



Example of monitoring a living shoreline site. Photo credit: Mariko Polk

## Measuring Multifunctionality of Living Shorelines, North Carolina

### Project Overview

This project analyzes three living shorelines implemented in North Carolina at different sites that ranged in context (from low-moderate development to high development) and age (installation years were 2005, 2010, and 2011).

Project analysis was designed to assess the ecological multifunctionality of living shorelines across sites by comparing the ecosystem functions of unprotected marsh shorelines and marsh sill living shorelines through analyzing the physical and biological functions provided by salt marshes.

### Key Takeaways

- Regardless of the project's original goal, all living shorelines in this study reduced wave energy and slowed erosion, with some even resulting in sediment accretion.
- While physical functions of the environment performed differently with the presence of living shorelines, benthic functions suggested similar functionality.
- Take pictures of your sites. Photos offer rich information about how sites change over time.

### Project Context

Living shorelines are installed for many different reasons, including education and demonstration, erosion reduction, and marsh habitat preservation. Each project may have a different aim or end goal. This study ignored these initial goals to focus on measuring ecosystem function (physical and biotic outcomes) across short- and long-term timeframes.

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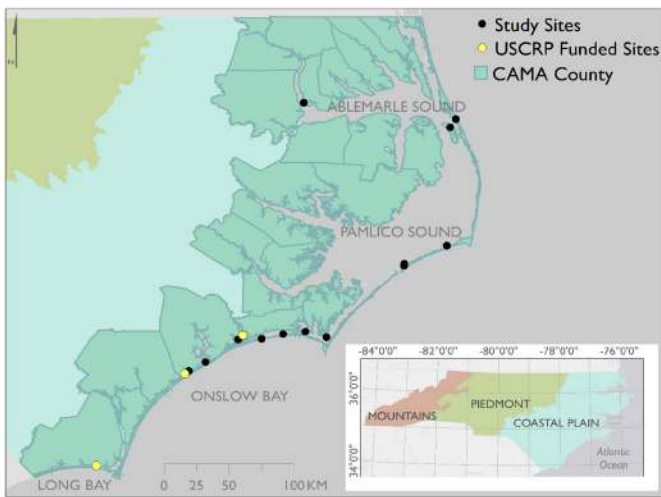
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Locations of studied living shoreline sites.

Photo credit: Mariko Polk

## Results

Overall, there were measurable differences in physical functions at living shoreline sites relative to control sites and similar biotic functions between living shoreline sites and control sites.

- Mollusk population and vegetation characteristics metrics were similar among all living shoreline and control studies.
- Similar to other studies in the region, carbon stocks were found to be generally less compared to unprotected sites. Bulk density was much higher, sediment accumulation was much higher, and below-ground biomass was much lower among living shoreline sites, which can strongly influence carbon sequestration.
- Rapid accumulation of sediment with larger grain size occurred at some sites behind the sill structure at a rate that influenced the overall capacity to sequester carbon.
- The presence of the sill structure at living shoreline sites reduced the amount of wave energy impacting the sites between 23 to 83%, depending on the season.



## Implications for Practice

Success in improving ecosystem function was seen at all living shoreline sites. Results showing comparative success between mollusks at study and control sites are an indicator that living shoreline projects have the capacity to sustain important marsh species critical to sustaining fisheries. Lastly, living shorelines were shown to substantially reduce the impacts of wave energy.

## Featured Researcher: Dr. Mariko Polk

Dr. Mariko Polk serves as the Coastal Processes Specialist for NC Sea Grant and is positioned at UNCW Center for Marine Science. In her position, she serves as a resource for coastal processes and hazards including hurricanes, sea level rise, and climate change. In 2019, USCRP funded Dr. Polk's project, "Multidisciplinary quantification of biogeomorphological impacts of living shorelines."

## Relevant Links

- [Dr. Mariko Polk's LinkedIn](#)
- [Dr. Mariko Polk's Google Scholar](#)
- [NC Sea Grant Team Page](#)
- [USCRP 2019 Funded Research](#)
- [Ecosystem Function and Biogeomorphology of Living Shorelines](#)
- [Building Coastal Resilience Through Shoreline Management](#)
- [Polk MA, RK Gittman, CS Smith, DO Eulie \(2022\) Coastal resilience surges as living shorelines reduce lateral erosion of salt marshes. Integrated Environmental Assessment and Management, 18\(1\):82-98](#)
- [Correll-Brown R, EH Wellman, DO Eulie, Scyphers SB, Smith CS, Polk MA, Gittman RK \(2022\) Shifting Baselines May Undermine Shoreline Management Efforts in the United States. Frontiers in Climate, 4, 719109](#)
- [Polk M A, DO Eulie \(2018\) Effectiveness of living shorelines as an erosion control method in North Carolina. Estuaries and Coasts, 41\(8\):2212-2222](#)

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