

Rethinking Bulkheads

“Living Shorelines” Are Proving More Effective and Ecological

by Christine Menapace

An interesting sea change is taking place regarding how we view coastlines, erosion, and ecology. Whereas manmade bulkheads were once the de facto standard to protect land from water encroachment, many state agencies and engineering firms across the U.S. are now recognizing there may be a better way. It involves a more environmentally sound—and sometimes less expensive—alternative deemed a “living shoreline.”



courtesy of T&M Associates

Above: Living shoreline stone revetments and offshore breakwaters protect from future erosion at John C. Bartlett, Jr. County Park At Berkeley Island.

Opposite page: The Sedge Island project on installation day. As was expected, some of the coir logs shown here did not hold up, and current site conditions are still being assessed.

Living vs. Hard Shorelines

While there are many different definitions of a living shoreline, it generally involves a method of shoreline stabilization using native plants, such as marsh grasses, with either a natural or engineered means of breaking up wave energy, such as oyster beds, rock, stones, concrete, dunes, and more. Rather than create an artificial barrier or wall at the shore's edge, the breakwaters of living shorelines are often wholly or partially sunken offshore and can contain holes for water to stream through.

The native plants prevent erosion by holding sediment together with their root systems and also buffer storms by absorbing wave energy, rather than deflecting it as bulkheads do. These native plants also enhance ecosystem functions, improving water quality by trapping pollutants before

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courtesy of Martha Maxwell-Doyle and the Barnegat Bay Partnership

Before



courtesy of T&M Associates

they reach waterways and supporting wildlife by providing food and habitat. Living shorelines essentially re-naturalize a coast and can often self-maintain with little assistance.

On the other hand, when a bulkhead (or “hard” shoreline) is installed, the intertidal zone (the land between high and low tide) is often eliminated. By losing this zone, an important habitat for fish and other wildlife disappears, water quality decreases, and storms can become more destructive to the property.

In their cost and materials, hard shorelines give an impression of durability. But as anyone who experienced Superstorm Sandy knows, a strong storm can demolish a bulkhead, with extremely costly and time consuming repairs or replacement. They can also begin to lose sediment from behind the bulkhead and cause

After



courtesy of T&M Associates

Before: Due to damages sustained during numerous storm events, including Superstorm Sandy, sections of the shorelines at Iowa Court in Little Egg Harbor had become vulnerable and parts of the street were eroding.

After: Shown is the new restoration/reclamation of the eroded marsh and new plantings at Iowa Court in Little Egg Harbor. The new stabilized marsh and sill will reduce sea level rise, flooding, and erosion. They will also strengthen the natural eco-system and protect the roadway and nearby properties.

erosion on neighboring properties. Even in the best of cases, bulkheads can completely fail after twenty or thirty years, say experts.

Perhaps it's not surprising then, that despite the seeming strength and solidity of bulkheads, research indicates living shorelines can actually more resilient in protecting against the effects of hurricanes, according to the National Oceanic and Atmospheric Administration (NOAA). The New Jersey Office of Policy and Coastal Management, a division of the Department of Environmental Protection (NJDEP), states on its site: "When properly designed, living shorelines have been proven to be an effective response to [erosion and sea level change] and frequently more beneficial than hard structure responses, such as bulkheads." The site references a study

conducted after Hurricane Irene that found: "76% of bulkheads were damaged during the storm, while other shoreline protection types experienced no damage... Vegetation density, while initially reduced by the storm, recovered within one year."

With more intense coastal storms, sea level rise, and a changing climate, it's not news to any New Jersey resident that nearly 1,800 miles of the state's shoreline are tidally influenced and vulnerable, including 239 coastal communities that can face surge and flooding. *Building Ecological Solutions to Coastal Community Hazards* (available for download at www.state.nj.us/dep/opi/assets/nwf_final_bescch_070517.pdf) is a sobering and informative read of future projections and potential solutions for our coastal environments given these challenges.

Legislation and Permits

With over 7,700 miles of tidal shoreline, much of it eroding, the state of Maryland is at the forefront of coastal advocacy and passed the Living Shoreline Protection Act in 2008. The law requires shoreline property owners in the state to use natural solutions to prevent erosion unless they can prove such methods won't work on their property. A Maryland loan program has distributed funds "for 475 living shoreline projects, protecting 200,036 linear feet of shoreline and creating over 3.75 million square feet of marsh."

Other states active in living shoreline initiatives include Florida and several of the Gulf states to name a few. Congressman Frank Pallone, Jr. of New Jersey has been pushing for a federal Living Shorelines

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Act that would create a grant program through NOAA to assist in construction. The legislation has the support of many organizations including the National Wildlife Federation, the Nature Conservancy, the American Shore and Beach Preservation Association, American Littoral Society, and the Jersey Shore Partnership.

