



Application of Living Shoreline Stabilization Methods to Protect Shell Middens in Mosquito Lagoon, FL



Melinda Donnelly
Linda Walters
Paul Sacks



What is living shoreline stabilization?

- Uses native species to stabilize shorelines
 - Alternative to hard-armoring
- Benefits
 - Ecosystem Services
 - Intertidal Habitat
 - Water Filtration
 - Nutrient Cycling
 - Natural appearance
 - Adapt to sea level rise



Study Site: Canaveral National Seashore



Natural shorelines have 3 layers of defense against erosion

- Upper Intertidal= mangroves
- Middle Intertidal= smooth cordgrass
- Lower Intertidal= oysters



Shell Middens in Canaveral National Seashore



Loss of intertidal habitats expose base of shell midden

Increased erosion from wave action caused by boats and storms



Pottery and other artifacts are washed into Mosquito Lagoon

Turtle Mound Shell Midden

- Timucuan Native Americans
 - 800-1400 AD
 - 35 feet tall
- National Park Service took control in 1977
 - National Register of Historic Places
 - Distinct Plant Community
 - Recreation



Scorpion-tail, *Heliotropium angiospermum*

Living Shoreline Stabilization at Turtle Mound



A photograph of a living shoreline stabilization project at Turtle Mound. The image shows a sandy beach area adjacent to a body of water. A path, labeled 'Anglers Path', is marked with yellow caution tape and white posts. The path runs along the shoreline, bordered by dense green vegetation, including mangroves and cordgrass. The water is calm and blue. The sky is clear with some light clouds.

450 Mangroves

620 Cordgrass

1140 Oyster Mats

Anglers Path

Living Shoreline Stabilization at Turtle Mound

- Red and Black Mangroves
 - 1 yr old seedlings
- Smooth Cordgrass
 - 1 yr old transplants

