Restoring Coastal Alabama: Different Approaches for Different Needs

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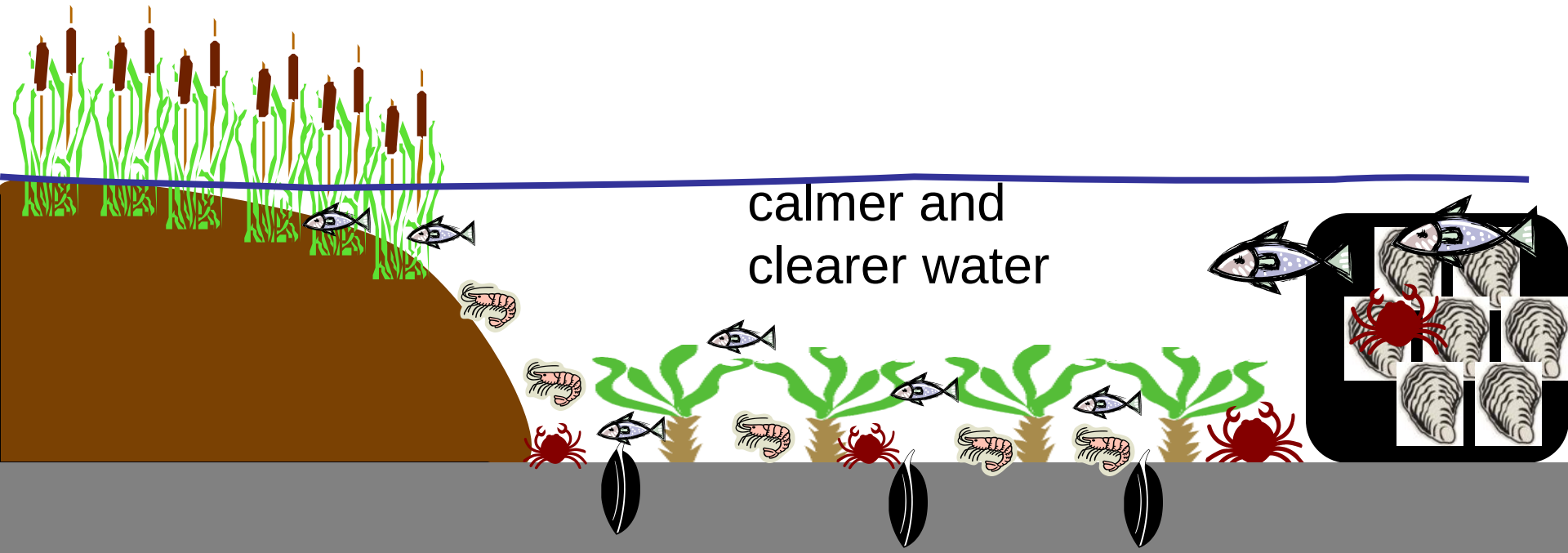
We are losing precious habitat…

- Abundant refuge and food
- Coastal builders
- Filters of land-derived nutrients
- Carbon sinks

How can restore these precious habitats in cost-effective ways…or how can we get “the most bang for the buck”?

What improvements could we expect as we build oyster reefs (subtidal breakwaters)?




Helen Wood Park
Northeast Point aux Pins
Alabama Port
South Point aux Pins
Coffee Island

Marshes

low/high marsh

floral zonation

Spartina density, morphology,biomass and nutrient storage

nutrients in sediment

nekton and infauna

Shoreline

accrual/erosion

Submerged habitat

water-column

suspended solids
particulate organic matter
phytoplankton
nutrients
transparency

bottom

granulometry
particulate organic matter
nutrients
benthic microalgae
seagrass
infauna

