



# Stakeholder-driven Modeling to Understand Oyster Population Sustainability

## Overview

The Eastern oyster (*Crassostrea virginica*) is a keystone species in northeast Florida estuaries, including at the Guana Tolomato Matanzas Research Reserve. In addition to providing important ecosystem services, such as water filtration and shoreline protection, the oyster supports a valuable recreational and commercial fishery. However, scientists, managers, and oyster harvesters are concerned about the long-term persistence and viability of local populations. In the Guana Tolomato Matanzas Reserve, water quality issues are causing some areas to be closed for harvesting, which could be intensifying harvesting pressure in remaining open areas. Other factors, such as predation, disease, and increased salinity, can also slow growth or kill oysters. This complicated situation recently led stakeholders and reserve staff to establish the Guana Tolomato Matanzas Oyster Water Quality Task Force in order to identify causes and collaboratively address the region’s oyster challenges.

This project builds on this existing partnership by conducting a collaborative scientific modeling investigation to improve oyster population assessment and management. Incorporating the input of end users and local stakeholders, the project is adapting an existing oyster population model to study the relative influence of anthropogenic and environmental factors on oyster populations and identify variables that should be monitored to assess long-term sustainability.

### Project Location

Guana Tolomato Matanzas National Estuarine Research Reserve, Florida

### Project Duration

September 1, 2018 to August 31, 2019

### Project Lead

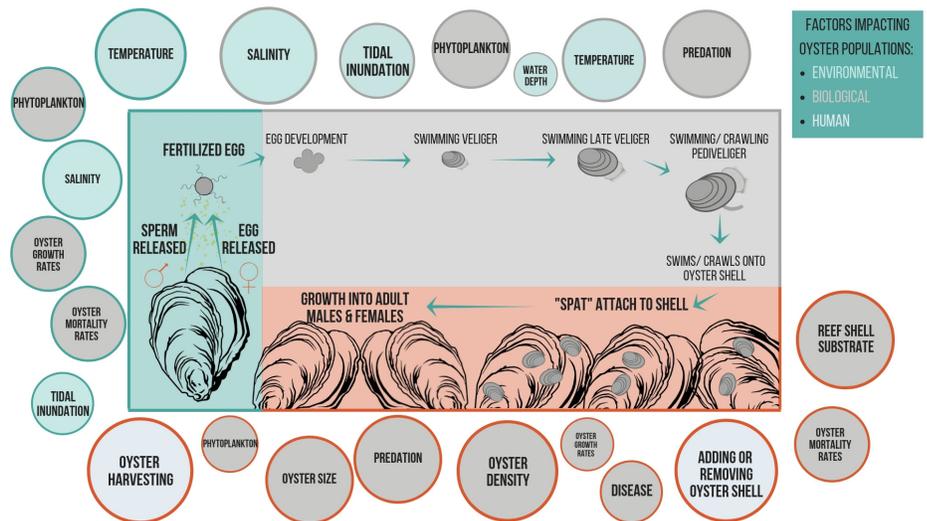
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### Project Type

Catalyst – Targeted investment for advancing collaborative science

### Project Partners

- Guana Tolomato Matanzas National Estuarine Research Reserve
- Northeastern University
- Oregon State University



## Anticipated Benefits

- Improved understanding of oyster population dynamics in the reserve.
- Enhanced science-based decision making about future monitoring, restoration, and education efforts in and around the reserve.
- Enhanced communication and collaboration among team members, end users, and stakeholders.

## Project Approach

The project team is adapting an existing model (a size-structured integral projection model) previously developed to study oyster populations in Apalachicola Bay, Florida. They are re-parameterizing the model with existing, locally-specific data, as well as with new field data on oyster growth and mortality that will be collected by the project team members in the reserve in a concurrent National Science Foundation-funded project. Throughout the project, the team is hosting quarterly meetings to engage end users from the Guana Tolomato Matanzas Oyster & Water Quality Task Force and provide feedback on model development and analyses.

Once the oyster population model is developed, the team will conduct sensitivity analyses to estimate the relative influence of environmental factors and harvesting on expected reproduction and growth of oyster reefs in different areas. This will reveal regions of the reserve that are most sensitive to harvesting. Additionally, they will identify high-reproduction, high-resilience areas of the reserve by conducting a sustainability refuge analysis, which will identify ideal locations for oyster reef restoration. The team will also use the model to identify metrics that should be collected in the field to inform future assessments of population sustainability. Additional analyses will simulate the effects of two harvesting practices on oyster reproduction and population sustainability, and will allow the team to make recommendations about managing harvest in the reserve.

## Targeted End Users and Anticipated Products

Research products are intended to support oyster management efforts by reserve staff and the Oyster & Water Quality Task Force, as well as coastal managers in Northeast Florida and beyond, who are concerned about oyster populations. Key information products include

- A mathematical model of oyster population dynamics, customized for the oyster reefs in the Guana Tolomato Matanzas Reserve;
- Estimates of oyster population sustainability and driving factors for distinct regions of the reserve;
- Monitoring, restoration, and harvesting recommendations; and
- Training for reserve staff in how to use the oyster population model.

### 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 [coast.noaa.gov/nerrs](http://coast.noaa.gov/nerrs) or [graham.umich.edu/water/nerrs](http://graham.umich.edu/water/nerrs).*