

# Demonstrating Oyster Reef Breakwater Living Shorelines in the Delaware Estuary to Enhance Coastal Habitat Resilience

Moses Katkowski  
Coastal Projects Manager, The Nature Conservancy in New Jersey  
(609) 861-4126  
mkatkowski@tnc.org

## Project Background

The Nature Conservancy has owned and managed the Gandy's Beach Preserve in Downe Township, Cumberland County, New Jersey for over twenty years. The preserve encompasses 2,700 acres of tidal and non-tidal wetlands, coastal forests, and agricultural fields adjacent to the Delaware Bay in southern New Jersey (Figure 1). The preserve includes about one mile of natural sandy beach habitat that is used by nesting horseshoe crabs and migratory shorebirds, such as the federally listed red knot (*Calidris canutus rufa*). Directly adjacent to the sandy beach are vast tidal marshes that support numerous migratory bird species and a host of marine life. The beach and tidal marshes are also flanked by small communities totaling less than one hundred homes. Much of the human community is protected by concrete seawalls and bulkheads of various materials. In addition, a few roads bi-sect the tidal marshes and extensive mosquito ditching has been pervasive for decades. The Gandy's Beach Preserve and the adjacent lands and waters are just one example of how the combination of hard infrastructure, sea level rise, coastal storms, and other factors threaten valuable coastal habitats.

In 2013, The Nature Conservancy partnered with the U.S. Fish and Wildlife Service on the Gandy's Beach Living Shoreline Project as part of the Post Hurricane Sandy Resiliency Program through the Department of the Interior. The aim of the project is to implement multiple living shoreline techniques at the Gandy's Beach Preserve to enhance the tidal marsh and beach habitats at the preserve across of gradient of wave energy environments. TNC and USFWS are working with local partners, the Rutgers University Haskin Shellfish Research Laboratory and The Partnership for the Delaware Estuary.