Fisheries

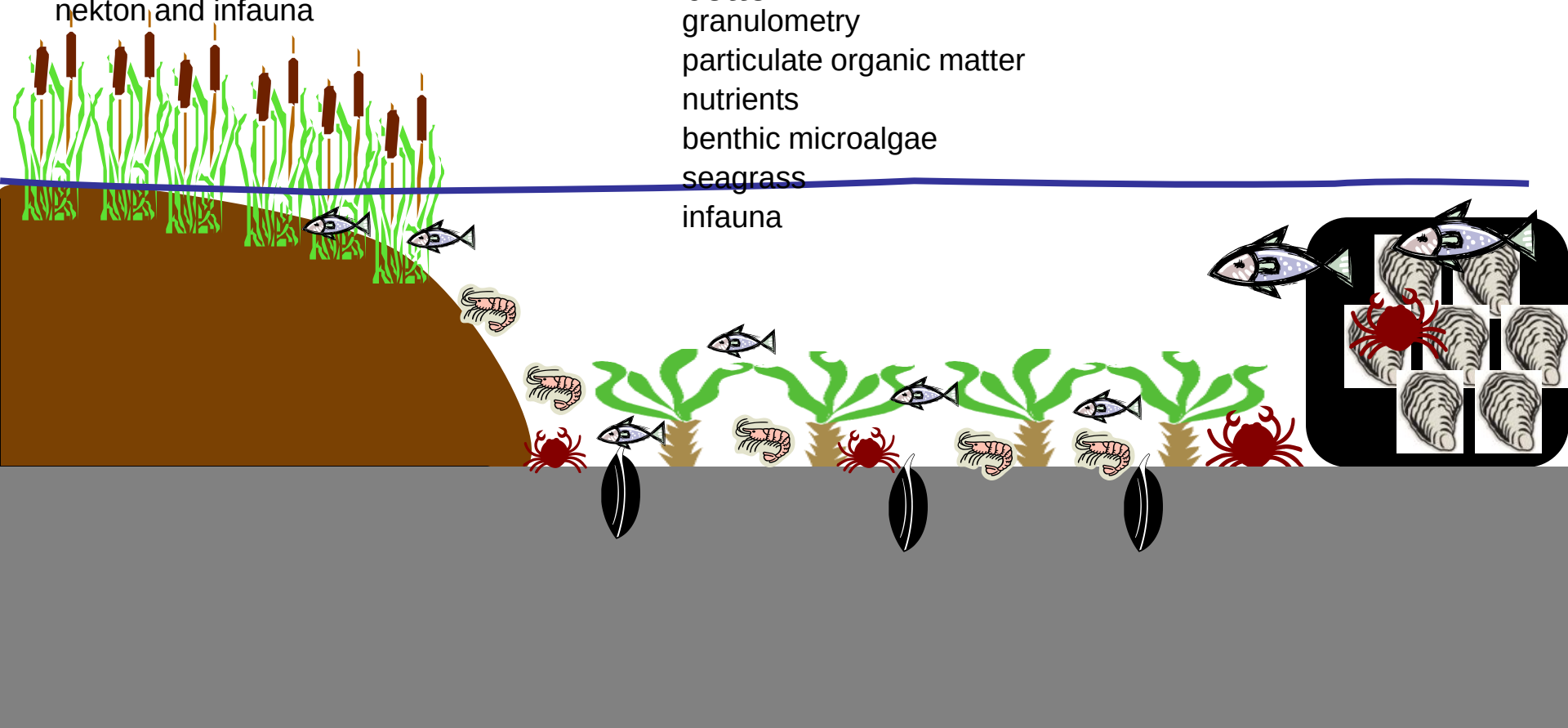
gillnetting

seining

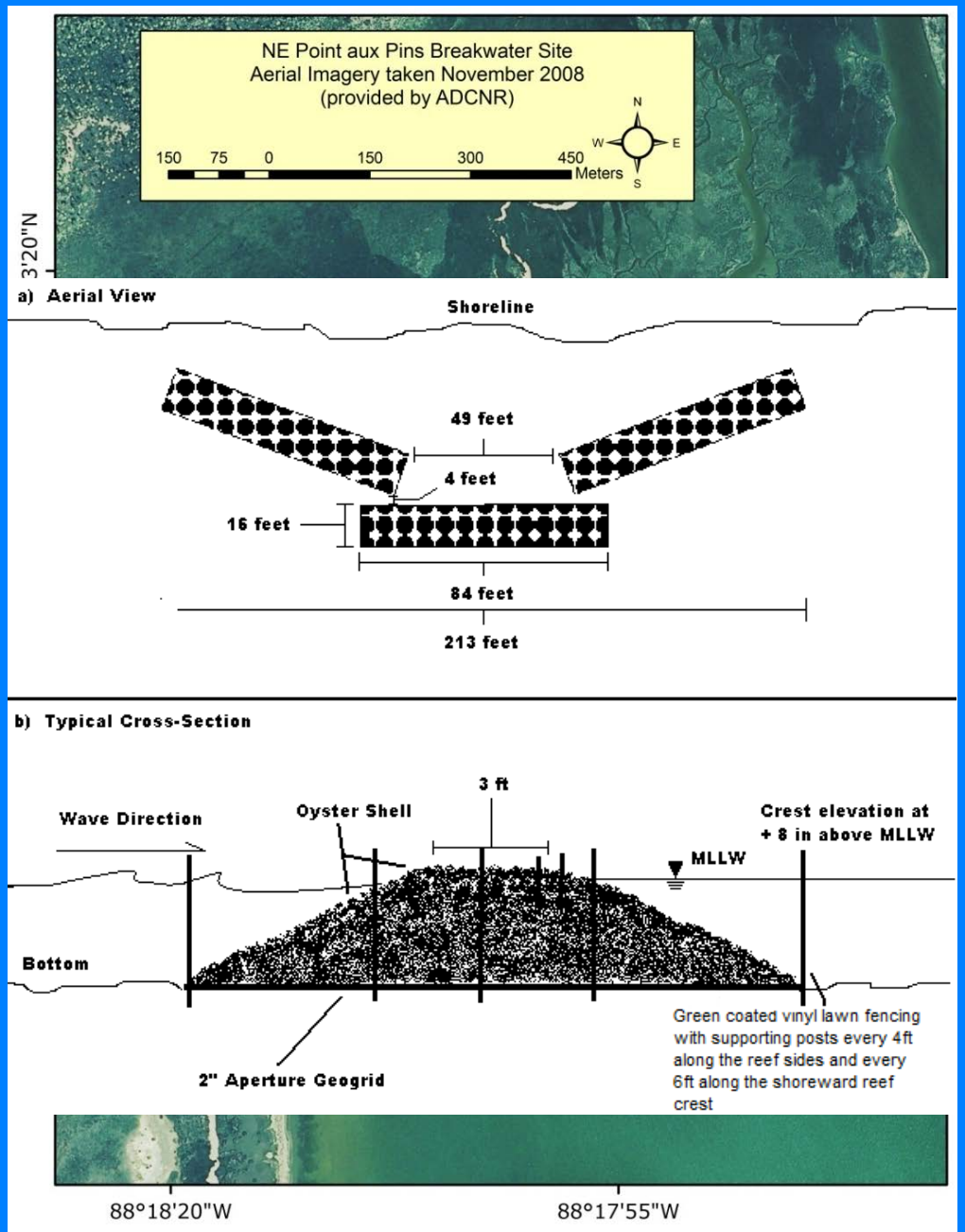
Reefs

footprint

oyster recruitment

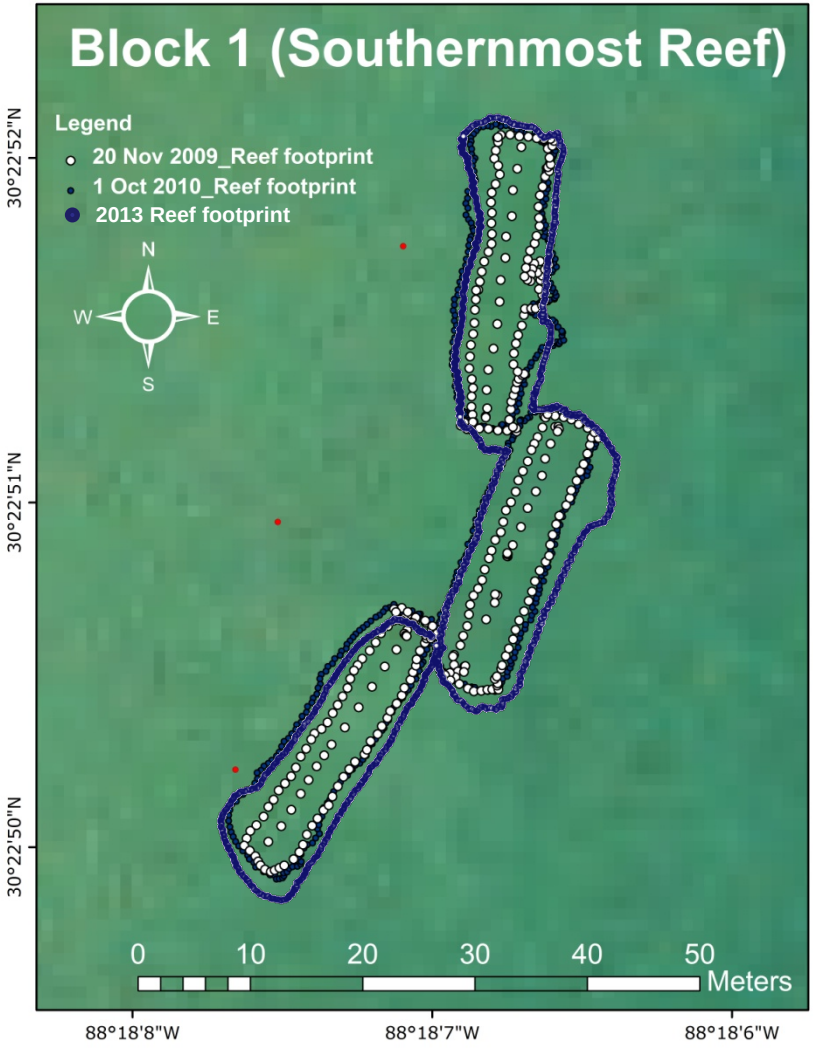


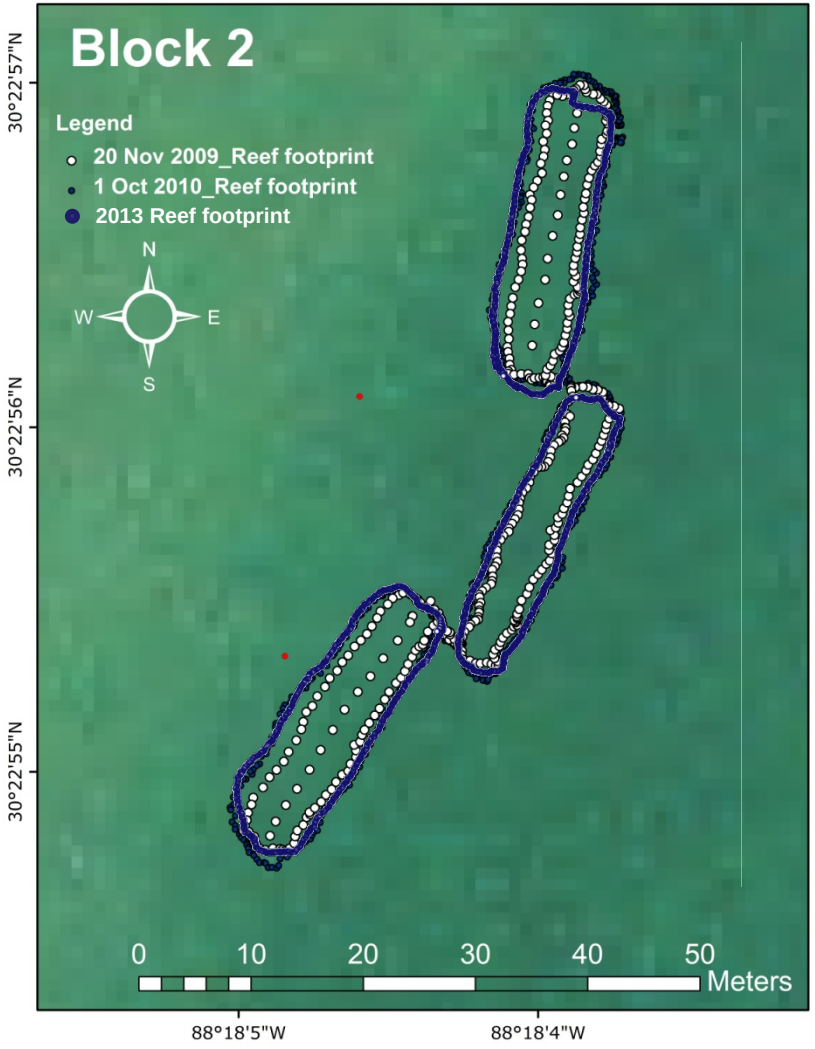
Northeast Point aux Pins



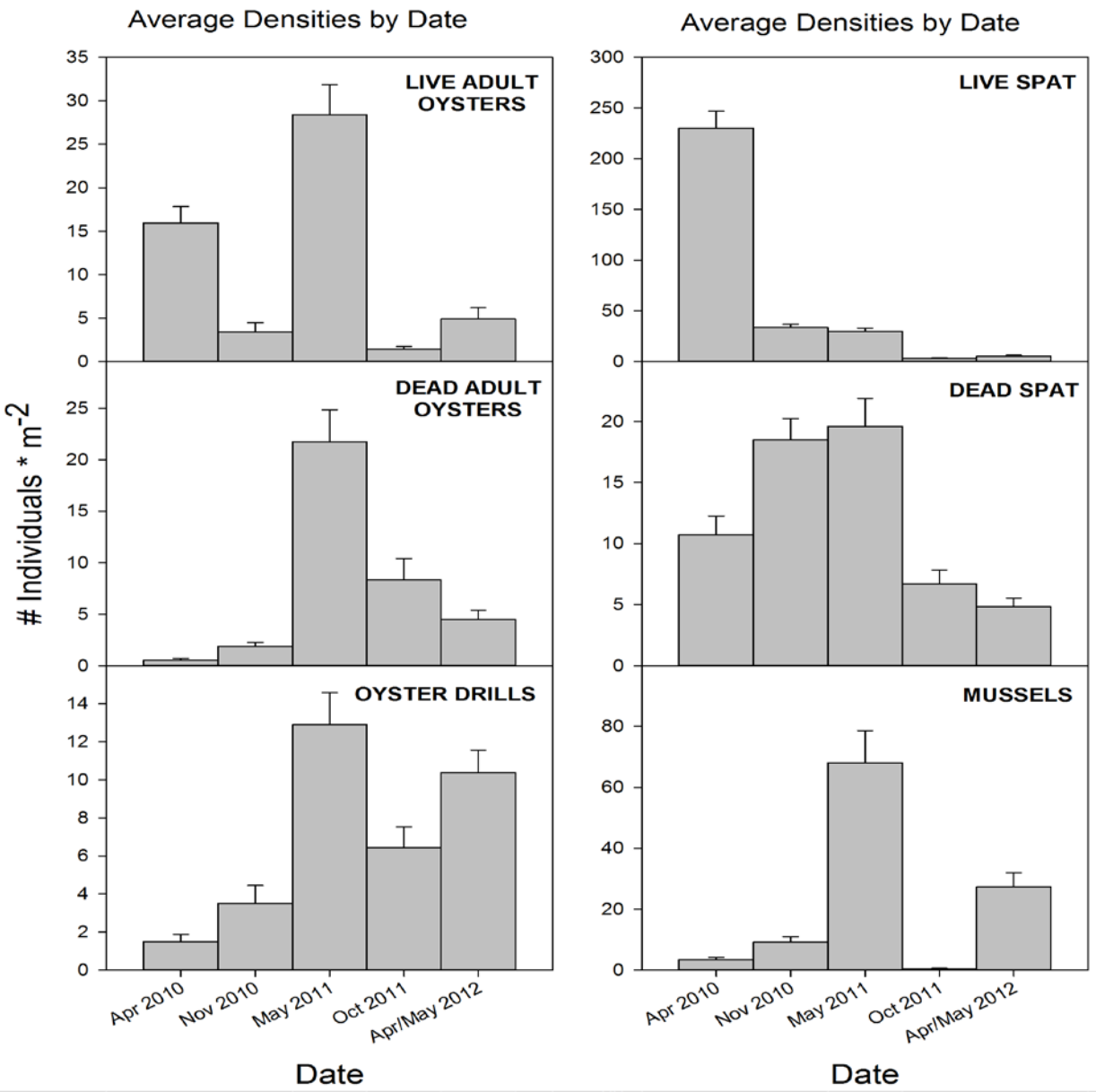
Loose Shell Aggregate: South and Northeast Point aux Pins

