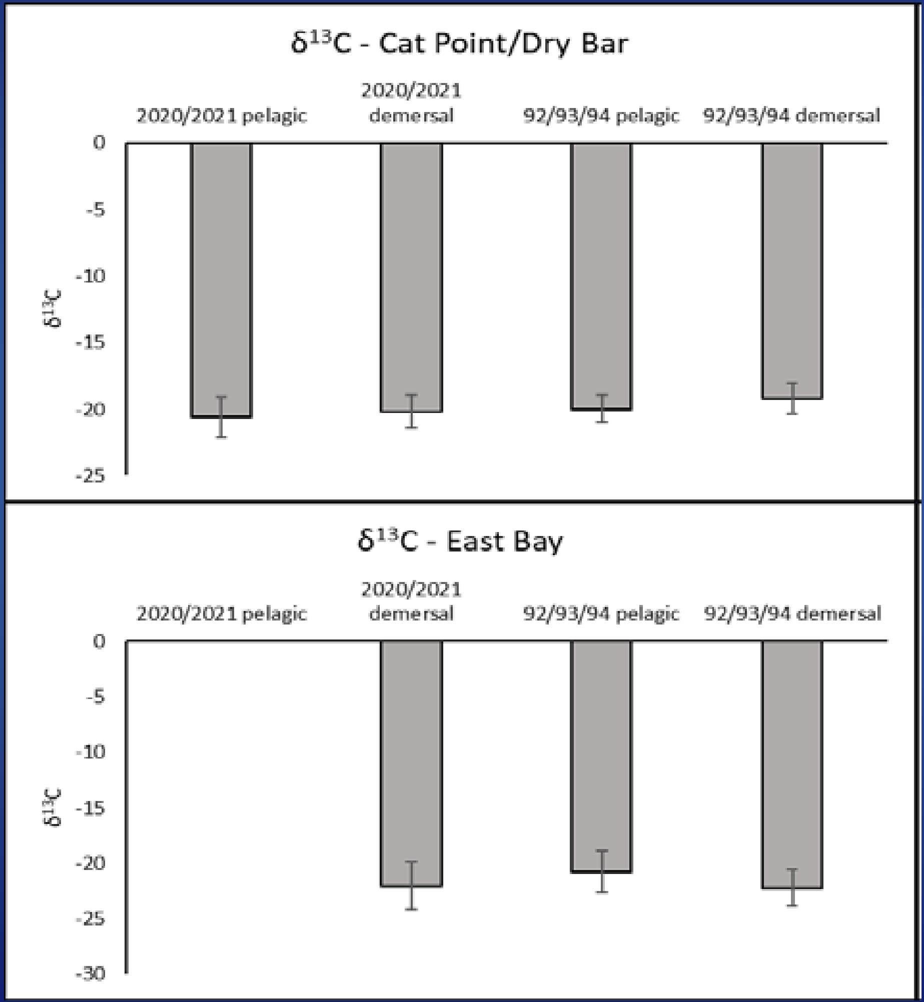
System Ecology

Apalachicola Bay food web and sediments 1994 vs. 2020 /2021 - Jeff Chanton (FSU)