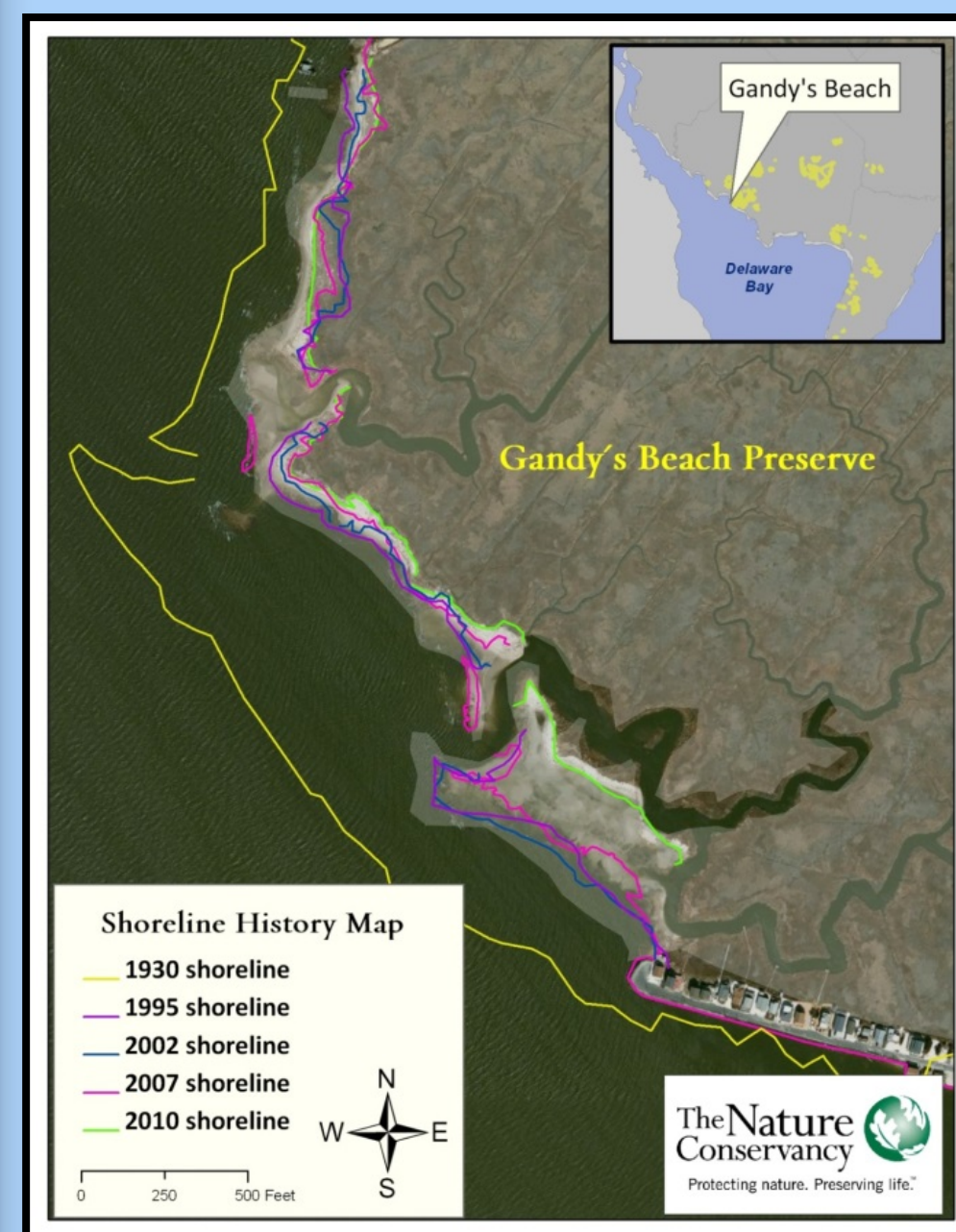


Figure 2



Figure 1

Field observations and historic aerial images at the Gandy's Beach Preserve indicate that significant shoreline erosion has reduced the acreage of beaches and tidal marshes, and degraded the habitats that still remain. TNC has estimated shoreline retreat on the natural shoreline at the Gandy's Beach Preserve to be about 500 feet between 1930 and 2007 (Figure 2).

## Project Objectives

- Increase resilience of salt marsh and beach habitats at TNC's Gandy's Beach Preserve (Figure 3)
  - Reduce the rate of shoreline retreat
  - Reduce wave-induced erosion (reduce wave energy by 25% using oyster reef breakwaters)
- Increase available hard substrate and provide vertical relief for the Eastern oyster (*Crassostrea virginica*) (Figure 4)
  - Increase acreage of available substrate for Eastern oyster attachment, growth, and survival
  - Determine if oyster reef breakwaters can locally increase the abundance and diversity of nekton species at the project site.
- Demonstrate the use of multiple living shoreline techniques in increasing the resilience of coastal habitats along New Jersey's Delaware Bayshore coast
  - Determine if and how living shorelines can be used to increase habitat resilience
  - Document lessons learned to apply to others areas of concern
- Engage youth and veterans in the implementation of coastal conservation projects in New Jersey (Figure 5)
  - Local schools worked to make 15,000 shell bags to be used in the living shoreline project
  - Engage student volunteers in the installation of the living shoreline project



Figure 3.

Photo credit: Damon Noe



Figure 4 Photo credit: TNC staff



Figure 5.

Photo credit: Rutgers University staff

## Oyster Castle Reef Breakwater Installation



Figure 6.

Photo credit: TNC staff

Installation of the living shoreline began in October 2015 and has continued through Spring of 2016. To date, we have constructed six oyster castle reef breakwaters (Figure 6).

The dimensions of the oyster castle reef breakwaters average 25 feet long, 6 feet wide, and 2.5 to 4 feet high. The goal of the oyster castle reef breakwaters is to:

- 1) Attenuate wave energy that is causing erosion of vegetated marsh and beach habitats.
- 2) Provide hard substrate for Eastern oyster attachment and growth.

## Shell Bag Reef Installation



Figure 7.

Photo credit: TNC staff

In less vulnerable areas of the shoreline we are installing low relief shell bag reefs. Shell bag reefs are 20-30 ft. long and 3-5 ft. wide, with 5-10 ft. gaps between each reef (Figure 7).

The goal of the shell bag reefs is to:

- 1) Increase sediment accretion around reef structures.
- 2) Provide natural, hard substrate for Eastern oyster attachment and growth.

## Monitoring

Monitoring will be conducted with three goals in mind: 1) to determine project performance in creating oyster habitat at the project site; 2) enhancing shoreline resilience by reducing wave-induced erosion; and 3) measuring impacts to target species, specifically fish and crab utilization of the living shoreline structures, and spawning horseshoe crabs and migratory shorebirds.

### Oyster Restoration Metrics

Reef areal dimension  
Reef height  
Oyster density  
Oyster size-frequency distribution

### Water Parameters

Salinity, temperature, dissolved oxygen

### Enhancement to Adjacent Habitats

Shoreline position, elevation, slope  
Density and % cover of marsh vegetation  
Change in wave energy

### Habitat Enhancement for resident/transient species

Change in nekton species abundance  
Nekton biomass and diversity over time

## Acknowledgements

Funding and support for this project came from the U.S. Department of the Interior and the United States Fish and Wildlife Service for Hurricane Sandy recovery and resilience efforts.



Figure 8.

Photo credit: Jenny Paterno