

Shoreline Breakwall Comparison

CHALLENGES AND OPPORTUNITIES FOR MANAGING DYNAMIC SHORELINES

While ship traffic increases in oceans worldwide, little is known about the potential environmental impacts of boats, especially smaller, recreational vessels, in estuaries. Recreational boating registration is on the rise in Florida. Researchers found that in 2012, one in twenty-one Floridians had a recreational boating license registration and that the state supports 10's of thousands of additional transient boaters (Montes et al. 2016). There have been a handful of studies that examined the ecological impacts of boat wakes on nearshore coastal and estuarine shoreline ecosystems, but neither the increase in traffic nor the negative effects are being recorded or observed. This project focuses on the Intracoastal Waterway, which encompasses 3,000 miles of natural waterways and manmade channels along the east coast and Gulf coast. The Intracoastal Waterway serves as an artery for commerce and recreation in the southeast and can be considered a "boat highway" through coastal wetlands.



Northeast Florida marshes are usually characterized by cordgrass (*Sporobolus alterniflorus*) in the higher intertidal zone and Eastern oysters (*Crassostrea virginica*) in the lower intertidal. Along stretches of Intracoastal Waterway shoreline, rapid erosion of both cordgrass and oyster habitat, and commensurate loss of their ecosystem services, is common.

Research Questions:

1. What is the wake climate in northeast Florida estuaries?
2. Can we engineer 'living shorelines' to dissipate boat wakes and protect shorelines?

Two projects stemmed from these research questions. One project was funded by the National Estuarine Research Reserve System (NERRS) Science Collaborative and established a partnership with the GTM Research Reserve. The other project was in partnership with FWC's Marine Estuarine Habitat Restoration Monitoring and Assessment Program (MEHRMA) and the St. Johns River Water Management District and located within the North Peninsula State Park.

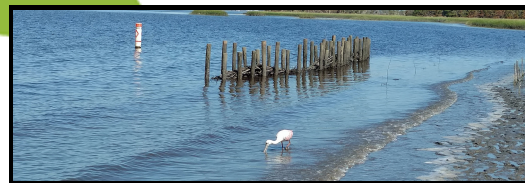


GTM Research Reserve

- Semi-permeable crepe myrtle branch-filled breakwalls (branches tightly bundled)
- Oyster shell-filled gabions
- Potato-based BESE-elements

North Peninsula State Park

- Cedar branch-filled breakwalls (branches loosely placed)
- Oyster shell-filled bags
- Transplanted cordgrass



GTM Research Reserve

- Breakwalls dissipated 30-90% of wave energy
- Minimal oyster recruitment on BESE-elements, but gabions are successful
- Marsh progradation toward channel at four of six sites

North Peninsula State Park

- Breakwalls dissipated ~15% of wave energy
- Vigorous oyster growth and cordgrass re-establishment
- Porosity of the breakwall is important to consider



Where do we go from here?

WHAT IS THE POTENTIAL FOR LIVING SHORELINES TO BE MORE BROADLY IMPLEMENTED ALONG HIGH-ENERGY SHORELINES AND NAVIGATION CHANNELS?



What other materials could be used in nature-based solutions for high-energy environments?

- Palm trees
- Recycled holiday trees
- Sandbar breaks
- Other bivalves



Where could gabion-breakwalls be installed?

- Critical wildlife areas
- Cities and small municipalities
- Historic forts/structures

What additional research is needed?

- Social science - perception of materials, trade-offs, behavior
- Seasonality of boat activity
- Testing different living shorelines configurations, materials, and geometry
- Environmental factors driving oyster survival and growth



What are other aspects to consider in gabion-breakwall design?

- How does the geometry of the wall layout and other components impact effectiveness of the breakwall?
- Would there be an opportunity to consider the design and material of boats (or motors) to reduce wakes?
- Would results be different if the breakwalls were submerged instead of in the intertidal zone?



Who could install gabion-breakwalls?

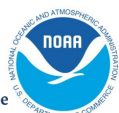
- Marine contractors
- Boat owners and private landowners
- Volunteers and citizen scientists

How could we impact boating behavior?

- Education
- Setting speed limits (based on vessel type)
- More enforcement

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