Reef footprint



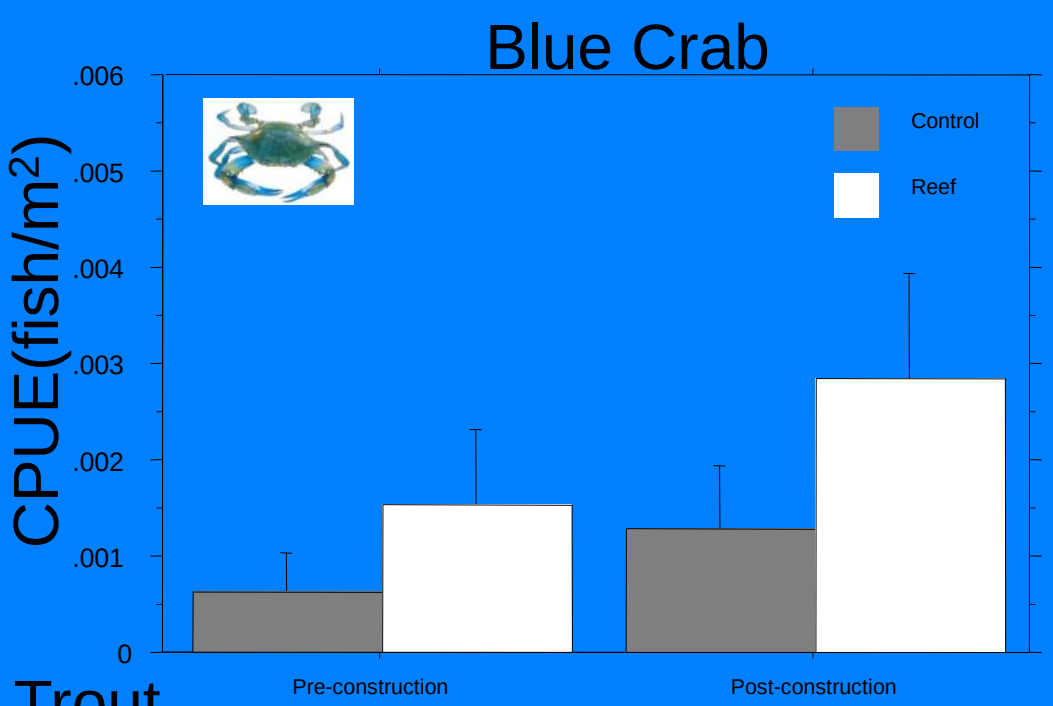


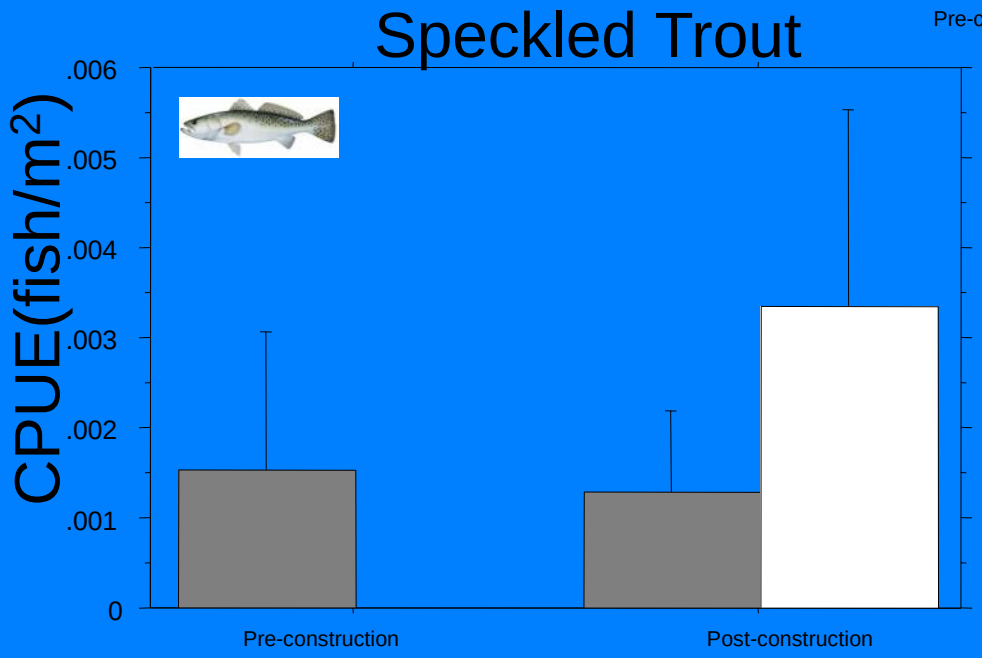
Oyster density



Seine Abundance

Positive impact on some economically important species



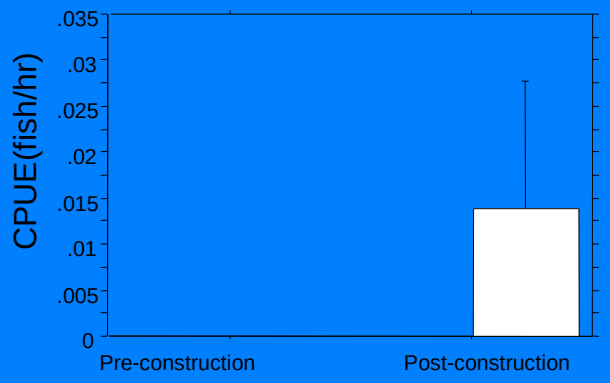


4” Gillnet Abundance

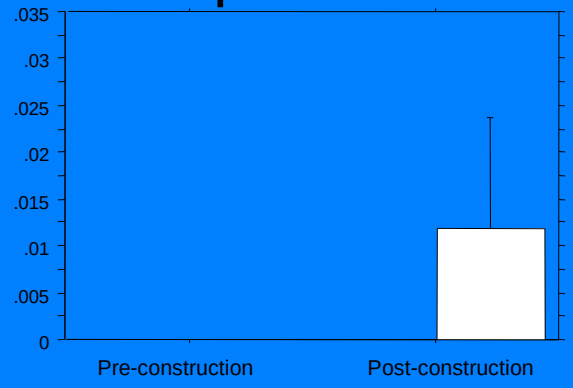
Positive impact on some economically important species

