



Evaluating Living Shorelines to Inform Regulatory Decision-Making in South Carolina

Overview

Declining marsh health and stability is a growing concern for South Carolinians as the coastal zone changes due to sea level rise and increasing development. There are a variety of living shoreline techniques that can be used to stabilize the shoreline, including the use of oyster habitat structures and fiber logs to reduce erosion and allow marsh grasses to flourish. As interest in living shoreline options gathered momentum, state agencies began pursuing a regulatory pathway to facilitate permitting for shorelines adjacent to private property, but realized that they needed more science-based information on long-term performance of these techniques in South Carolina before developing specific permitting guidance. To address this knowledge gap and to ensure that new regulations would be based on sound science, two state agencies and two National Estuarine Research Reserves collaborated on an intensive, multi-year project to evaluate the effectiveness of a variety of living shoreline technologies under different coastal environmental conditions.

Project Location

South Carolina

Project Duration

September 2015 to May 2019

Project Lead

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Project Type

Collaborative research – Generating science that informs decisions

Products

- [Summary of Living Shoreline Research to Inform Regulatory Decision-Making in South Carolina](#) – This technical report summarizes project findings and provides a decision tree for selecting treatments for different shoreline conditions.
- [Data sets about living shoreline performance](#) – Project data sets have been archived and made available to agency partners to enable customized analyses.
- Numerous presentations and two upcoming journal articles.

Project Approach

Core elements of the research approach included

1. Ongoing consultations with agency partners and a broader working group to guide the project and maximize value for the primary end-user—the South Carolina Department of Health and Environmental Control, Office of Ocean and Coastal Resource Management;
2. Analysis of historical data and monitoring of 62 previously created living shoreline projects to better understand their long-term performance and ability to stabilize different types of shorelines;
3. Installation and monitoring of 16 experimental living shorelines sites treated with bagged oyster shells, cement-coated manufactured wire reefs, coir logs, and Curlex® Bloc. Ongoing monitoring tracked metrics such as sediment gain or loss behind a treatment and changes in the adjacent marsh; and
4. Case studies and interviews with land owners to assess their perspectives on living shoreline approaches.

Project Partners

- ACE Basin National Estuarine Research Reserve
- North Inlet-Winyah Bay National Estuarine Research Reserve
- South Carolina Department of Health and Environmental Control, Office of Ocean and Coastal Resource Management
- South Carolina Department of Natural Resources, Marine Resources Research Institute
- South Carolina Department of Natural Resources, Office of Fisheries Management

Project Webpage

nerrsciencecollaborative.org/project/Sanger15

Results

This project produced detailed information about how a range of shoreline treatments performed under different conditions and how the treated shorelines changed over time. A few highlights of the findings are summarized here.

How did living shorelines benefit coastal areas?

- When oysters grow on living shoreline structures, they offer similar shoreline protections as natural oyster reefs by dispersing wave energy, trapping sediment, and promoting marsh growth.
- Monitoring at existing and experimental living shorelines found that oyster growth varied greatly among sites and treatments within the first one to two years, but subsequent oyster growth was rapid at most locations where oyster habitat structures had been installed.
- Shoreline bank elevation began increasing behind bagged oyster shells within one to two years following installation. Marsh expanded at some sites as early as two to four years after installation.