Changes in $d^{13}C$



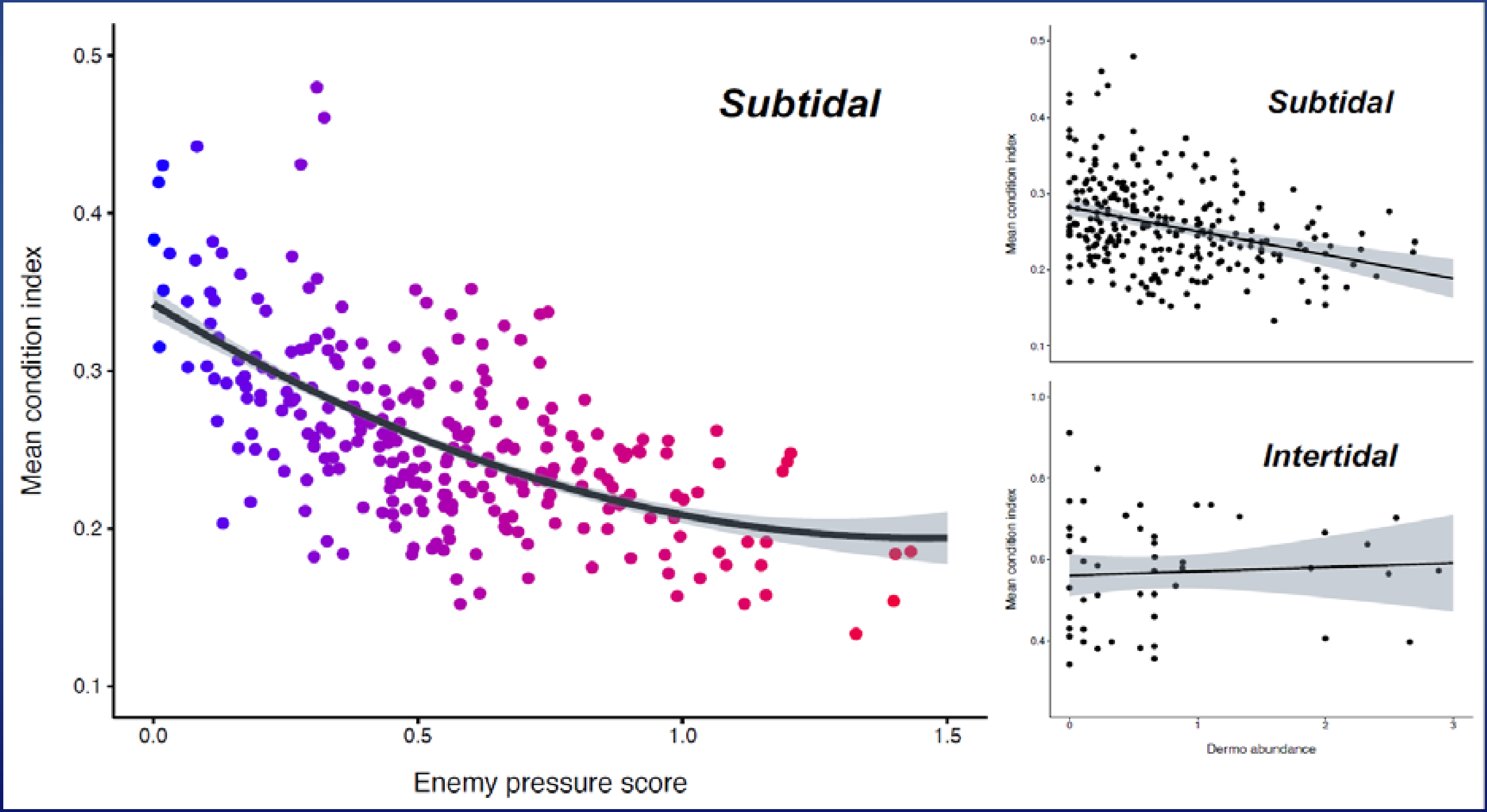
Negative values – more terrestrial input in 2021 vs 1994