Speckled Trout

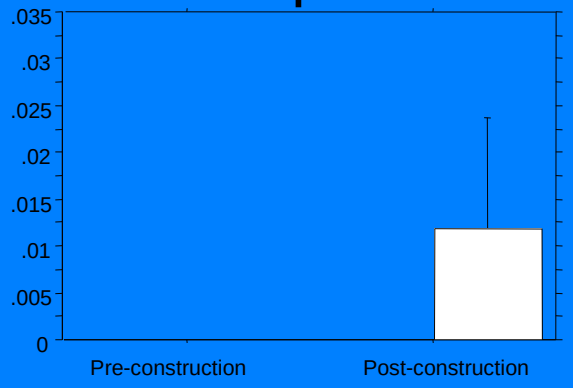
Silver Perch



Striped Mullet



Sheepshead

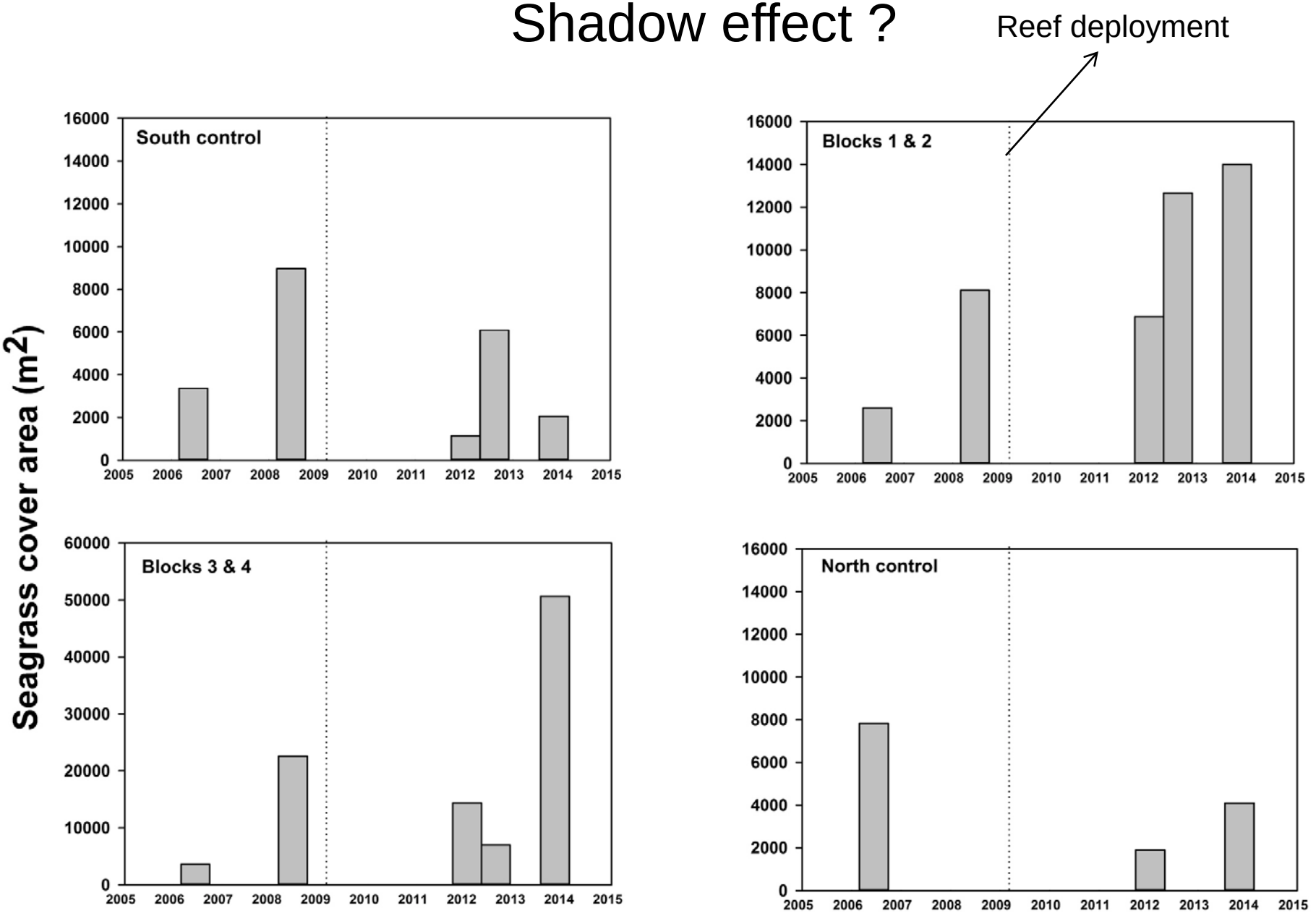


Water quality and seagrasses

When comparing reef vs. control plots:

- No significant impact on water clarity (light penetration) and quality (TSS, POM, chlorophyll and nutrients)
- No significant effect on seagrass abundance and growth

Shadow effect ?



Shoreline and Marshes

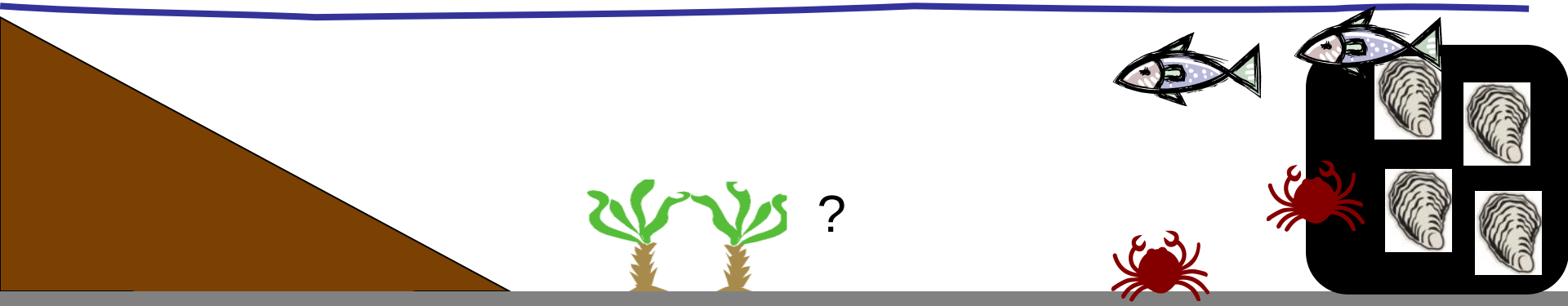
No promoted values in reef vs. control plots after reef deployment: sustained erosion across experimental area

↓

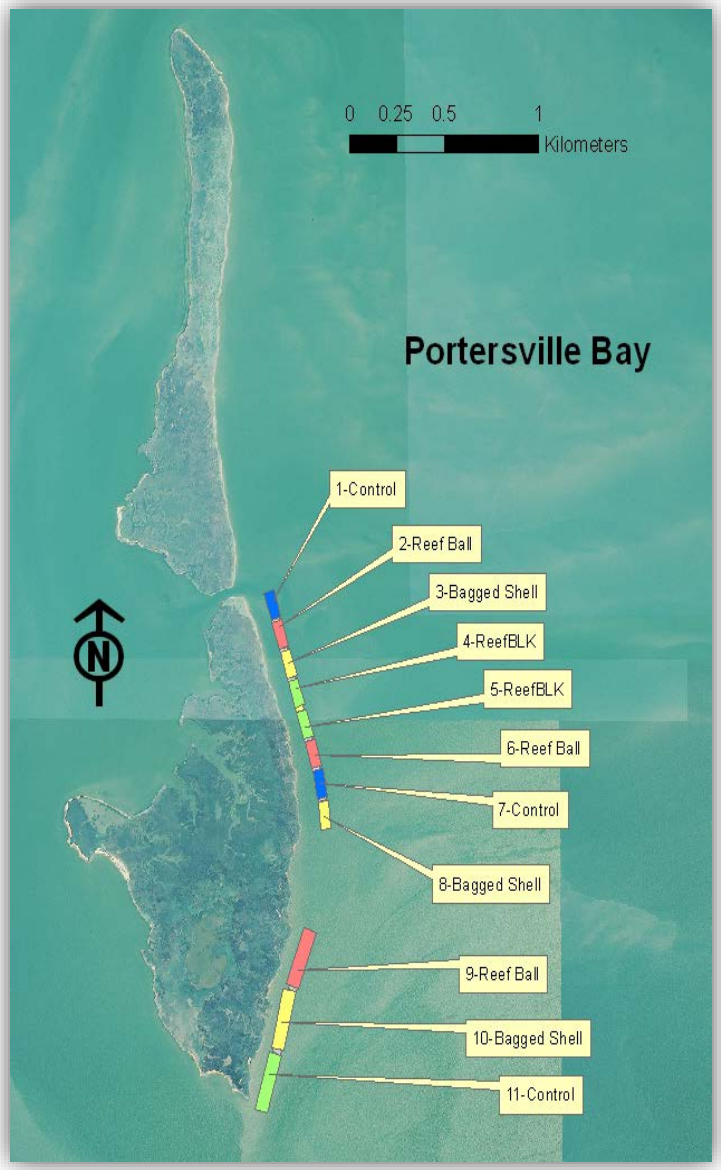
need to look for evidence of shadow effects

Are the subtidal breakwaters at Northeast Point aux Pins working as expected?