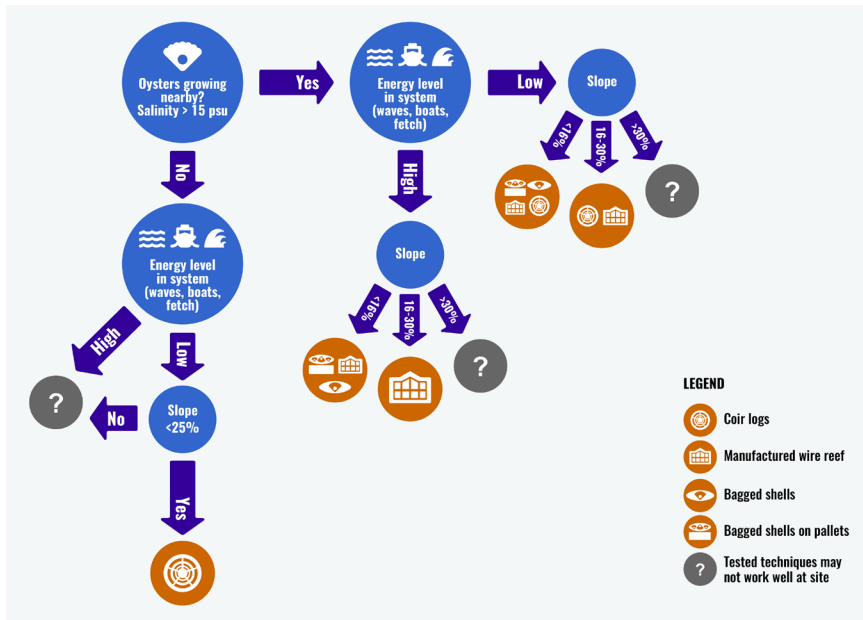
What types of sites are suitable for living shorelines in South Carolina?

- Site characteristics—such as bank width and slope, wave energy and currents, sediment firmness and composition, and proximity to natural sources of oysters—impact the success of a living shoreline treatment. The project's technical report explains how to assess these characteristics and select an appropriate living shoreline technique.
- In general, living shorelines perform best on wide, gently sloping shorelines with firm, coarse sediment. None of the techniques tested were successful on steep banks with slopes greater than 30 percent, or at sites with high disturbance from waves, currents, or boats.

How did different treatments perform over time?

- Manufactured wire reefs were the most likely to remain intact and in place for the first one to two years. Bagged oyster shell was the next most reliable technique. Coir logs failed in about 50 percent of installations, and Curlex® Blocs failed in all deployments in this study.
- Wire reefs were effective on shorelines where bagged oyster shell might wash away or sink into the mud. Oyster recruitment was slower and less consistent on wire reefs than bagged oyster shell, so they were generally slower to stabilize shorelines.

- Where successful (e.g., low current or wave environments), coir logs quickly trapped sediment, particularly when deployed higher on a shoreline; however, coir logs degraded in saltwater and lasted only two to three years. Their ability to stabilize marsh in the longer term, without periodic replacement, remains uncertain.



This flow chart shows living shoreline techniques (orange circles) that may be successful given particular site characteristics (blue circles).

What did homeowners think about projects installed on their shoreline?

- Private property owners were excited about the potential for living shorelines to improve the environment and their enjoyment of it, but expressed frustration with the lengthy, complex permitting process and the lack of a readily available and identifiable point-of-contact for regulatory questions.

Benefits

The data, presentations, and reports generated by this project have expanded knowledge about living shorelines in coastal South Carolina. South Carolina coastal resource management agencies now have locally-relevant, science-based information about living shoreline performance under varying environmental conditions. This information is expected to enable the state’s coastal zone management agency to simplify regulations, set standards for living shoreline projects, and review permit applications while regulations are being developed.

This project also represented an exciting opportunity for diverse agencies and organizations to come together to address an emerging issue in coastal South Carolina. Strengthened relationships will benefit next steps and ensure a tighter alignment between agency policies and the work of other organizations helping to advance the state of the knowledge regarding living shorelines. For example, project results will shape outreach programs and guidance for homeowners to help them select appropriate and sustainable options to protect their shorelines.

About the Science Collaborative

The National Estuarine Research Reserve System’s Science Collaborative supports collaborative research that addresses coastal management problems important to the reserves. The Science Collaborative is managed by the University of Michigan’s Water Center through a cooperative agreement with the National Oceanic and Atmospheric Administration (NOAA). Funding for the research reserves and this program comes from NOAA. Learn more at nerrsciencecollaborative.org or coast.noaa.gov/nerrs.