# End User-Derived Research to Improve the Effectiveness, Sustainability, and Prevalence of Coastal Restoration Projects

## Project Location

Weeks Bay National Estuarine Research Reserve, Alabama

## Project Duration

September 2015 to March 2019

## Project Lead

Eric Sparks
Mississippi State University and Mississippi-Alabama Sea Grant Consortium
*eric.sparks@msstate.edu*

## Project Type

Collaborative research – generating science that informs decisions

## Project Partners

- Alabama Department of Conservation and Natural Resources
- Dauphin Island Sea Lab
- Mobile Bay National Estuary Program
- The Nature Conservancy
- University of South Alabama
- Weeks Bay National Estuarine Research Reserve

## Project Webpage

*http://www.nerrssciencecollaborative.org/project/Sparks15*

## Overview

Degradation of coastal habitats has led to major declines in oyster reefs and coastal wetlands. Coastal restoration projects are critical to restoring these habitats, but they often include little to no monitoring or evaluation of success. Without monitoring and evaluation, it is difficult to make comparisons across restoration designs. This reality, in combination with limited "best practice" resources, significantly hinders coastal restoration projects.

This project quantified the functionality, sustainability, and cost-effectiveness of different coastal restoration designs at the Weeks Bay National Estuarine Research Reserve, comparing plots planted with nursery grown plugs to plots made of natural marsh, both with and without offshore breakwaters. What was learned from this research—along with the regulatory knowledge of the collaborative team—was combined with pre-existing literature to create user-friendly outreach materials such as living shorelines two-pagers for homeowners, living shorelines permitting guides and workshops, and a living shorelines workshop for consultants, landscapers, and marine contractors.

## Project Approach

The project included a manipulative field study to answer two questions identified by an advisory group of coastal managers and researchers: 1) how do offshore breakwaters affect shoreline vegetation and function? and 2) is it beneficial to plant behind breakwaters in high-wave energy climates? The study utilized breakwaters installed in 2012 along the eastern shore of Bon Secour Bay, Alabama, by The Nature Conservancy and Weeks Bay Reserve. The effectiveness of restoration designs was quantified using metrics associated with shoreline dynamics and elevation change; plant growth; fisheries enhancement; and water quality.

The project team also focused heavily on outreach activities to increase awareness of living shorelines among private landowners and contractors and provide them with informational and practical tools, including development of a low-cost wave gauge that measures wave energy—an important step in site assessment for determining living shoreline suitability and design.

All aspects of this project were accomplished through a collaborative process with an advisory group composed of natural resource professionals, land managers, researchers, and outreach specialists to ensure that the research answered questions of importance to them, and that products would be of use to target audiences. The group was engaged throughout the project, from conceptualization to completion, including informing refinements to the field study, planning and hosting workshops, and developing outreach materials.

## Results

The study produced two major findings about how breakwaters affect vegetation: 1) breakwaters can enhance natural vegetation in high wave-energy environments, given sufficient time; and 2) survival of planted vegetation in high-wave energy environments is minimal.

With regard to the effects of breakwater presence on faunal abundance and diversity, the study found that fish and invertebrate abundance was higher in breakwater sites than in no-breakwater sites. If the goal of a breakwater or living shoreline restoration project is to increase faunal abundance and diversity, then implementation of a breakwater, without planting, is sufficient in areas with habitat redundancy.

## Products

Targeted end users include contractors, landscapers, project managers, property owners, and anyone planning a shoreline restoration project. Products include

- Living shorelines workshops and accompanying fact sheets;
- Fact sheets that provide information about a variety of wetland plants that may be used for shoreline restoration projects;
- A step-by-step guide for using Google Earth to estimate shoreline erosion history;
- Homeowners' guides to living shorelines for Alabama, Mississippi, and Florida;
- Living shorelines permitting guides for Alabama, Mississippi, and Florida;
- A "do-it-yourself" wave gauge build tutorial; and
- A series of publications for *The Pelican Post, Extension Outdoors*, and the Mississippi-Alabama Sea Grant website.

## Benefits

The clearest and most impactful outcome of this project is the improved management of shorelines, particularly around Mobile Bay. Because of this project, local non-governmental organizations and natural resource agencies have reallocated resources for shoreline restoration projects in more suitable, low-energy areas, where they may have an immediate and larger positive impact. Furthermore, the project advisory group meetings and other presentations have led land managers and other natural resource managers to consider the tradeoffs associated with large-scale breakwater projects. This contributes to more cost-effective restoration projects by considering which projects will make a true impact, and making more informed decisions about how to spend restoration money.

Through presentations, workshops, and development of outreach materials, the project team has enhanced awareness of living shorelines as a stabilization option, including among waterfront property owners and contractors. The result has been an increasing number of requests from both property owners and contractors to assess shorelines for living shoreline implementation. Most of these individuals explained that they did not know about living shorelines as an option before an outreach event or publication from this project.

Finally, while still in the early stages of use, the low-cost wave gauges developed during the project are expected to lead to better site assessments and more successful restoration and preservation projects.

## What's Next

This project has been valuable for establishing and furthering the Coastal Conservation and Restoration Program within the Mississippi State University Coastal Research and Extension Center, especially for expanding the living shorelines component affiliated with Mississippi-Alabama Sea Grant that will continue to serve the region.

Results from this project have been leveraged to obtain funding for other projects, including: 1) the development of a living shoreline contractor certification course; 2) using wave gauges to map and assess the effects of wave climate on coastal ecosystems; and 3) developing a decision-support tool to help reduce runoff pollution in coastal waters through marsh restoration.

**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 nerrssciencecollaborative.org or coast.noaa.gov/nerrs.*