OYSTER MONITORING IN TAMPA BAY

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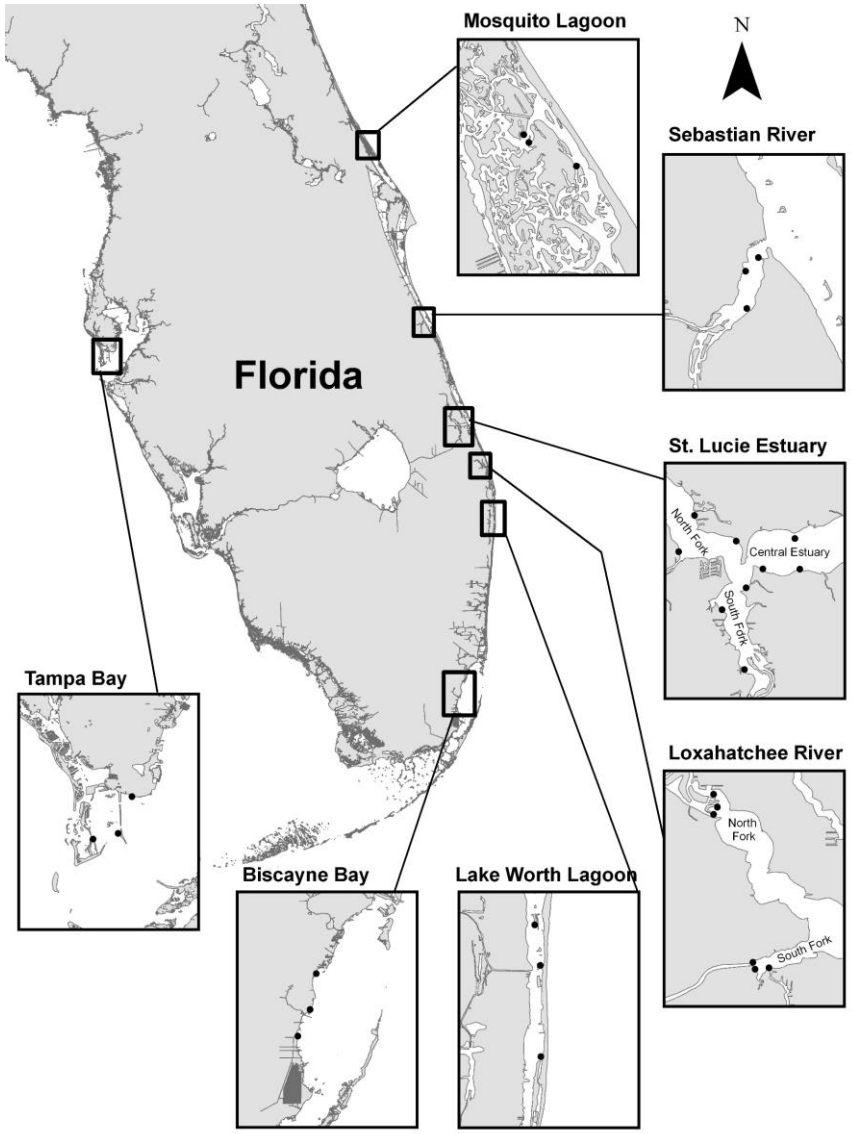
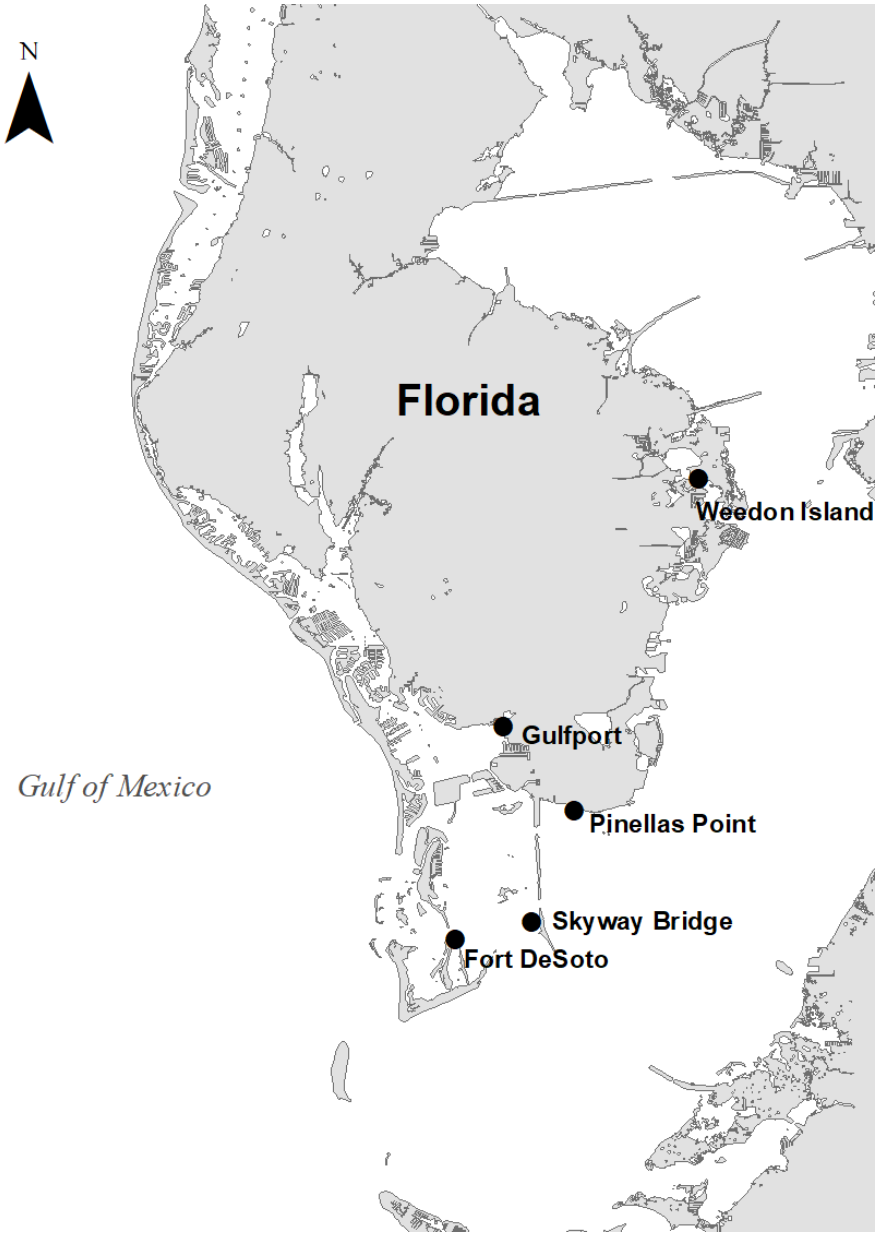
Comprehensive Everglades Restoration Plan (CERP)