NSD between demersal and pelagic fish species from 2021 vs 1994

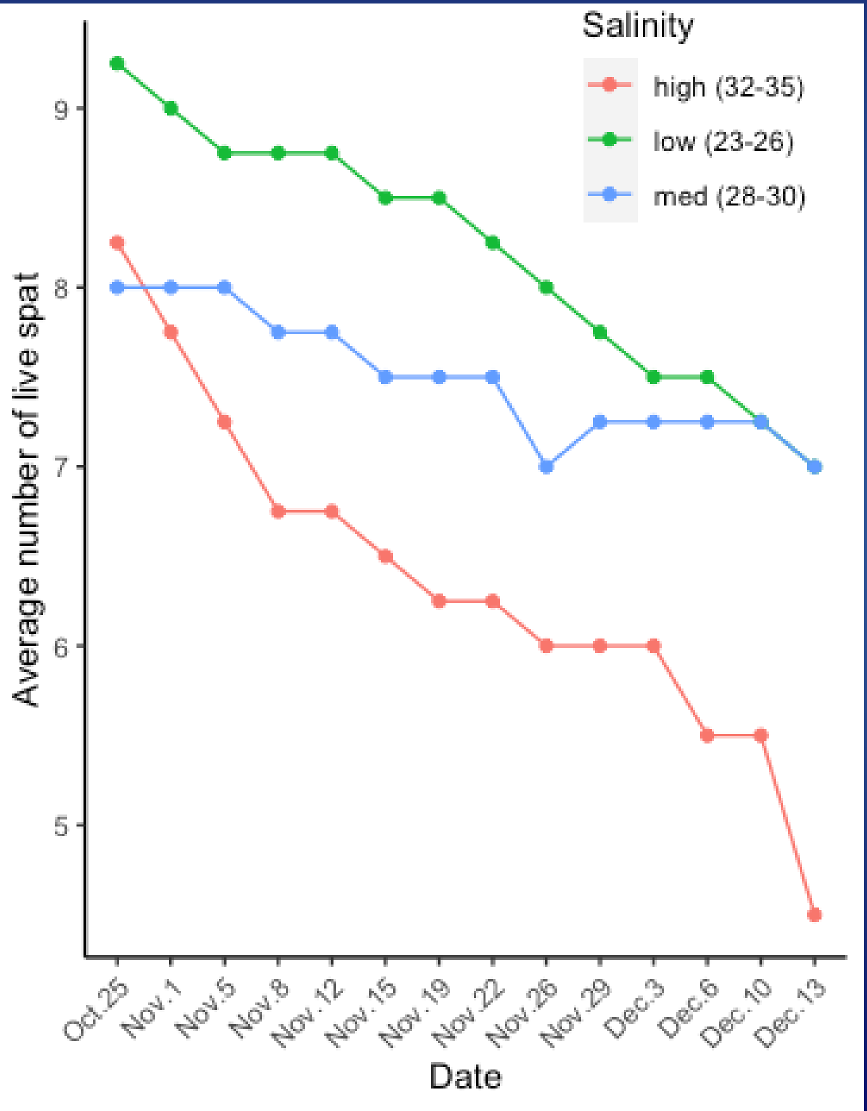
OYSTER BIOLOGY

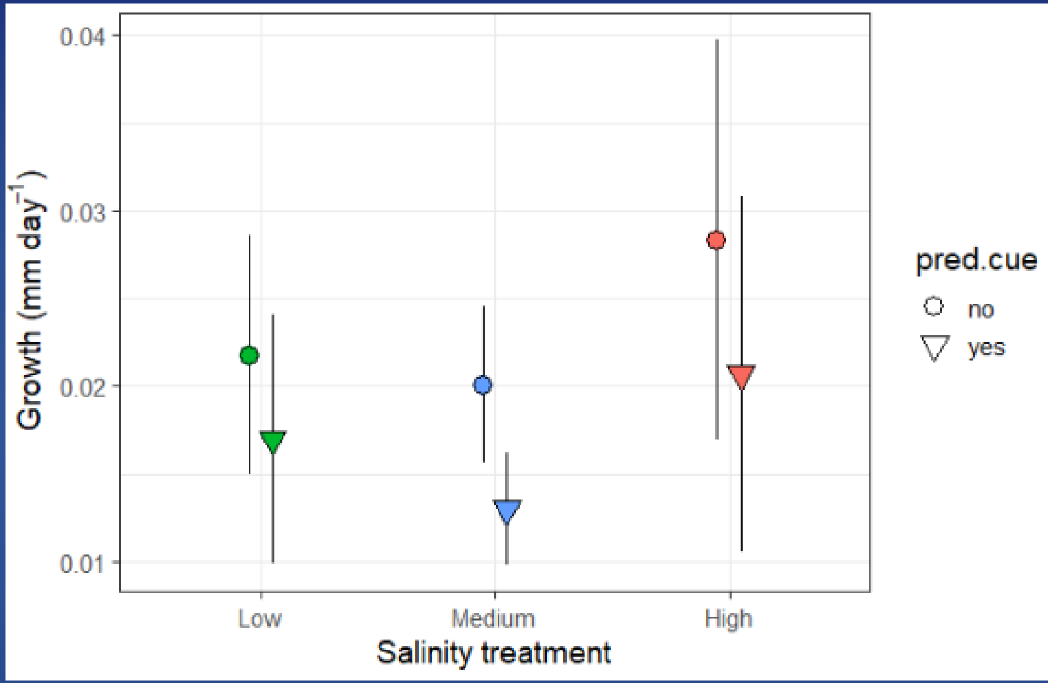
Oyster disease and condition index in Apalachicola Bay
Collaboration of Matt Davis (FWC) and Tara Stewart Merrill (FSU)