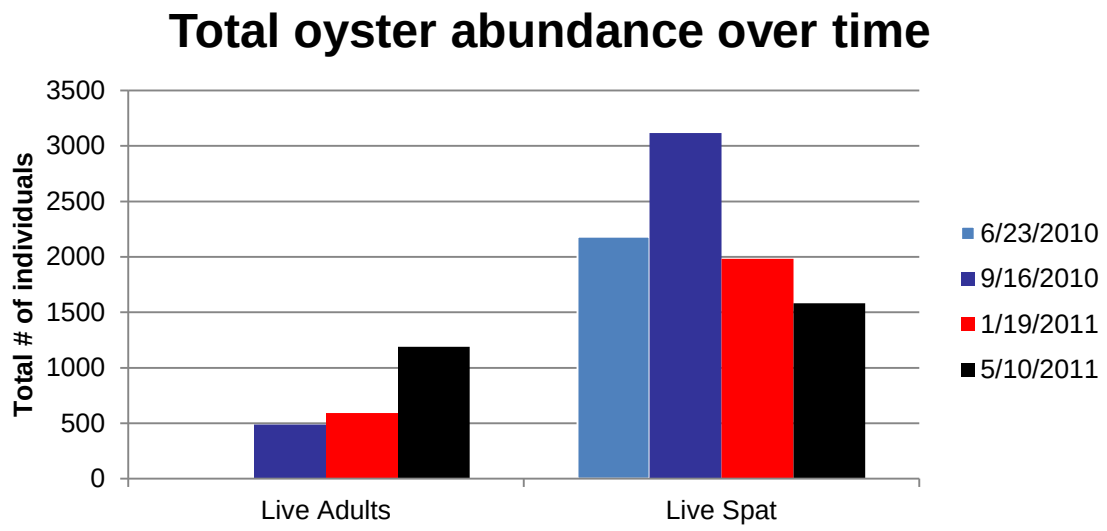
they do for fisheries, perhaps for water quality and seagrasses, but thus far no evidence for shoreline erosion and marshes

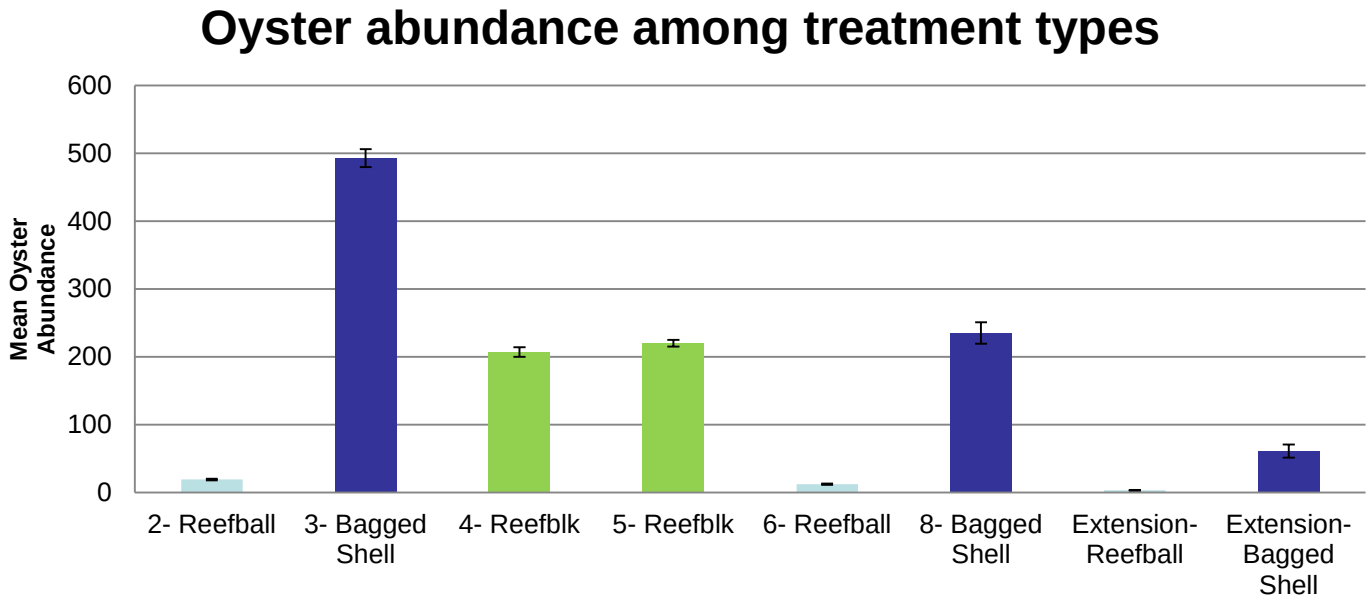


Coffee Island

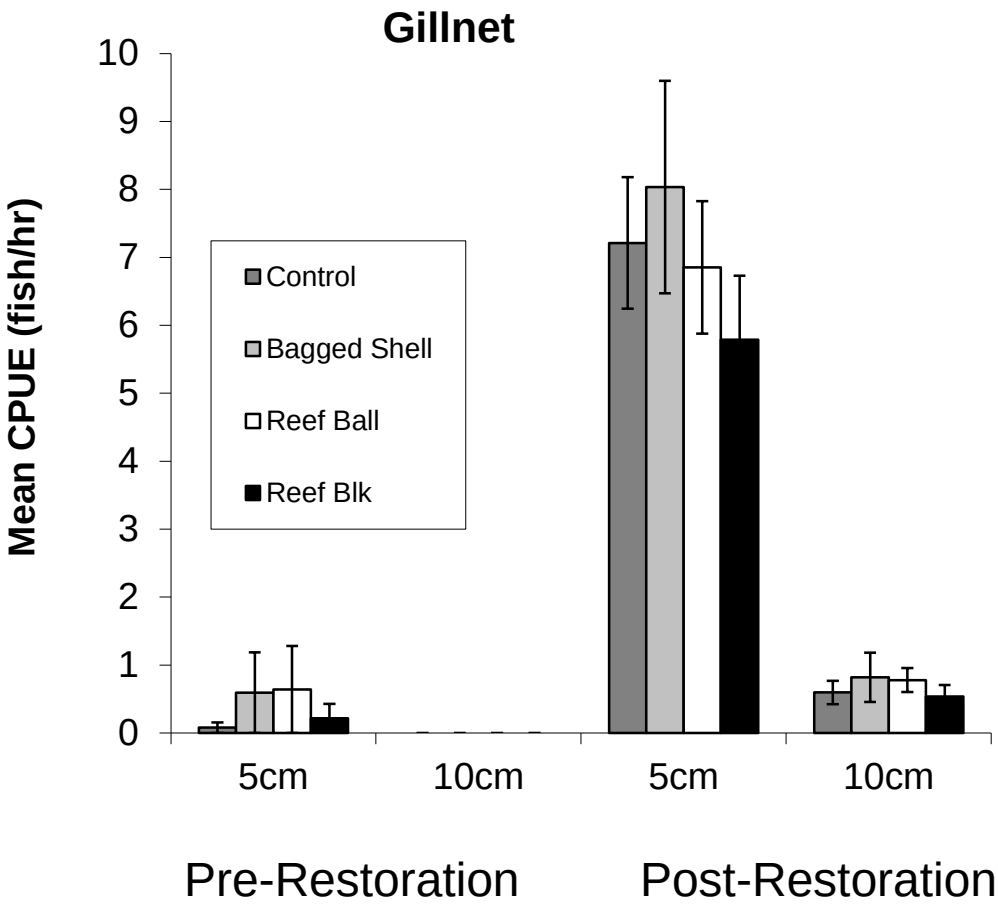


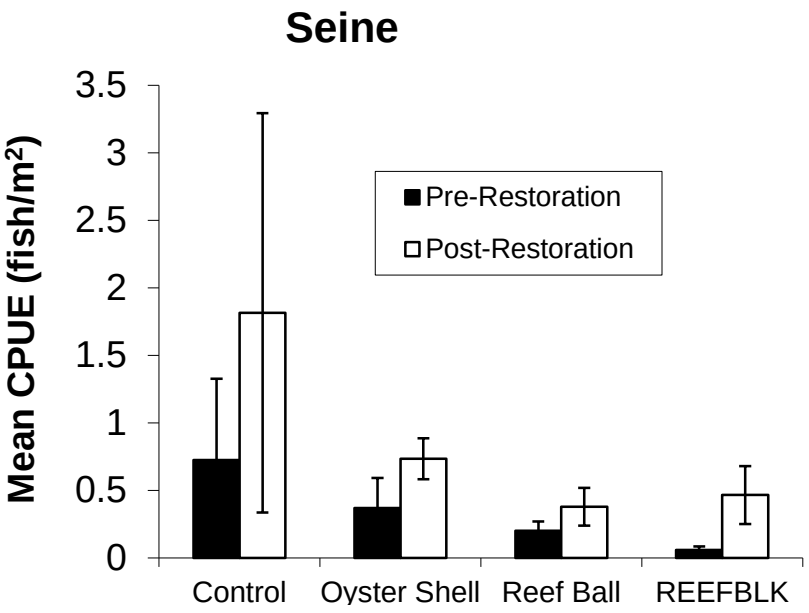
Oyster abundance





Fisheries


Gillnet
Mean CPUE (fish/hr)
10
9
8
7
6
5
4
3
2
1
0
Control
Bagged Shell
Reef Ball
Reef Blk
5cm
10cm
5cm
10cm
Pre-Restoration
Post-Restoration