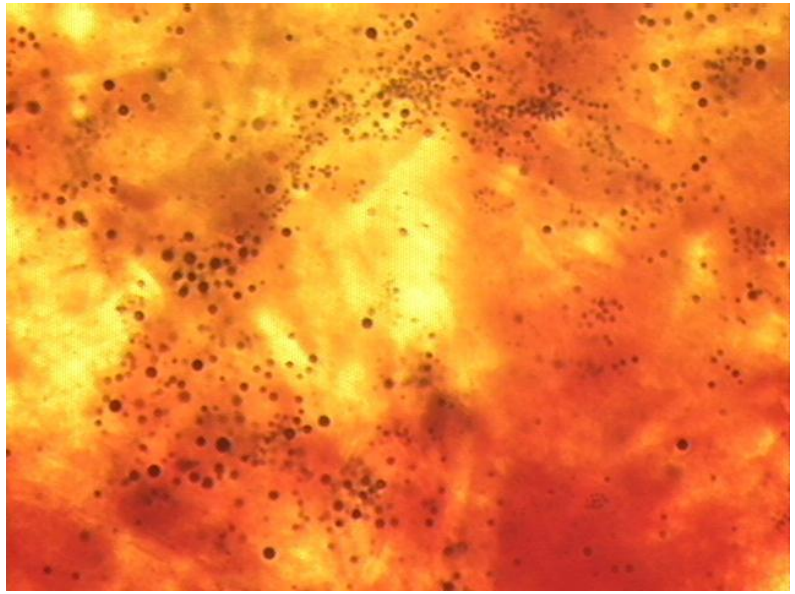
- 2005-2007
- Used as an outlier site to compare to long term CERP trends in Loxahatchee River, St. Lucie Estuary, Lake Worth Lagoon, and Biscayne Bay
  - Sebastian River, Mosquito Lagoon, Tampa Bay
- 3 stations
  - Pinellas Point, Skyway, Fort DeSoto

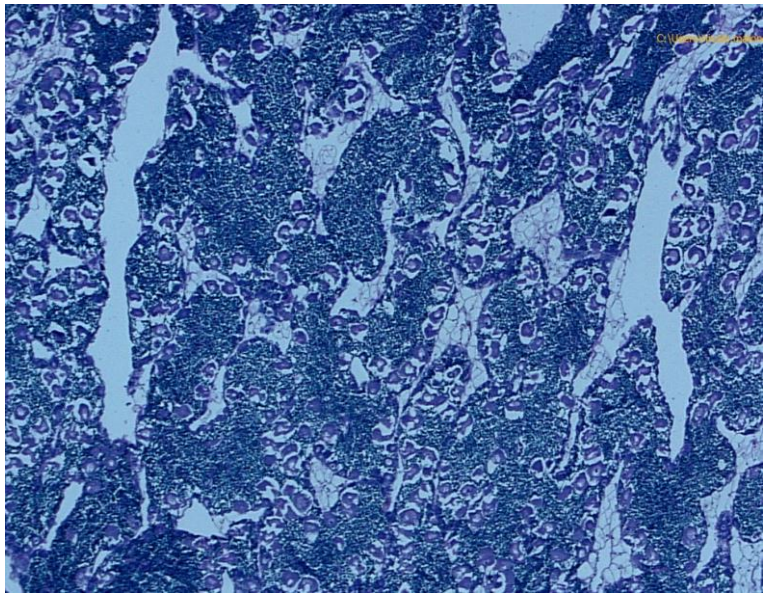


State monitoring

- 2016-present
- Added 2 more stations:
  - Gulfport
  - Weedon Island
- 5 total monitoring stations