OYSTER BIOLOGY

Effect of salinity on juvenile oysters – laboratory experiments (Andy Shantz FSU)





Summer 2022

- Field surveys of drill abundance at sites with contrasting salinity regimes.
- Cage studies to assess predation rates, survival of outplant oysters.

Follow up lab studies on drill consumption rates, survival, habitat use across salinity.

ABSI HATCHERY

Produce oyster seed and spat on shell for experimental restoration study and oyster biology

Successful spring and fall spawns in 2021
Spring spawn planned for April 2022

ABSI Hatchery

New 3,760 sqft hatchery operational summer 2022

- Temp-controlled algae room
- Temp-controlled brood stock room
- Spawning wrack 50 3-L tanks with recirculating system
- Larval holding tanks - six 1,000 gallon tanks; produce 3M larvae her tank (18M per spawn).
- Setting tank area

Management

Results of research applied to development of management plans,
<u>in collaboration with stakeholders and management agencies</u>

<u>Potential</u> Management Options

Ecosystem Based management

State Monitoring Programs

Limited entry fishery

Summer Closure

Re-shelling programs

Sanctuary reefs

Increase enforcement

Community Engagement

Community Advisory Board

Oystermen’s workshops

Public presentations

Annual open house

Shell recycling program

Hatchery Internships

Educational programs

Community Advisory Board (CAB)

Board Members

5	Non-profit organization
4	Seafood industry
4	Business
3	Local government
3	State Government
3	Federal government
2	Other

The CAB is tasked with developing recommendations for the

Apalachicola Bay System Management and Restoration Plan

and to ensure there is a mechanism for the Plan implementation

CAB Management and Restoration Plan Goals

Goal A: A Healthy and Productive Bay Ecosystem

Goal B: Sustainable Management of Oyster Resources

Goal C: Ecosystem-Based Adaptive Management and Restoration Plan Supported by Apalachicola Bay System Stakeholders

Goal D: An Engaged Stakeholder Community and Informed Public

4 Goals, 10 objectives, 42 strategies

November 2021 – CAB approved framework for the Plan

QUESTIONS?

FOR ADDITIONAL INFORMATION:

ABSI website: https://marinelab.fsu.edu/absi/
ABSI email: fsucml-absi@fsu.edu

ABSI MISSION

The ABSI seeks to gain insight into the root causes of decline of the Apalachicola Bay ecosystem, and why they are not recovering despite

Ultimately, the ABSI will help develop a management and restoration plan for oyster reefs and the long-term health of the bay


The ABSI comprises four primary components
Research
Management
Community Engagement
Oyster Reef & Bay Restoration

Current research

- Hydrodynamics
- Water Quality
- Environment
- Nutrients + Productivity
- Habitat

- Reproduction
- Early life stages
- Population genetics
- Enemy Pressure
- Stress responses