Jessica Cobb, with NJDEP's Watershed and Land Use Management program, says Sandy "was really the impetus" for starting to think about living shorelines in New Jersey. In July 2013, the state officially adopted Permit 24, commonly referred to as the Living Shorelines General Permit, to encourage "habitat creation, restoration, enhancement, and living shoreline activities" and to remove some of the regulatory impediments for these projects. Since that time, Cobb says about seventy projects have been completed that involve living shorelines or very similar measures. Just a few have included: Atlantic City Gardner's Basin; Bradley Beach Maritime Forest; Fair Haven at 78

DeNormandie Avenue; Slade Dale Sanctuary in Point Pleasant; and Spring Lake at Shore Road.

With no one-size-fits-all solution and an admittance that "everyone here is still learning," projects have varied greatly. "Everything is so site specific," says Kira Dacanay, principal fisheries biologist with the Bureau of Shellfisheries. Both Cobb and Dacanay call it "adaptive management," or essentially testing, adjusting, and perfecting as you go. Here's two very different examples.

Sedge Island

Just west of Island Beach State Park lies Sedge Island, home to the New Jersey Division of Fish and Wildlife education center. Over the last several years, the shoreline under the caretaker's house had severely worn away, and it was decided the island was an excellent candidate for a living shoreline—but with a twist. "It's definitely an experiment in using only natural materials," comments Dacanay.

The project used a method of rolling coir log (made from the outer husk of the coconut) in fiber mat-

ting and coir bags filled with shells in the hope that these materials will trap sediment and eventually become completely buried by the reforming wetland. "If all goes according to plan, you won't see them," says Dacanay.

In other living shoreline projects, shell bags are typically made of plastic mesh for its durability and limited coverage of surface area, which exposes more shells to encrusting organisms. In these designs, the goal is often to encourage reef development to buffer wave energy. Since the objective of Sedge's living shoreline is to reclaim coastal wetlands, not reef development, the coir bags were used in an effort to keep the project plastic free.

Installed in just one day (June 18, 2019), the project nevertheless "took a fair amount of prep," comments Dacanay. Wooden stakes in a sort of cradle design were used to secure the coir logs to the bay bottom.

Meant to be an experiment, Dacanay says preliminary results have not been published yet, but admits some coir logs have stayed in place,



Restoration of South Green Street in Tuckerton.



courtesy of T&M Associates

In 2018, the reconstruction of John C. Bartlett, Jr. County Park at Berkeley Island became one of the first major projects to include living shorelines in New Jersey.

while others haven't. (Areas where bags or logs broke free are telling about wind and wave energy patterns and materials orientation.) She has also been "pleasantly impressed with the durability of the coir bags."

Shortly after installation, there was an increase in wading birds using the coir logs as platforms for hunting in the newly created tide pool habitat. As time has passed, native plants and algae have grown and created a refuge for smaller fish such as mummichogs, sheepshead minnows, and three-spined stickleback. These fish weren't absent, emphasizes Dacanay, but are now attracted to the habitat and observable. As expected, a much greater presence of fish species has been recorded within the pools created by the living shoreline than outside of it. "If you create habitat, they will come," asserts Dacanay.

John C. Bartlett, Jr. County Park at Berkeley Island

When Sandy tore through the twenty-five-acre peninsula of John C. Bartlett, Jr. County Park at Berkeley Island, the beloved location sustained catastrophic damage. The south shore suffered great shoreline loss, which severely eroded the parking lot and washed away part of the entrance road. The wave screen, bulkhead, and armor mat also sustained significant damage. Even prior to the storm, the park had already experienced significant long-term erosion and damage simply due to its bay location.

Immediately after Sandy, Ocean County partnered with the NJDEP, the Barnegat Bay Partnership, and Stevens Institute of Technology to collaborate on shoreline stabilization concepts. The engineering firm T&M Associates was brought on board to

prepare final design documents, prepare and obtain permits, and provide construction support services.

Completed in July 2018, the final, collaborative design of the nearly seven-million-dollar reconstruction became one of the first major projects including living shorelines in New Jersey. In addition to spartina planted at the low marsh, stone revetments, offshore stone breakwaters, and timber bulkheading were added. Various sized openings were designed to help regulate the tide entering and exiting the area, though some were revisited after a nor'easter hit during construction. Due to the large openings in the original design, it was determined the upland portion of the park and the shoreline was threatened by erosion. In an adaptive management

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measure, the two large gaps were closed with additional stone.

Last year, the project won an ACEC Engineering Excellence Award in the Water Resources Category. This year, another living shoreline project by T&M, the restoration and stabilization of Iowa Court and South Green Street in Little Egg Harbor and Tuckerton, also won an ACEC Engineering Excellence Award. That project included: installation of a marsh sill; internal sheeting with notches to allow water inundation twice a day; spat-on shells for future oyster habitat; restoration and planting of nearly one acre of marsh; beach replenishment; and installation of an offshore stone breakwater. According to T&M, "Using a traditional bulkhead for [this project] would not prevent flooding and could increase the risk of scouring or shift risk to adjacent properties." The living shoreline solution proved to not only be more eco-friendly, but also more economical. "Living shorelines are excellent solutions for the long-term sustainability of our marsh edges, shorelines, and eroding ecosystems," comments Kristopher Kryston, T&M regional environmental practice leader. "They provide resiliency for increasing storm events, while also offering habitat re-creation and enhancement. T&M is proud to be involved in living shoreline projects from an engineering and scientific perspective."