- Oyster Mats



Living Shoreline Stabilization at Turtle Mound



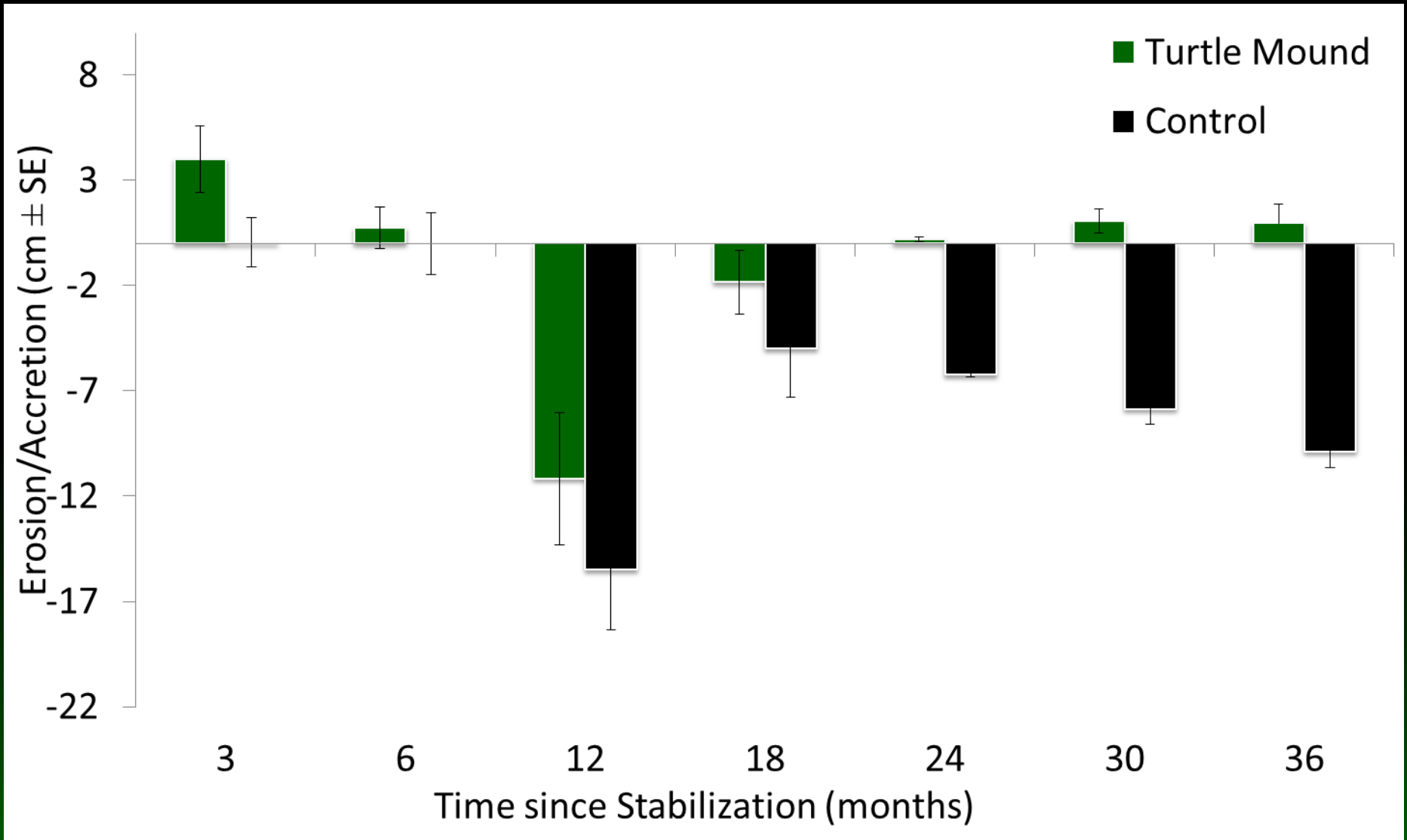
2903 total community volunteers

Post-Stabilization Monitoring

- Erosion
 - Restored
 - Unrestored (control)
- Oyster Recruitment
 - 30 mats
- Plant Survival and Percent Cover
 - 2 rows of 30- 0.25 m² quadrats
 - Point-Intercept Method



Post-Stabilization Monitoring



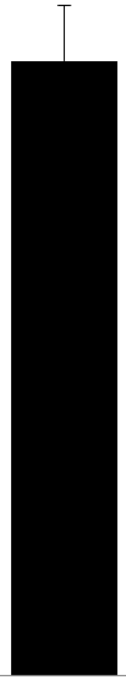
Average Mean Sea Level Rise = 0.24 cm/yr

Post-Stabilization Monitoring

Mean # Oysters per m² (\pm SE)



6

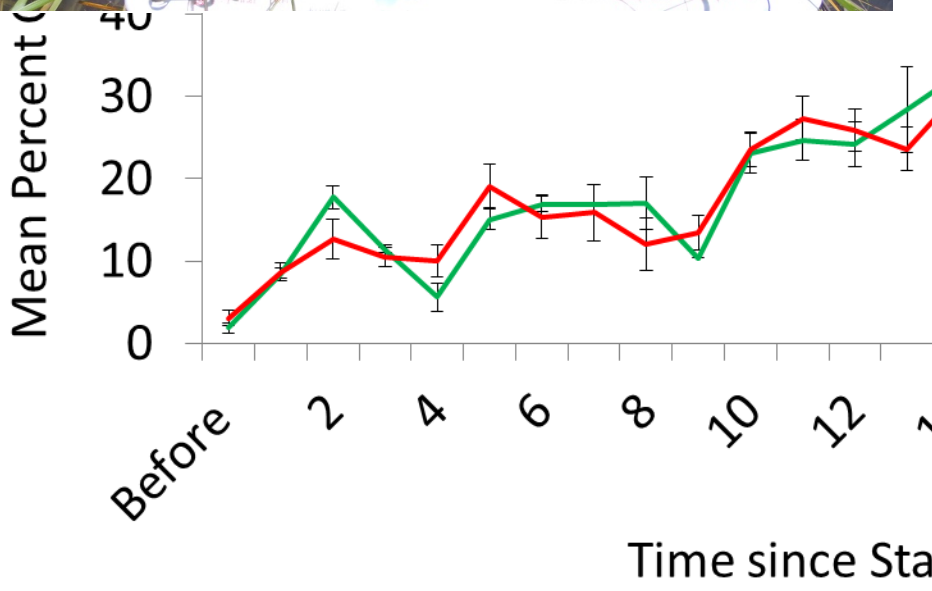


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Post-Stabilization Monitoring



- Cordgrass Zone
- Mangrove Zone



Post-Stabilization Monitoring

Above-Ground Root Structures



Flowers



Living Shoreline Stabilization

Before Restoration



1 month Post-Restoration



Conclusions

- Accretion of sediment
- Increased intertidal habitat

3-yrs Post-Restoration



Living Shoreline Stabilization

Since 2012...

- 5 Additional Sites
- 830 m shoreline stabilized
- On-going monitoring

Seminole Rest



Hong Kong



Castle Windy



Living Shoreline Stabilization

Future Applications

- 2 shorelines were stabilized this summer
- Tests of alternate methods

Shell Bags



Hybrid Shorelines



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