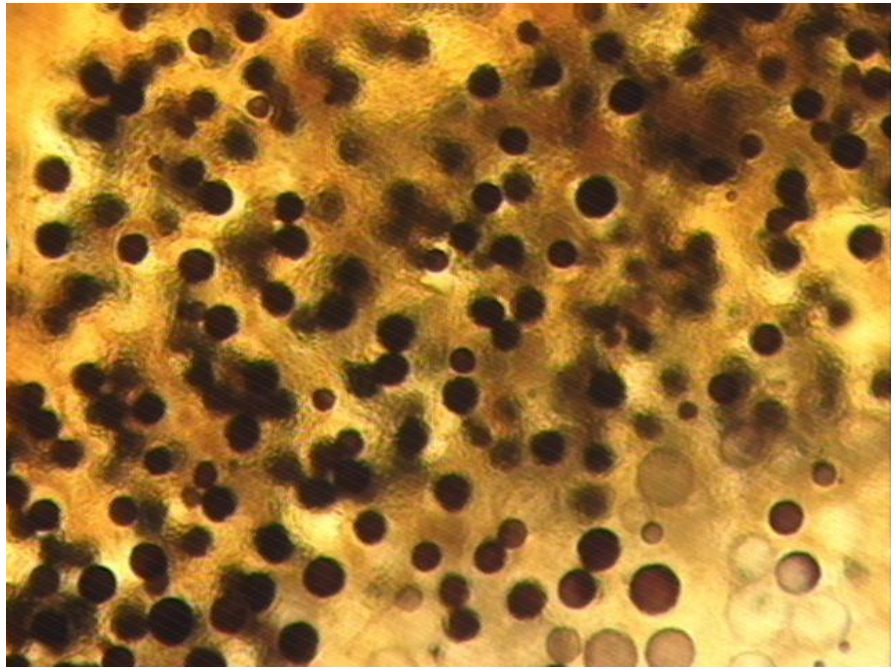






Dermo disease and reproduction

- Live oysters collected monthly
  - Gonadal development
  - Prevalence and intensity of oyster disease *Perkinsus marinus* (dermo)



Dermo disease

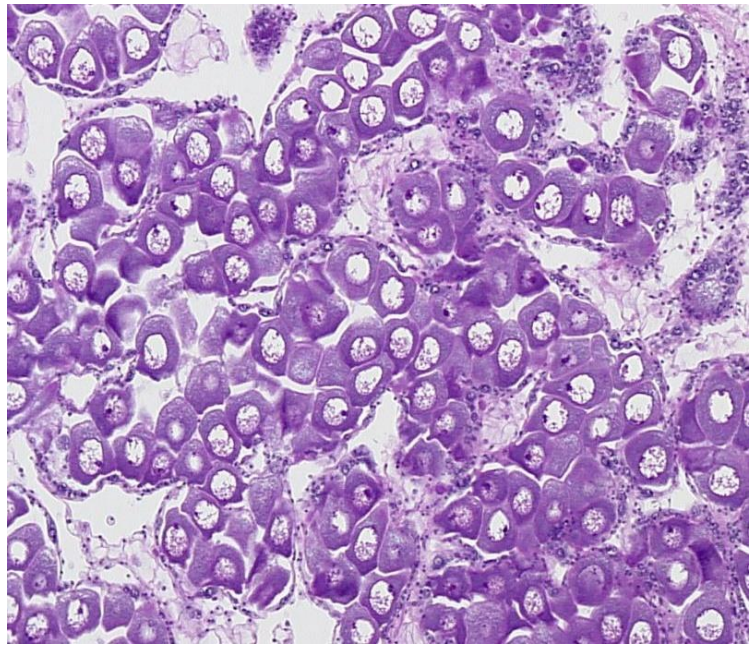
- Parasite density (infection intensity) was ranked according to the Mackin scale (Mackin 1962).
- Mean infection intensity and the percentage of infected oysters for each station
- Oysters in TB typically have moderate to moderately high rates of dermo prevalence

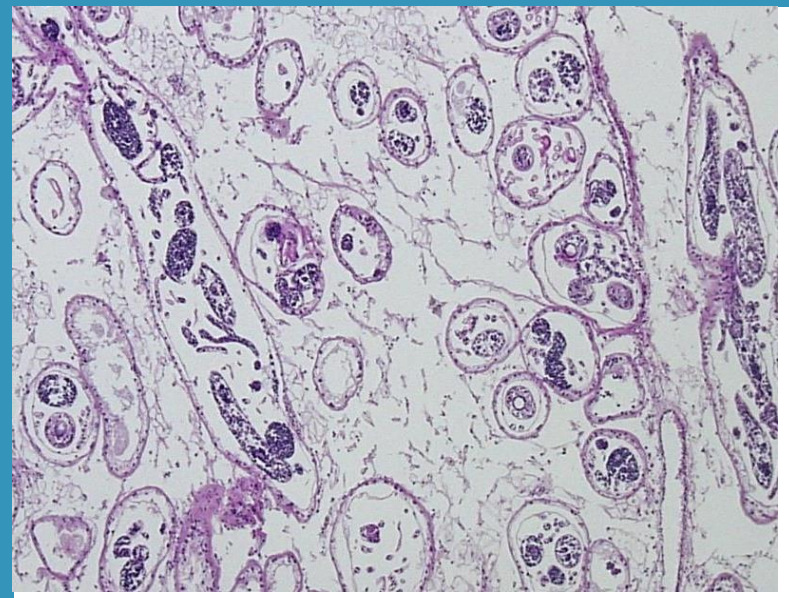
Stage	Category	Number of cells
0	Uninfected	None detected
0.5	Very light	<10
1	Light	11–100 cells
2	Light to moderate	Local concentrations of 24–50 cells
3	Moderate	3 cells in all fields at 100×
4	Moderate heavy	High numbers in all tissues
5	Heavy	Enormous numbers