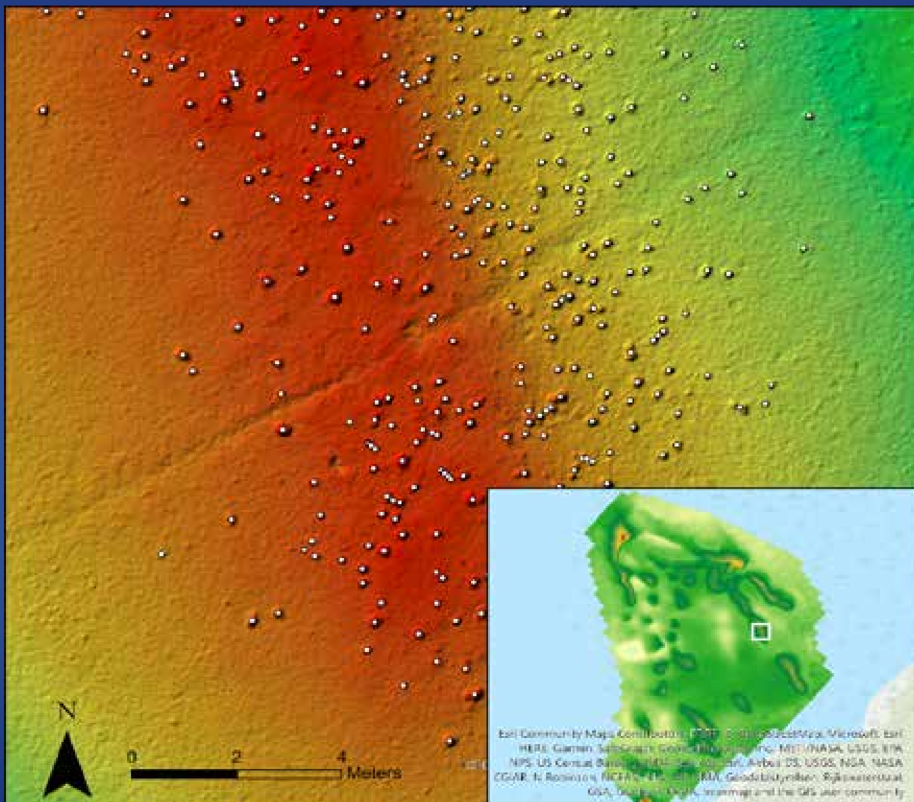
- Intertidal dynamics
- Subtidal populations
- Shell dynamics
- Invertebrate Communities
- Fish Communities

