



# Evaluation of the Ecosystem Services of Shellfish Culture Operations in North Carolina

## Overview

The North Carolina National Estuarine Research Reserve is interested in better understanding the potential impacts of shellfish cultivation on wild shellfish resources. While ecosystem services provided by wild oysters, such as water filtration and nutrient cycling, are often also attributed to shellfish farming, recent siting of shellfish farms in a coastal reserve has raised some concerns for resource managers. North Carolina's shellfish aquaculture industry has been small but stable for over 30 years; however, current legislative changes are aimed at creating the potential for rapid growth. The southern portion of the North Carolina coast has consistently provided more than 50 percent of the wild harvest in the state, which has contributed to the interest in creating oyster farms throughout the region.

This project will assess the ecosystem services of shellfish farming by measuring impacts of newly established farms in the North Carolina Research Reserve. Because there is an opportunity to assess conditions before farm installation, North Carolina estuaries provide an ideal place to measure these effects. Two years of intensive sampling in and adjacent to oyster farms, concentrating on wild shellfish resources and the physical and chemical environment, will aim to link small-scale changes with larger-scale ecosystem-level alterations. Coastal managers, state agencies, and shellfish farmers will provide input throughout the course of the project to ensure that the study parameters align with decision-making needs. The project will culminate with the production of visualization tools and models to allow resource managers, culturists, and reserve staff members to make better decisions when determining the locations and scales of shellfish farming operations.

### Project Location

North Carolina National Estuarine Research Reserve

### Project Duration

November 2016 to October 2019

### Project Lead

- Dr. Elizabeth Darrow, Lead University of North Carolina Wilmington (910) 962-7153 and [darrowe@uncw.edu](mailto:darrowe@uncw.edu)
- Troy Alphin, Martin Posey, Susanne Brander, Aswani Voley – University of North Carolina Wilmington
- Brandon Puckett – North Carolina National Estuarine Research Reserve
- Joao Ferreira – Longline Environment Ltd
- Suzanne Bricker – NOAA
- Tim Holbrook, Al Smeilus, Matt Schwab – Oyster farmers

### Project Type

Collaborative Research – generating science that informs decisions

### Project Partners

- Longline Environment Ltd
- North Carolina National Estuarine Research Reserve
- National Oceanic and Atmospheric Administration
- Oyster farmers
- University of North Carolina Wilmington

## Anticipated Benefits

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- Stronger relationships among diverse groups interested in shellfish farming in North Carolina.
- Decision-making support for end users, including shellfish growers, regulators, industry groups, and resource managers.
- Advanced scientific knowledge on southeastern North Carolina oyster populations and habitat.

## Project Approach

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This project will evaluate the potential ecosystem services and impacts of the developing shellfish industry by applying a “before after-control impact” study design. The project team will measure environmental and ecological parameters and metrics of oyster health before and after the establishment of oyster farms. The study parameters will focus on wild shellfish population health, water and sediment quality, and biomass and diversity of estuarine species. To maximize the time and resources available, the research team will seek input from end users, including reserve managers, state agencies, and shellfish culturists to refine the list of parameters and study locations. This group of end users will be regularly updated and asked to provide additional feedback, as data products are developed and refined. The goal is to provide consistent data on wild shellfish resources and the physical and chemical environment (i.e., organic enrichment, oyster gene expression), specifically looking at potential ecosystem-level alterations. Site-specific measurements of feeding and growth rates of aquacultured oysters will be used in models predicting oyster farm impacts on phytoplankton food and nitrogen cycling. Data, visualization tools, and models created by this effort will inform resource managers’ (including reserve staff members and culturists) decision-making related to the locations and scales of aquaculture operations.

## Targeted End Users and Anticipated Products

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- Key data and carrying-capacity model predictions for coastal managers (North Carolina Division of Marine Fisheries) to understand the potential tradeoffs associated with oyster aquaculture.
- A decision-support tool for reserve managers to establish shellfish cultivation guidelines for the reserve.

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### 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).*