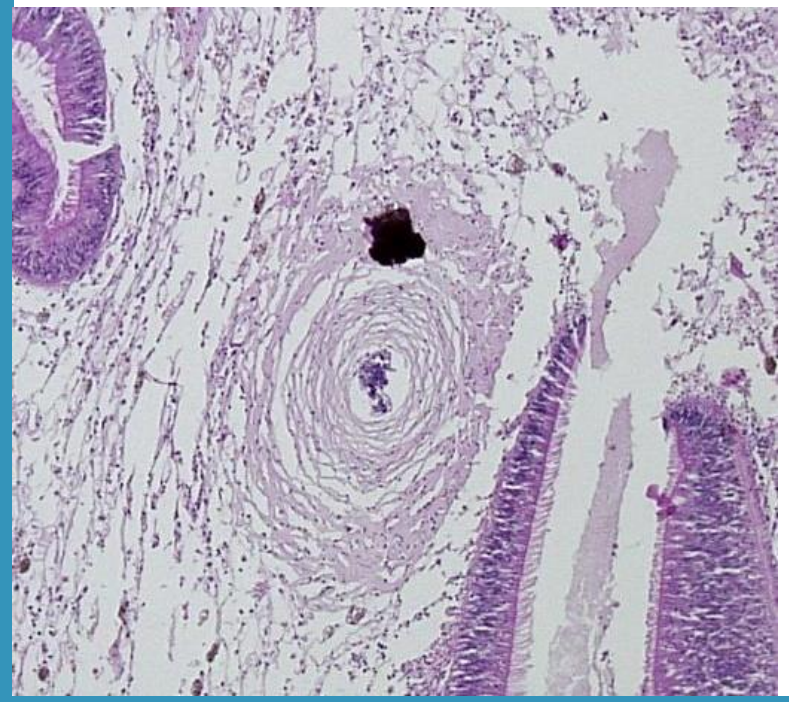
Reproductive development

- Remaining tissue of each oyster preserved for histological determination of reproductive development stage
- Classification scheme modified from Fisher et al (1996)

Value	Stage	Observations
1	Developing	Gametogenesis has begun immature gametes located on follicle walls mature gametes may be present
2	Ripe/Spawning	Follicles distended and full of ripe gametes ova compact/sperm with visible tails no immature gametes on follicle walls active spawning, but less than 2/3 depleted
3	Spent/Recycling	Most gametes evacuated from the follicles more than 2/3 depleted
4	Indifferent	Gonads devoid of gametes, cytolysis ongoing







Reproductive development

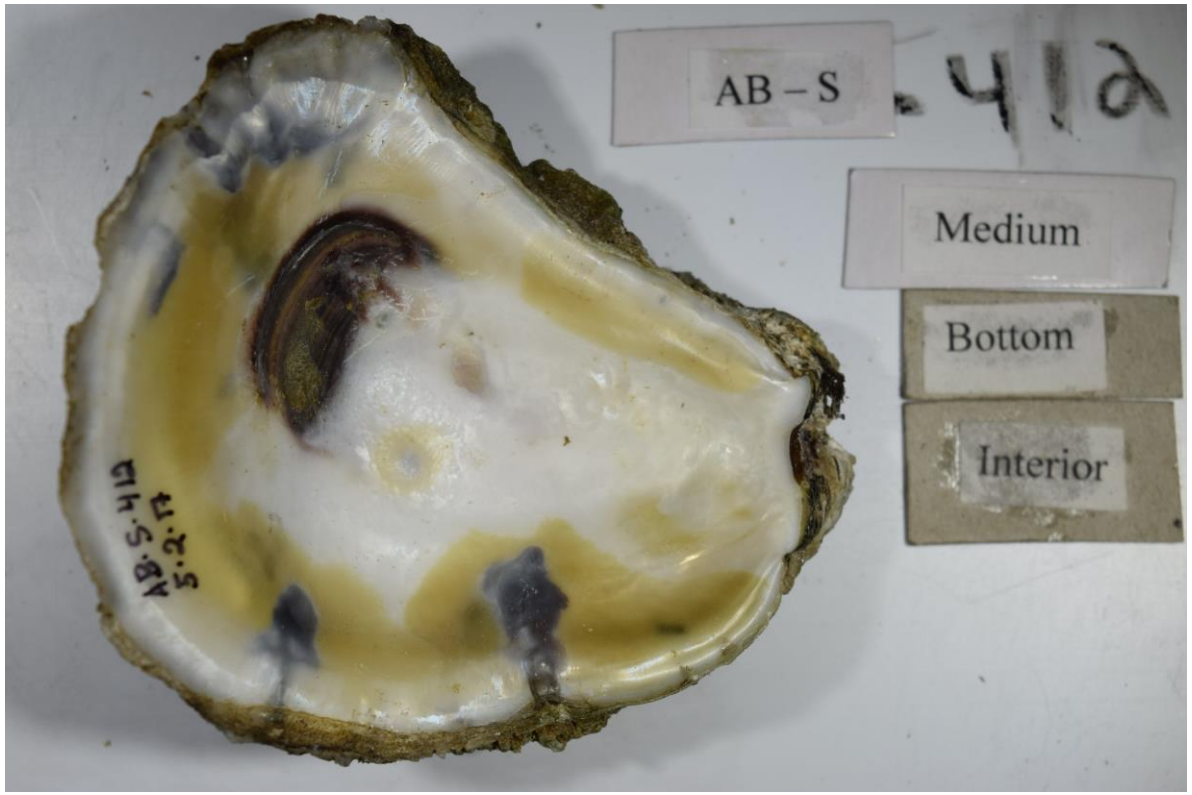
- Monthly means of reproductive development stages
- Warmer water temps coincide with spawning
  - Cooler months with dormant and recovering stage
- Higher prevalence of parasites (*Bucephalus polymorphus*, trematodes, nematodes, etc.) when compared to CERP sites
- Parasitic prevalence calculated as the percentage of oysters infected, regardless of infection level.

Condition index

- Additional live oysters collected monthly for condition index (CI) and shell pest analysis
- CI can be used as an indicator of oyster health
- By comparing the dry meat weight of the animal to the interior volume of the shell
  - When there is more tissue occupying the space inside the shell there will be a higher indices value.