Residential Projects

Despite the success of municipal projects, unfortunately, it isn't currently a solution that's easily accessible to many individual homeowners of shoreline property. As Permit 24 now stands, all living shorelines must be designed and/or sponsored by the DEP, the U.S. Army Corps of Engineers, or Federal resource agencies; or must be for research purposes. But Cobb hopes that will change in the future.

"We're seeing issues with the permit. We're potentially looking at private property... [to] revisit the engineering guidelines and make them more user-friendly," says Cobb.

Even the NJDEP's *Living Shorelines Engineering Guidelines*, written by the Stevens Institute of Technology, states: "The objective is to reduce the number of under-engineered or improperly designed structures, while at the same time recognizing that some living shorelines projects may not need the same level of detailed engineering analysis as traditional approaches.... The nature of these projects is such that diversity and innovation should be encouraged rather than discouraged."

While living shorelines are big news for those who support or work in coastal habitats, for many the concept is still unknown. "Certainly, some are screaming from the rooftops..." Cobb says of advocates, but admits, "typical homeowners aren't all that familiar."

And unfortunately, when a homeowner needs coastline stabilization, "contractors know bulkheads, they may not know living shorelines." Even finding an engineering firm may prove challenging. Unlike T&M, "there aren't many engineering firms that are taking this on," says Cobb. As a result, education, outreach, and volunteer opportunities are especially important to the future of living shorelines.

Yet despite the challenges and dire predictions of future threats to our coastal ecosystems, it's exciting to know we have found better solutions to meet them. "It is an exciting time," comments Cobb, "But sadly, it's also time to face the music. We need to become more resilient. There are so many threats to our coastlines. Living shorelines are an important component of that." She adds, "I'm loving being a part of this... seeing what is to come." ♦

For more information:

www.state.nj.us/dep/opi/living-shorelines.html

www.coastalresilience.org/nj-living-shoreline-grants

www.littoralsociety.org/living-shorelines.html

www.cleanoceanaction.org/fileadmin/editor_group2/Water_Quality/Living_Shorelines_ALS.pdf

"LIVING SHORELINE" GLOSSARY OF TERMS

Armor mat – an engineered filtration fabric that forms a boundary layer on the soil surface. They are designed to protect, grow and permanently reinforce natural vegetation.

Breakwater – a barrier built out into a body of water to protect a coast or harbor from the force of waves.

Bulkhead – a retaining wall along a waterfront.

Marsh sills – structures that run parallel to the coast, combining engineered structures with natural vegetation. They have two critical elements: an offshore, low relief mound (the sill) and an intertidal area between the sill and the upland (the shore) containing marsh vegetation.

Revetment – A facing of stone, etc., built to protect a shore structure against erosion by wave action or currents.

Sheeting – A pile with a generally slender, flat cross section to be driven into the ground or seabed and meshed or interlocked with like members to form a diaphragm, wall, or bulkhead.

Spat-on-shells – Oyster larvae attached to shells. As generation after generation of spat grow into adult oysters, they form dense clusters of oyster reefs or beds.

Wave screen – fixed structures that reduce or reflect wave energy and protect the shoreline from erosion.



The restoration at John C. Bartlett, Jr. County Park at Berkeley Island.



"Sea Girt Lighthouse" by Theresa Troise Heidel

Please refer to Jersey Shore Moments, page 49 and The Jolly Tar, page 49.

Restaurants & Nightlife

Bay Head

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72 Bridge Avenue, (732) 295-1110
www.charliesofbayhead.com

Please refer to our ad on page 61.

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a variety of poultry, fish, and game as well as vegetarian options. Homemade pastries and ice cream made on site by their award winning pastry chef will make a sweet ending to a sublime Shore dining experience. And remember a Gift Card to Charlie's makes the perfect gift. Visit their website at www.charliesofbayhead.com for complete menus and event information.

Belmar

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www.anchoravernnj.com

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and innovative food and drink in a gorgeous and comfortable setting, while taking advantage of our water views and the natural beauty overlooking the Shark River. Our eclectic American menu changes seasonally, while always offering fresh seafood and an extensive raw-bar. A diverse appetizer selection, burgers, and wood-fired artisan pizzas complete the menu with offerings for everyone. We look forward to serving you!

Freehold

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402 West Main Street, (732) 577-0200
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Escondido is a fresh take on contemporary Mexican cuisine. Stop over and try Escondido's homemade guacamole and salsa, made daily with only the freshest ingredients. The menu features an array of traditional flavors and unique items, all made from scratch. Over 70 different tequilas highlight the Cantina, where margaritas are made using premium tequilas and fresh-squeezed fruit juice. Choose Escondido for a break from the standard Mexican fare without having to travel south of the border.

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