Seine
Mean CPUE (fish/m²)
3.5
3
2.5
2
1.5
1
0.5
0
Pre-Restoration
Post-Restoration
Control
Oyster Shell
Reef Ball
REEFBLK

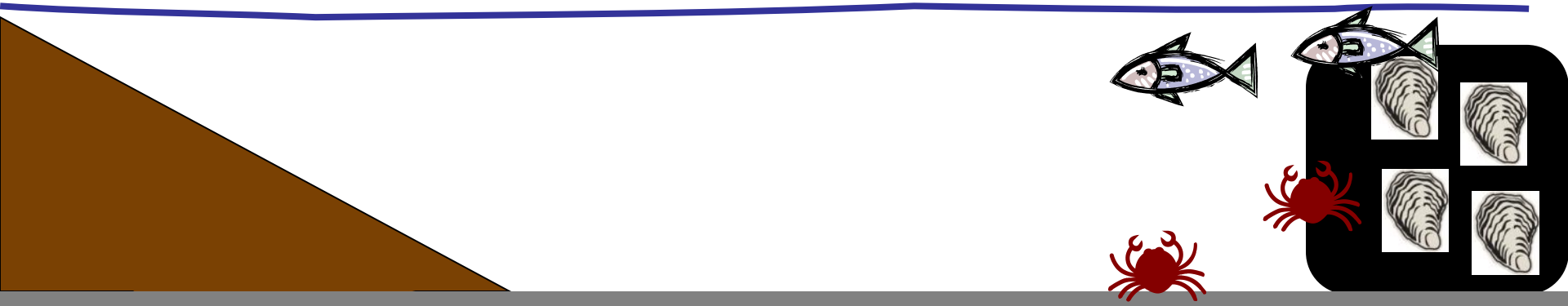
Water quality, seagrass, shoreline and marshes

No promoted values in reef vs. control plots after reef deployment → need to look for evidence of shadow effects

Are the subtidal breakwaters at Coffee Island working as expected?

they do for fisheries, but thus far no evidence for water quality, seagrasses, shoreline erosion and marshes

and this is also the case the other sites with subtidal reefs: South Point aux Pins, Alabama Port and Helen Wood Park

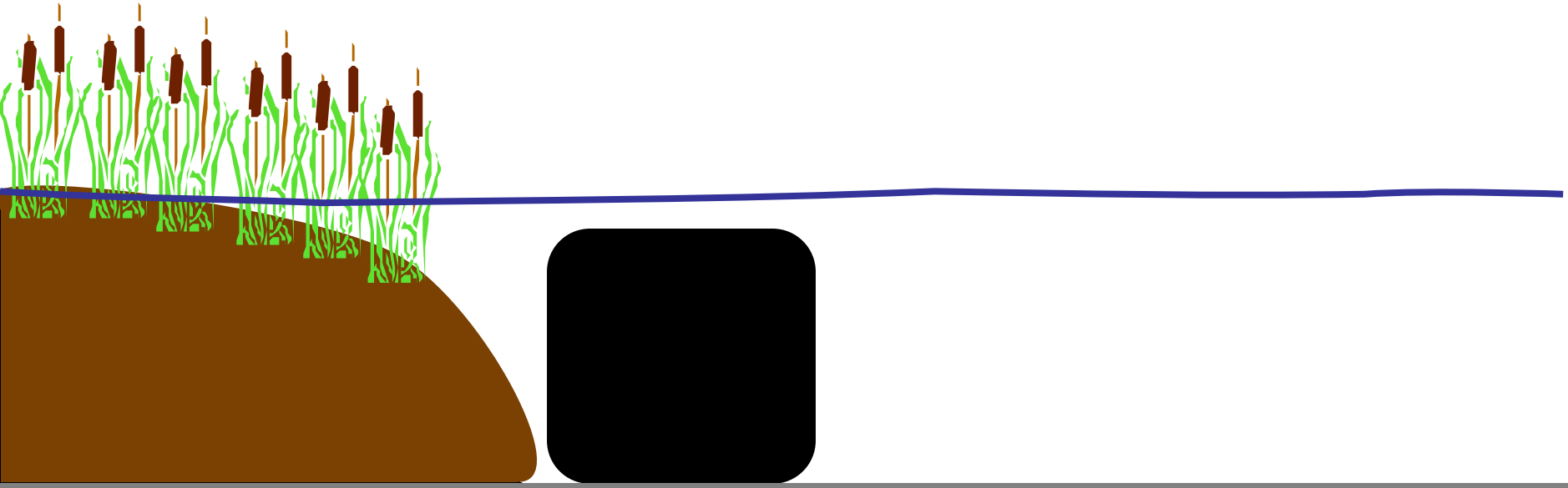


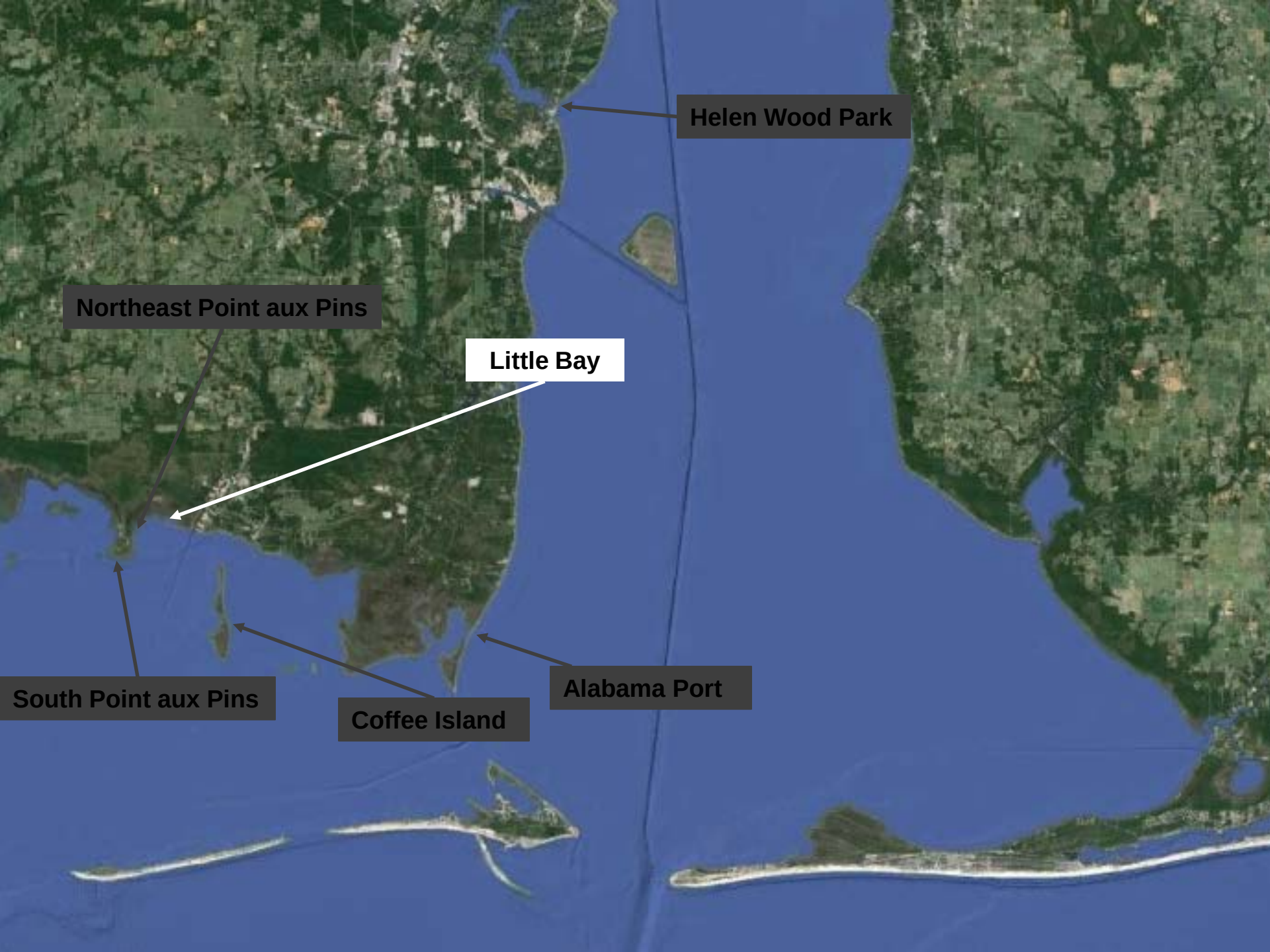
So the **subtidal reefs** deployed in all of these projects do definitely enhance fisheries. There is potential evidence they may also enhance water quality, seagrass, shorelines and marshes, but more work is needed for conclusive results