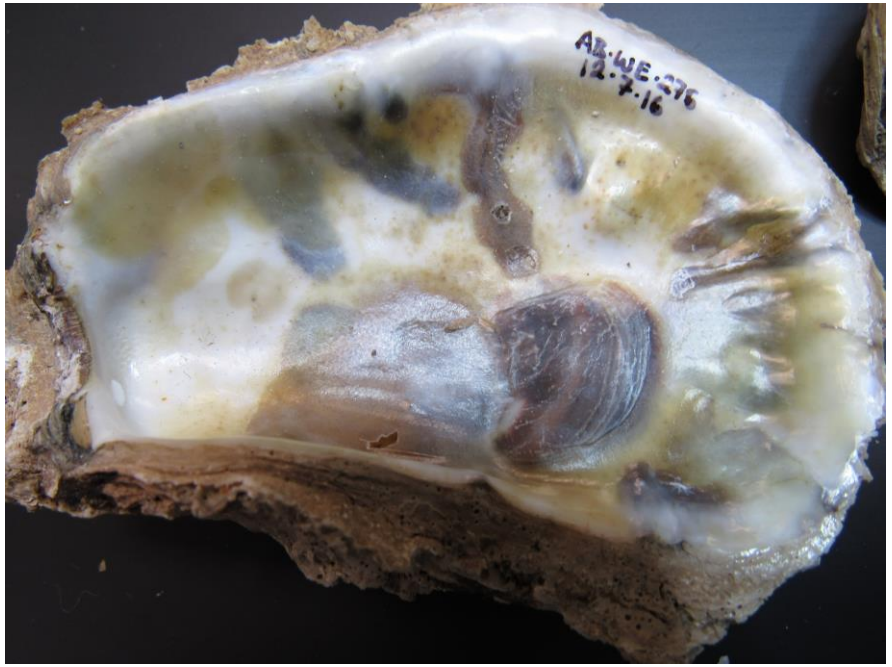
Shell Pests

- January 2016 – March 2022
- Use samples from condition index
- Started as a qualitative and quantitative analysis
- 2018 developed an SOP to analyze shell pest damage using image analysis software Image Pro Premier



Shell Pests

- Using shells as guide, pest damage is measured in program
- 2 out of 5 stations typically have higher pest percent damage than the other three stations
  - Weedon island and Fort DeSoto
- Higher salinities and temperatures are favorable for most pests



Recruitment

- 3 replicate spat monitoring arrays deployed and retrieved monthly at all stations
- Retrieved shells taken back to lab, where each shell is examined for oyster spat and counted when seen

Recruitment

- Data from top of first shell and bottom of last shell not analyzed to account for predation, wave action, sedimentation, algae cover, etc.
- Weedon typically has higher spat count each month when compared to other stations in TB
  - Closer to freshwater input which can keep salinities closer to optimal rather than the other 4 consistently saline stations

Density and Shell Height

- Surveyed biannually
  - March and September
- 15 replicate ¼-m^2 quadrats are haphazardly deployed
- Volumetric and weight measurements
  - Each quadrat is placed in a tared bucket and weighed
  - Volume of each quadrat
- Shell Height
  - Maximum of 50 live oyster shell heights (umbo to vertical shell margin) measured per quadrat

Density and Shell Height

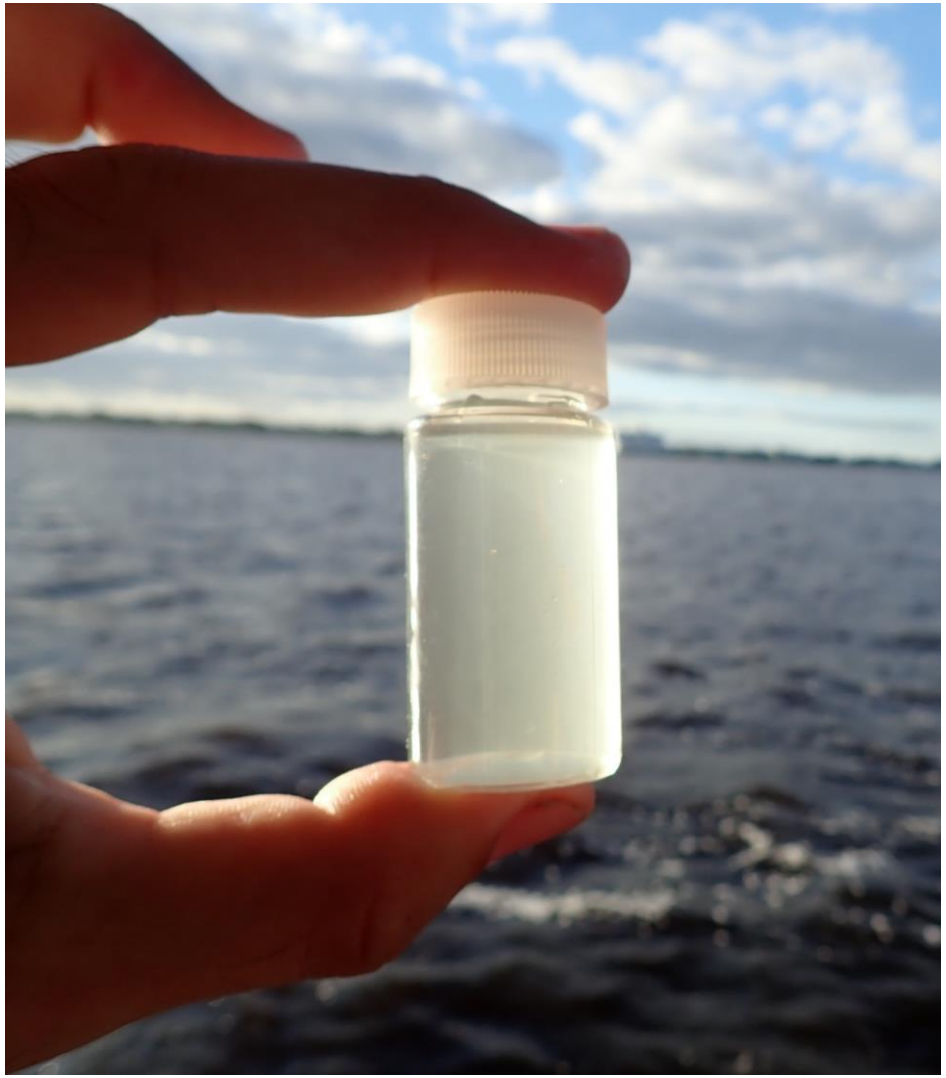
- All live and dead oysters (articulated shells) counted
- Total live and dead per station, and proportion of dead oysters to total number of live and dead oysters
- Mean SH per station each survey

