Sea Grant NEW YORK

Natural and Nature-based Features
Case Study #1

Oyster castle barrier at Gandy's Beach, August 2022. Photo credit: Danielle McCulloch Prosser, USFWS

Gandys Beach, New Jersey: High-energy Living Shoreline Project

Project Overview:

Located at Gandys Beach, NJ (39.278860, -75.242320), this study created a trial of different types of large-scale living shorelines, including shell bag breakwaters, coir logs, *Spartina alterniflora* plantings, and oyster castles. The study's goals were to assess whether these living shoreline structures would be able to tolerate Delaware Bay conditions, including ice, while also attenuating wave energy, accreting sediment, and reducing erosion, elevation, and vegetation loss. The structures were also evaluated for their ability to provide shellfish and nekton habitat, and minimize horseshoe crab impingement. Shoreline position and geometry, acreage of beach and salt marshes, wave heights, vegetation, and nektonic populations were assessed to comprehend the baseline conditions of the area.

Key Takeaways

- Variability between shoreline sites makes standardizing design criteria or installations of living shoreline projects difficult.
- Widespread agreement is needed on how to monitor living shoreline and NNBF projects, including how to set and quantify achievable targets.
- Long-term monitoring is key to project evaluation and adaptive management.
- To increase the chances of success, the spatial and structural scale of the NNBF intervention needs to match the site's needs.

Project Context

Beaches and marshes on Delaware Bay experience high wave energy, with the study site at Gandys Beach, NJ, being exposed to 30 mile fetch and a 6.5 foot tidal range. This 0.5 mile long shoreline experiences significant erosion.

Kathleen M. Fallon, Ph.D.
Sr. Coastal Processes and Hazards Specialist | email: kmf228@cornell.edu | 631-824-4746

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srijb.org/nature-based-solutions

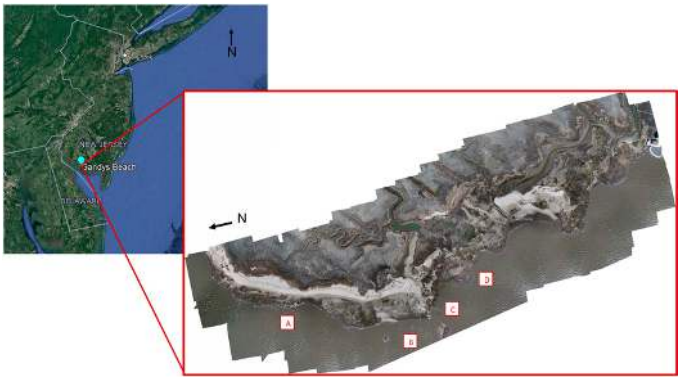
Photograph of Oyster Castle breakwaters, August 2019. Photo credit: Amy Bredes, Stevens Institute of Technology

Results

- Monitoring of ecological metrics such as vegetation and bivalves showed a positive outcome over time for the living shorelines.
- Coir logs survived Delaware Bay conditions, including ice events.
- Coir logs attenuated wave energy when crests were emergent.
- Coir logs did provide shellfish and nekton habitat and posed negligible hazards to horseshoe crabs.
- Monitoring provided data and new knowledge to inform future living shoreline projects in the region.

Implications for Practice

Project goals in both structural and ecological metrics were attained; however, challenges did arise. For example, in some cases, breakwater structures seemed to amplify wave energy. Thus, larger scale projects may have been more effective, but also more challenging to permit. Long term monitoring of wave energy, site topography and bathymetry, and crest elevation is required to determine prolonged success of structural integrity and hazard mitigation. In addition, monitoring was performed for ecological metrics such as patch size and extent of vegetative community, density, size and survival of oyster community, abundance, richness and diversity of mobile nekton community, and horseshoe crab impingement.



Orthomosaic created from drone imagery of Gandy's Beach Preserve with sites A, B, C, and D labelled, April 2020. Photo credit: Amy Bredes, Stevens Institute of Technology

Featured Researcher: Dr. Jon Miller

Dr. Jon Miller is a coastal engineering expert, Director of the NJ Coastal Protection Technical Assistance Service, a Coastal Processes Specialist with New Jersey Sea Grant, and a Research Associate Professor at Stevens Institute of Technology in the Department of Civil, Environmental, and Ocean Engineering. His research on the effect of low-crested living shorelines on wave attenuation received funding from the U.S. Coastal Research Program in 2021.

Project Funding & Partners

- Stevens Institute of Technology
- Rutgers University New Jersey Agricultural Experiment Station
- US Fish & Wildlife Service
- The Nature Conservancy
- Partnership for The Delaware Estuary Inc.
- USCRP (monitoring)

Relevant links

- Observations of Wave Height Amplification Behind an Oyster Castle Breakwater System in a High-Energy Environment: Gandys Beach, NJ
- Dr. Miller's Laboratory Site
- USCRP 2021 Recipients
- Dr. Miller's Profile - Stevens Institute of Technology
- Dr. Miller's Google Scholar

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About SRIJB (https://srijb.org/): The SRIJB is a CUNY-wide institute created through a partnership amongst the National Park Service, the City of New York, and the City University of New York (CUNY). Our mission is to produce integrated knowledge that increases biodiversity, well-being, and adaptive capacity in coastal communities and waters surrounding Jamaica Bay and New York City. The Institute is hosted and supported by Brooklyn College and works closely with member organizations including NY Sea Grant, the Jamaica Bay Rockaway Parks Conservancy, and the Jamaica Bay Ecowatchers.

New York Sea Grant (NYSG) (www.nyseagrant.org) is a partnership program of the State University of New York, Cornell University, and the National Oceanic and Atmospheric Administration that delivers science-based solutions for environmental stewardship, economic vitality, and resilience across New York's Marine and Great Lakes regions.