An alternative approach: breakwaters right by the shoreline

Marshes	Shoreline	Breakwater
low/high marsh	accrual/erosion	oyster recruitment

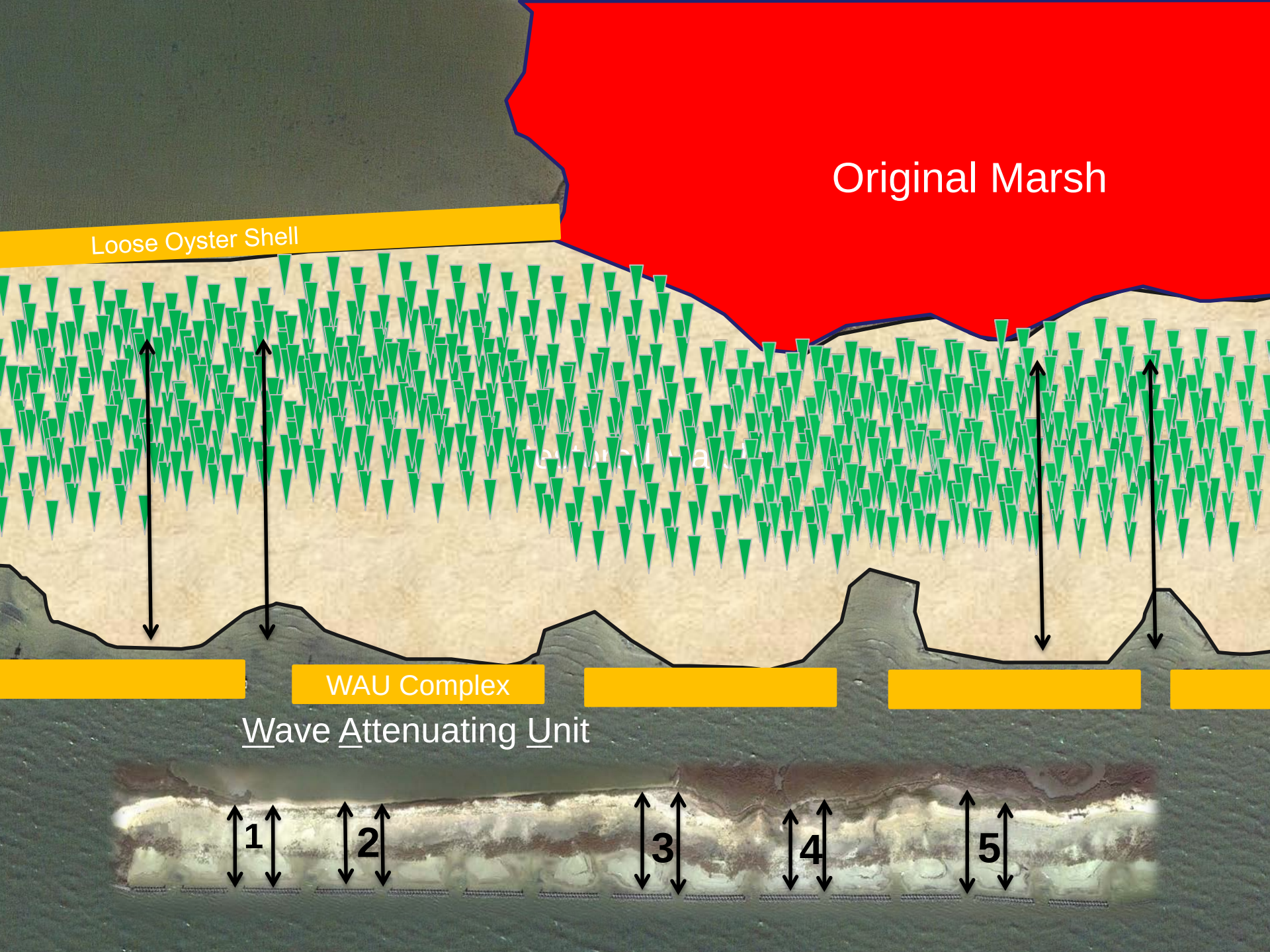
elevation profiles
sediment characteristics
floral zonation
Spartina density
nekton




Helen Wood Park
Northeast Point aux Pins
Little Bay
South Point aux Pins
Coffee Island
Alabama Port