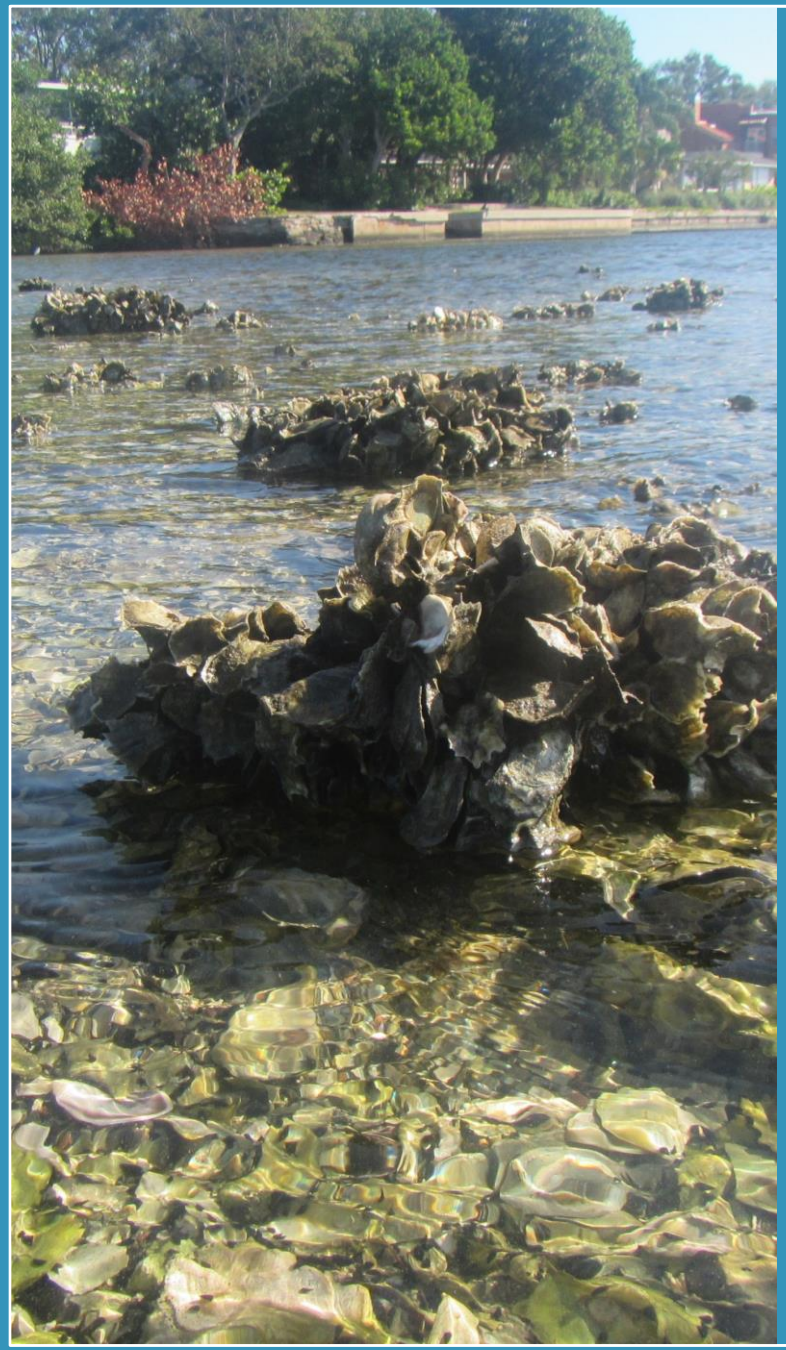
Density and Shell Height

- Fort DeSoto die off
  - Has not really come back
  - Little substrate, high salinities, lots of pests and predators, on top of all this – macroalgae exacerbated by most recent red tide
- Weedon has had several die offs but can usually recover well enough

Water quality

- Salinity, temperature, pH, DO, Secchi, and turbidity
- Salinities are not as variable as some of the EC CERP sites can be
- DO, Secchi, and turbidity can be variable during the summer months





