Oyster and Salt Marsh Edge Interactions: Informing Living Shoreline and Oyster Restoration Design

Principal Investigator: James Byers, University of Georgia Odum School of Ecology

ABSTRACT

This project will expose the spatial relationships and mechanisms of interaction between the two dominant ecosystem engineers of Georgia's estuaries — Spartina cordgrass and oyster reefs — as well as how their distributions and relationships are likely to change over time. The research is intended to directly inform resource management (Oyster Restoration and Living Shorelines design) and predictive modeling – Sea Level Affecting Marshes Model.

We recognize that there is often insufficient communication between research and stakeholders. For this reason, a cross-cutting objective for our entire project is partnership and communication via audience-appropriate means. From this project's inception we have gained advice and support from stakeholders such as DNR, MAREX and TNC and will continue to do so through the project's progression. These partners will be critical in helping to disseminate results by useful and intuitive means, e.g. hosting a stakeholder workshop.

Elevated temperatures as a result of Climate Change, coupled with Sea Level Rise, are likely to have dramatic effects on oyster and Spartina distribution patterns. Here we examine the effect of predicted elevated air temperatures on oysters and Spartina, both separately and combined in a field and mesocosm experiment. Variable air temperatures will be created through the use of small greenhouses. Temperature will be regulated by thermostat controlled cooling vents. We will analyze survival probabilities of the two species as a function of species combinations (i.e., solo or combined), temperature, and tidal height. We will also investigate oyster reef accretion potential under present and predicted temperatures. Oyster reef accretion potential has been shown to be greater than extreme SLR predictions in North Carolina, however Georgia oyster reef ecology has been shown to function differently than regions even 100 miles north or south. We will measure accretion potential using oyster growth rates across intertidal reef gradients.

This project is designed to understand interactions and spatial distributions of oyster reefs and Spartina stands, and to assess how these interactions and distributions will change under future climate conditions. The ecosystem services that healthy oyster reefs and Spartina stands provide will play a critical role in coastal adaptation to the effects of Climate change and sea Level Rise, and will help to buffer severe climatic events. Living Shorelines and Oyster Restoration projects or “green infrastructure”, here defined as planned and managed natural and semi-natural systems, can provide more enhanced ecosystem services then traditional gray infrastructure like sea walls, and can help prepare for these future climatic challenges. In Georgia, a coalition of marine stakeholders (including Georgia Department of Natural Resources, The University of Georgia Marine Extension Service, Sapelo Island National Estuarine Research Reserve, The Nature Conservancy and Coastal Conservation Association), are working together in partnership to prioritize and design Oyster Restoration and Living Shoreline projects. Unfortunately, Living Shoreline and Oyster Restoration design in the state is still under development, and due to the unique nature the of the Georgia coast, technologies that have been developed in other states are not always applicable here. Without a clear understanding of how these species respond to environmental conditions and interact with one another, the usefulness of these designs will be limited. It is essential that we understand how these biotic interactions operate now, and how they are likely to behave in the future. This study is timely, as it will help improve available data, empowering vulnerable communities with the information necessary to make informed decisions about policies, technologies and models that affect their lives.