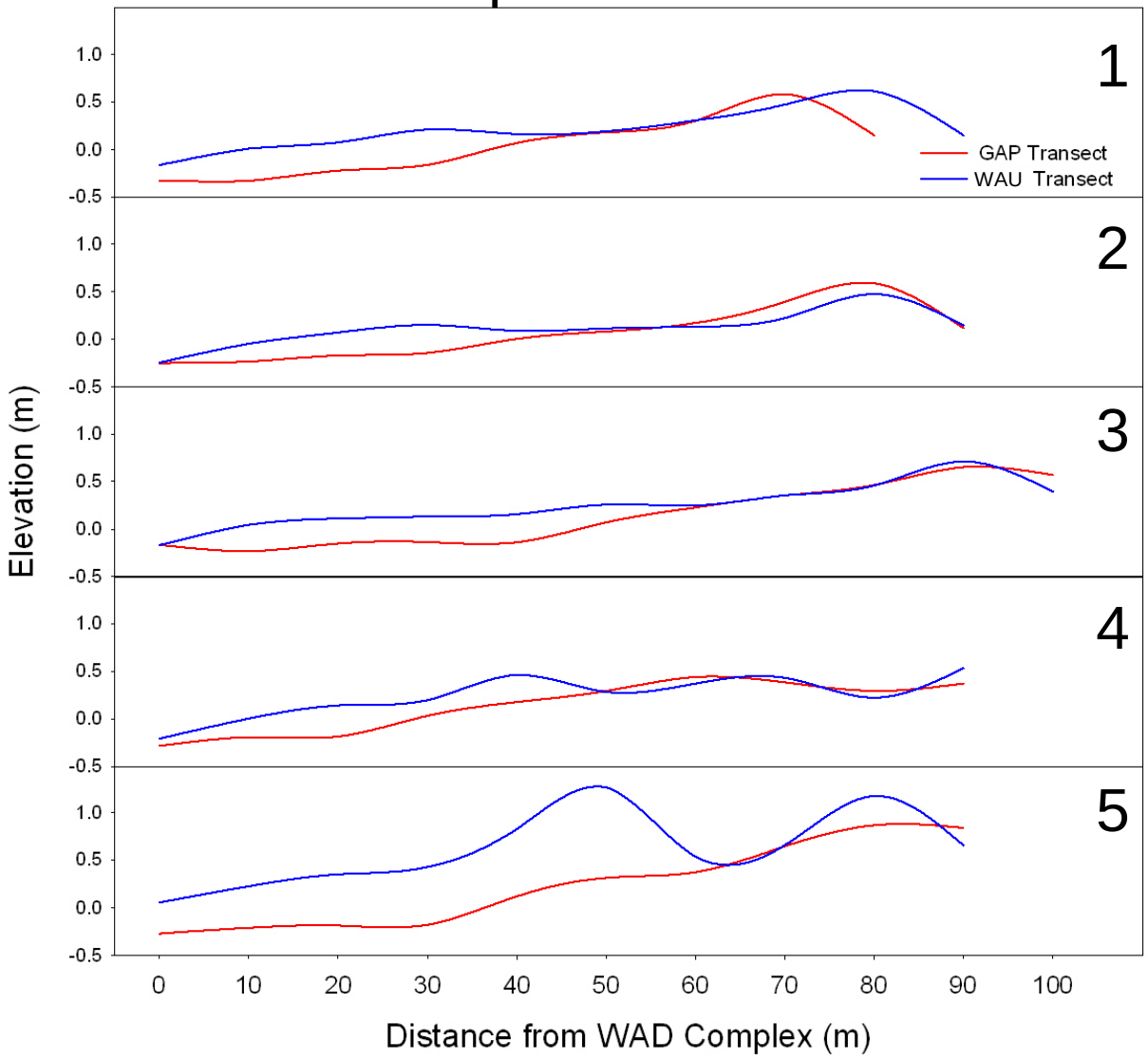

January 2012
0.2 km
©2010 Google

Wave Attenuating Units (WAU): Little Bay

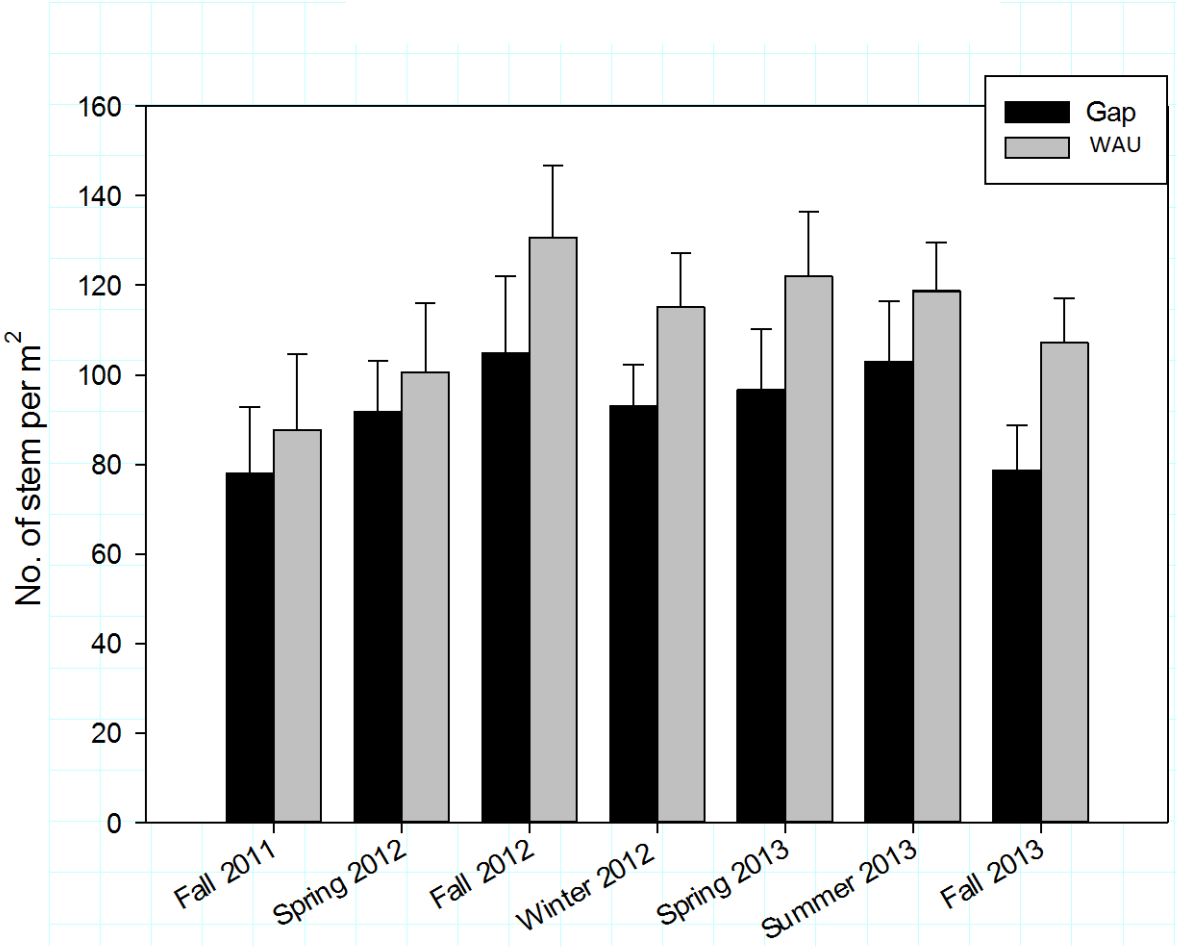

Original Marsh
Loose Oyster Shell
WAU Complex
Wave Attenuating Unit
1
2
3
4
5

Elevation profiles

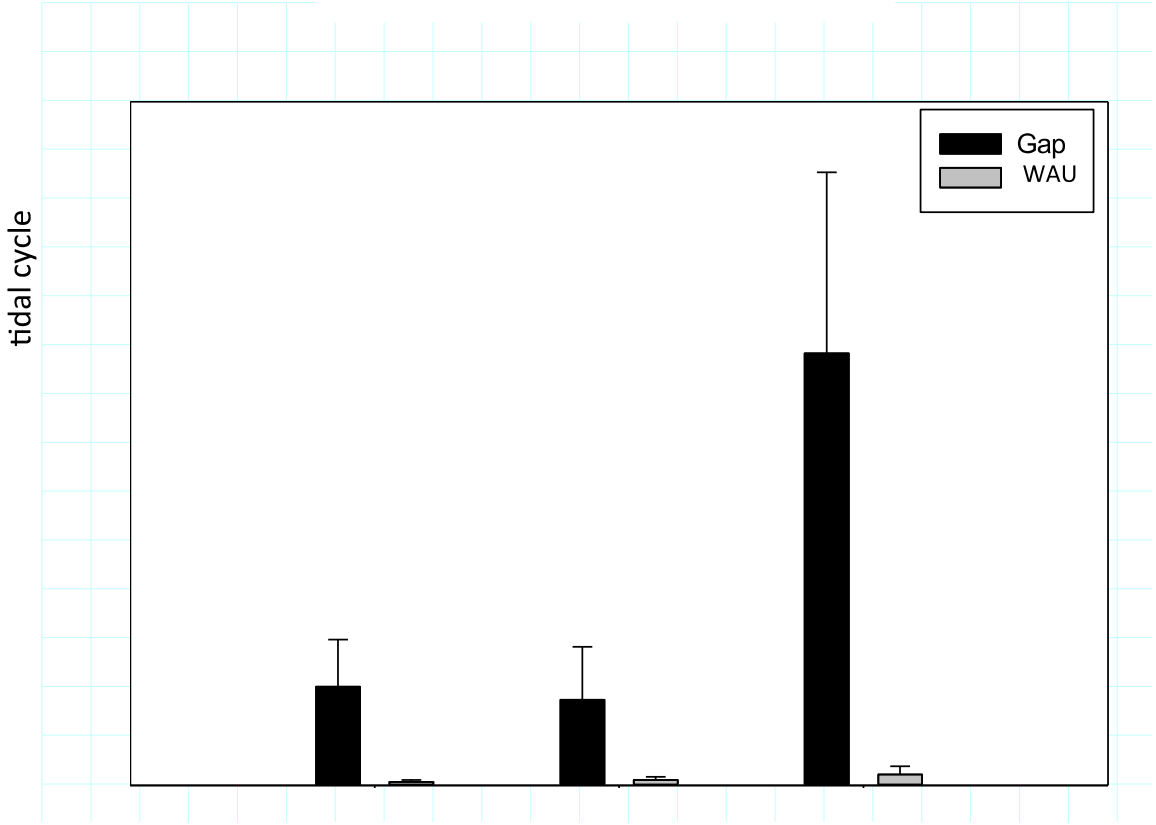
April 2013



Restored *S. alterniflora* density

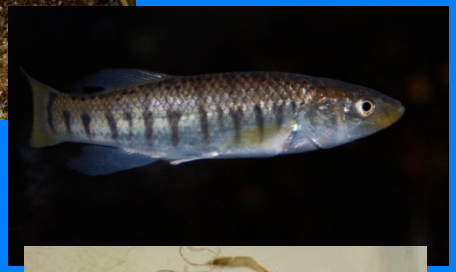


Total Nekton Abundance



Nekton

- **Fish:**
  - Mullet
  - Croaker
  - Pinfish
  - Bay Anchoy
  - Silverside
  - Sheepshead Minnow
  - Killifish sp.
  - Sailfin Molly
  - Darter Goby
  - Tongue fish
- **Invertebrates**
  - Blue Crab
  - White Shrimp
  - Grass Shrimp
  - Mud Crab



Intertidal breakwaters at Little Bay

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seem to be enhancing the marsh

- Sediment is compacting and stabilizing; erosion gaps between consecutive WAD complexes does not seem to be a problem

- Marsh plants are well established ; mostly Spartina alterniflora but there are others (S. patens, Distichlis spicata, succulents)

- Large amounts of nekton visiting the restored marsh

- Oysters are settling on the WAUs and seem to maintain fair survivorship, although the settling densities are not high.

So wrapping it all up together

- Subtidal reefs: definite fisheries enhancement and potentially other benefits (seagrasses, marshes)… at any rate it seems clear they may have some limitations, such as fully reverting shoreline erosion

- Intertidal reefs: definite shoreline stabilization→ perhaps method of choice if shoreline/marsh stabilization is the main goal?

Different living shoreline designs offer different options to managers given their priority needs and budget requirements

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More research needed for a better “a la carte” menu, particularly integrating multidisciplinary approaches and parties

Restoration Ecology
THE JOURNAL OF THE SOCIETY FOR ECOLOGICAL RESTORATION

SETBACKS AND SURPRISES

Do restored oyster reefs benefit seagrasses? An experimental study in the Northern Gulf of Mexico

Shailesh Sharma[1,2,3], Joshua Goff[2], Ryan M. Moody[2], Dorothy Byron[2], Kenneth L. Heck Jr.[1,2], Sean P. Powers[1,2], Carl Ferraro[4], Just Cebrian[1,2]

Ecological Engineering 90 (2016) 352–360

Contents lists available at ScienceDirect

Ecological Engineering

journal homepage: www.elsevier.com/locate/ecoleng

A hybrid shoreline stabilization technique: Impact of modified intertidal reefs on marsh expansion and nekton habitat in the northern Gulf of Mexico

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Thank You!!!!!

- ADCNR State Lands, Coastal Section
- TNC
- Marine Resources Division
- NOAA
- Numerous techs, interns and graduate students at DISL: Stan Bosarge, Lynn Moore, Jared McKee, Rachel Gamble, Nick Bawden, Luke Dodd, Kate Nixon, Carrie Robbins, Michelle Beumer, and Nicole Waite
- J & W Marine (Reef Construction)
  - Reed, Jessie, and Jason