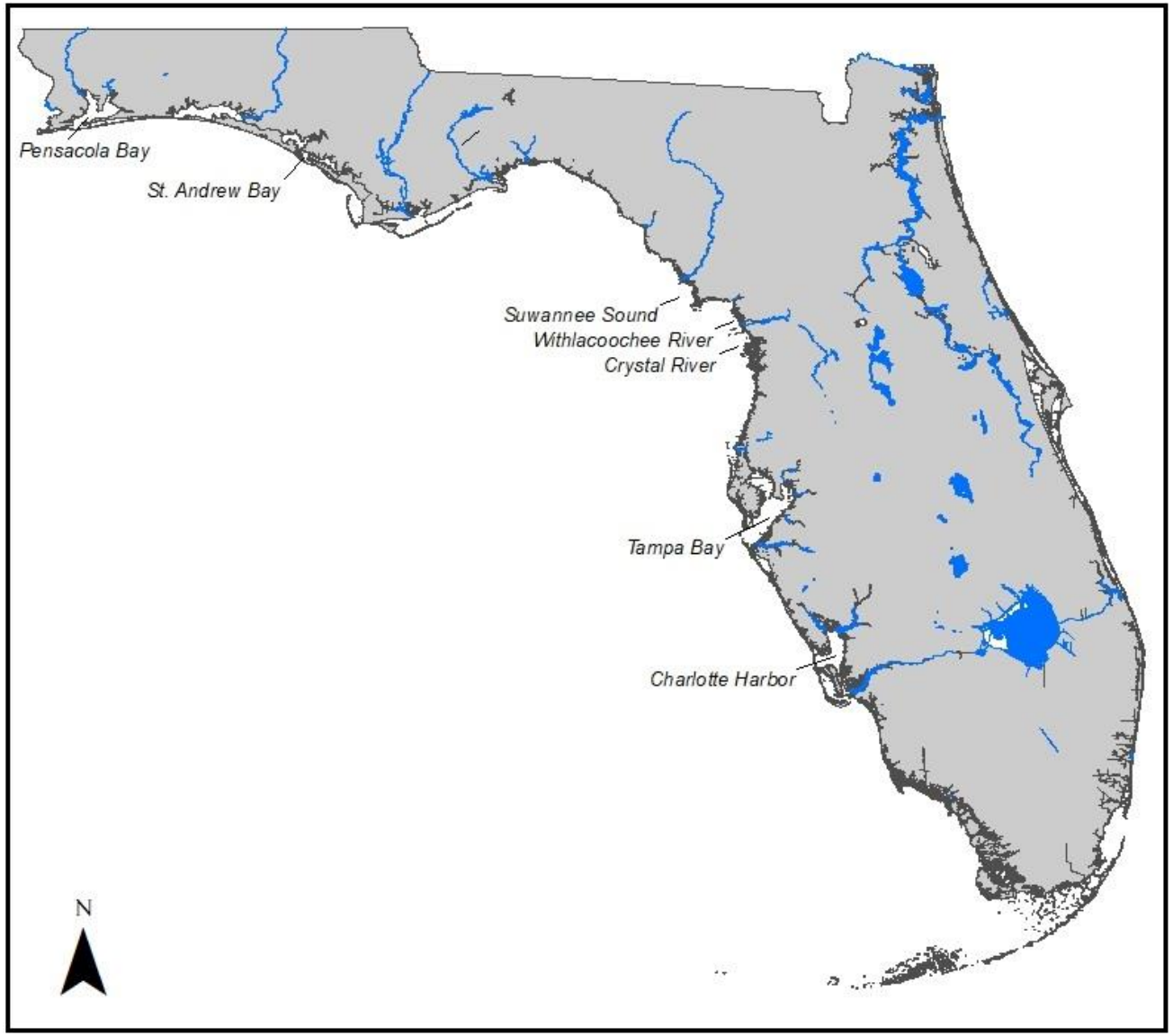
Future projects for TB

- Analyze dataset!
- TIG (Trustee Implementation Group)

TIG

Six study sites in Florida:

- Pensacola Bay and St. Andrew Bay in the Panhandle region
- Suwannee Sound and the Withlacoochee/ Crystal River area in the North Peninsular region
- Tampa Bay and Charlotte Harbor in the South Peninsular region*

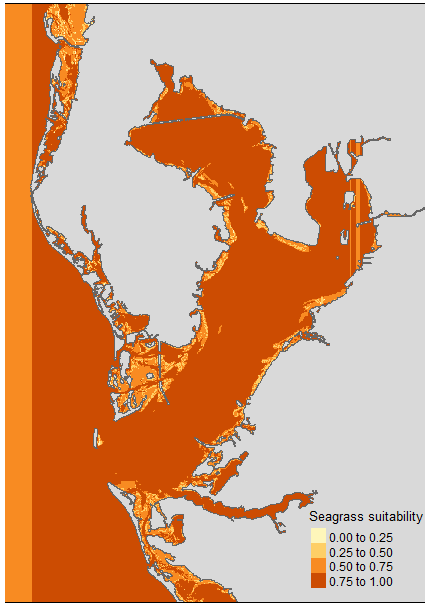


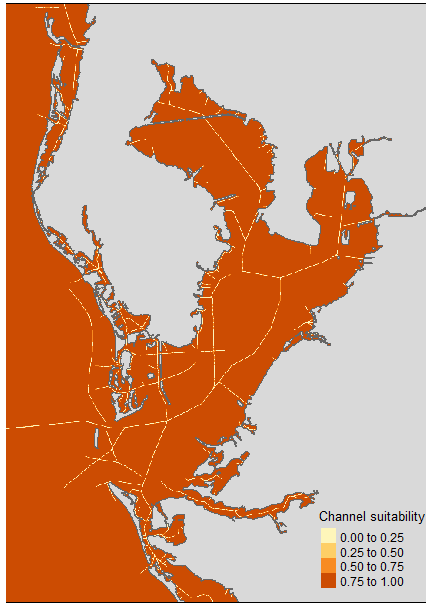
TIG

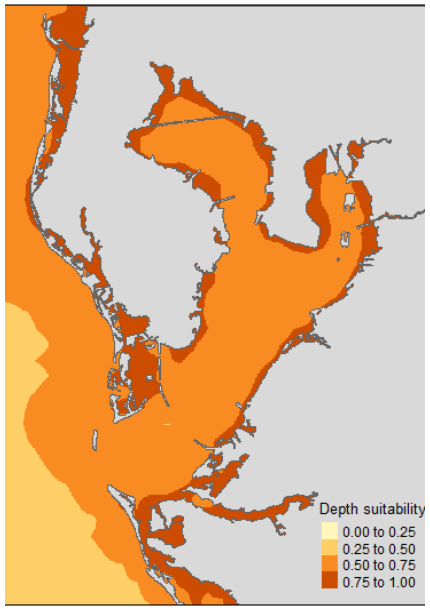
- Task 1 – data compilation
- Task 2 – benthic mapping
  - Qualitative surveys by poling or probing from a boat to determine general benthic compositions.
- Task 3 – field assessment and monitoring
  - Stratified random survey of oysters conducted to determine oyster density and size distribution
  - Monitoring chosen stations within sites
- Task 4 – HSI model –
  - Once the model is created, data collected during mapping efforts and oyster density surveys will be used to verify the validity of the model.