- Food webs
- Sediment dynamics
- Coastal Erosion
- Climate change

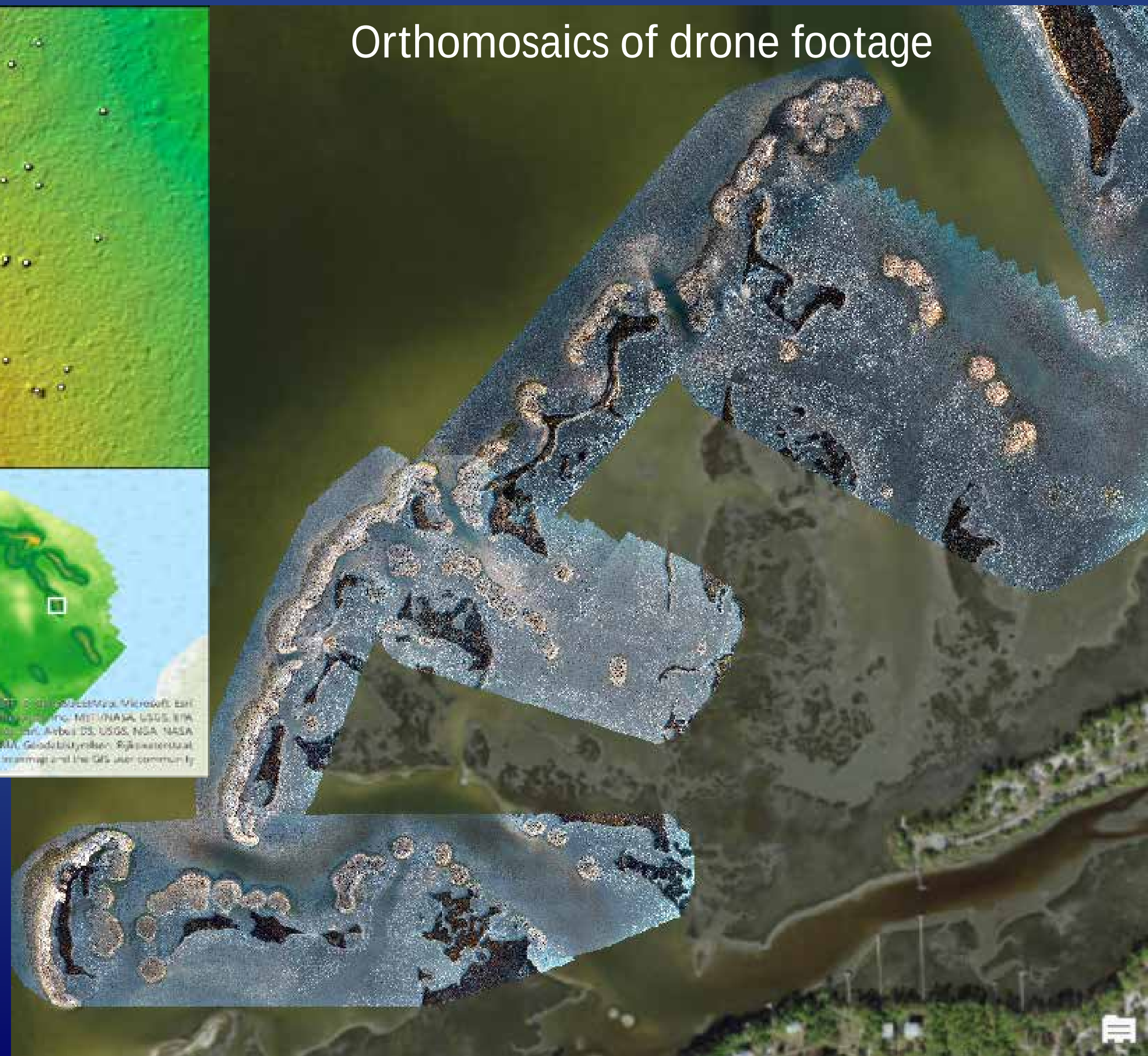
- Development
- Fishing Pressure
- Management
- Restoration

OYSTER ECOLOGY

Spatial and temporal patterns of intertidal oyster reefs



Oyster clusters extracted from digital elevation models using ArcGIS pro



Orthomosaics of drone footage

The X-axis is the longitude for each site (going from west to east) with each panel representing a different size class. Error bars are +/- 1 SD and the dashed line at 25 is somewhat arbitrary – it came from your discussion with Shannon where he said “they used to pull up about 25 market sized oysters per tong lick” but obviously this should be taken with a grain of salt.

As another way to think about this, a typical bushel of oysters has between 100 -150 oysters in it (we’ll call it 125 for simplicity). If management wanted 400 bushels per hectare as a target, that would be ~50,000 oysters (125 x 400) per 10,000 m^2; or 5 market size oysters per meter sq. When I got back to the lab today I quickly tested the tongs from the top of the ramp on 408. Standing ~6’ above the ground, if I extended my arms so the handles were 1.2 m apart where I was holding them (a little over 1 foot beyond my shoulders on each size), a tong lick with 1m long combs covered almost exactly 0.5m^2. Obviously the real area covered by a tong lick will depend on reef depth, comb length, and an oysterman’s size/wingspan, but (1) hitting 400 bushels per hectare would only require an average of a few oysters per tong lick, and (2) we could probably create a distribution for area covered per tong lick by depth pretty easily, add in some random variance and bootstrap some estimates re: how our sampled numbers would equate to an oyster density at each site.