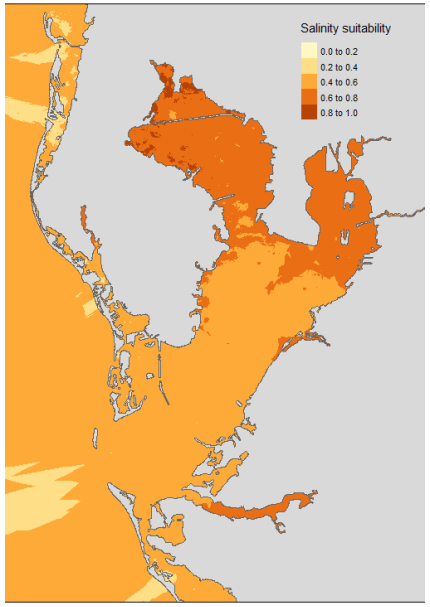
HSI model

- GIS-based habitat suitability index (HSI)
- Conducting habitat suitability analyses to identify optimal oyster restoration locations along the Florida Gulf coast using existing water quality and oyster data from cooperating agencies
- HSI score ranging from 0 (unsuitable) to 1 (optimal)



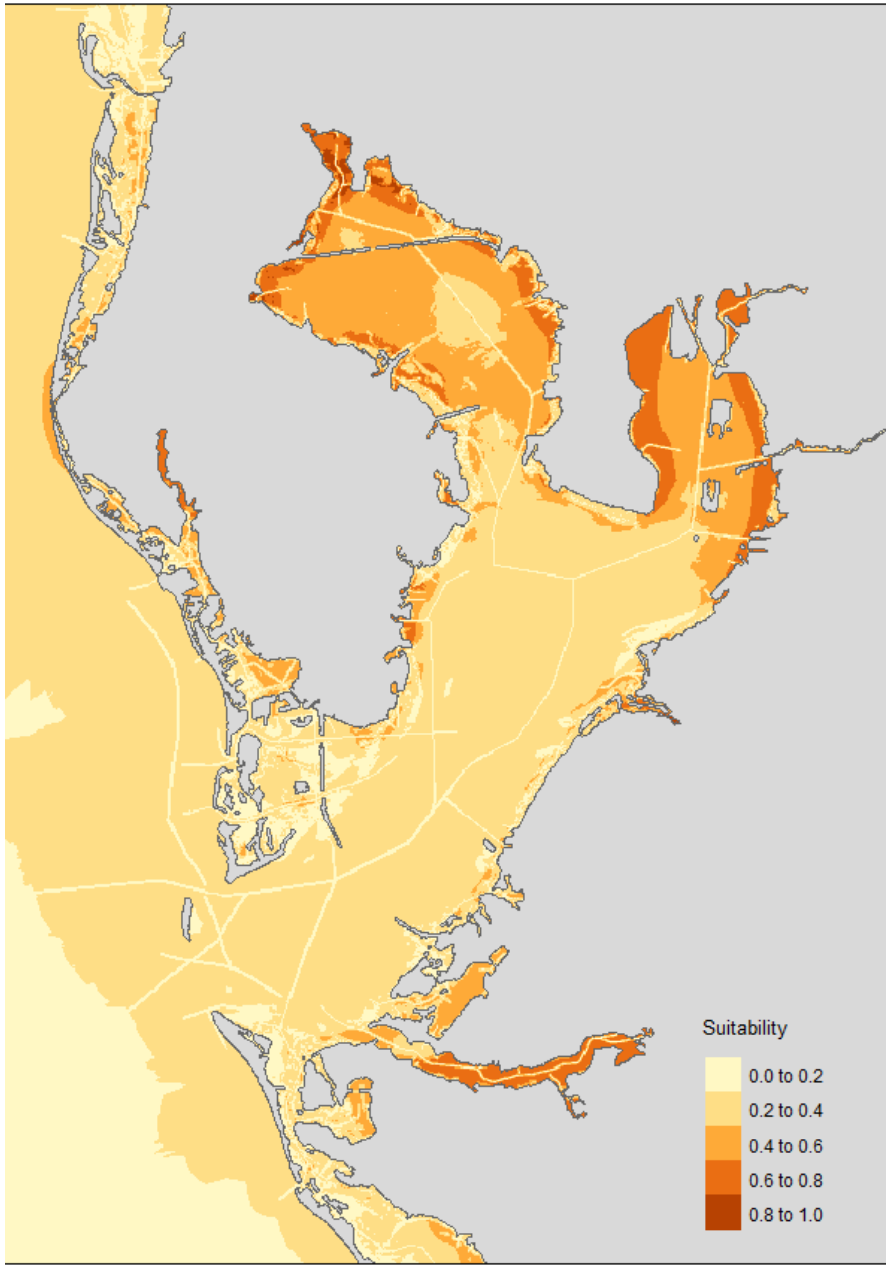






TB location suitability

- Habitat suitability = seagrass SIV * channel SIV * depth SIV * salinity SIV



THANK YOU!

QUESTIONS?