

Project Partners:

- University of North Carolina Wilmington
- North Carolina National Estuarine Research Reserve
- NOAA National Centers for Coastal Ocean Science
- Longline Environment, Ltd.



DESCRIPTION

North Carolina’s shellfish aquaculture industry has been small but stable for over 30 years, however, regulatory changes are creating a climate for potential rapid growth. Increased interest in shellfish aquaculture has placed pressure on resource managers making siting decisions, including whether to site aquaculture within the North Carolina National Estuarine Research Reserve (NCNERR). New farms provide an opportunity to assess conditions after farm installation, making North Carolina estuaries an ideal place to explore the ecosystem services of shellfish farming. This project aimed to link small-scale changes around oyster farms with larger-scale ecosystem-level alterations, and provide local assessment of ecosystem services to be considered by decision-makers.

OBJECTIVES

- Use stakeholder guidance to develop a decision-support tool to incorporate environmental impact and ecosystem service criteria into aquaculture siting decisions
- Collect new field, lab, and modeling data on shellfish cultivation impacts on: wild oyster resource, habitat, and water quality in a NCNERR site (Masonboro Island) and a site outside of the Reserve (New River)
- Develop a better understanding of environmental influences of shellfish cultivation in the NCNERR and other regions in southern North Carolina

FINDINGS

WATER



No changes across farms or in farms compared to non-farmed areas

SEDIMENTS



Localized, limited increases in ammonium under farms in some months

WILD OYSTERS



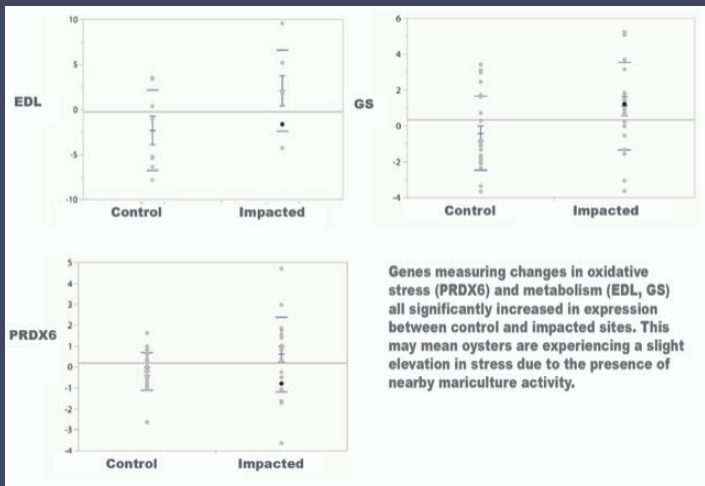
Higher density and larger oysters on reefs nearer to farms

HABITAT

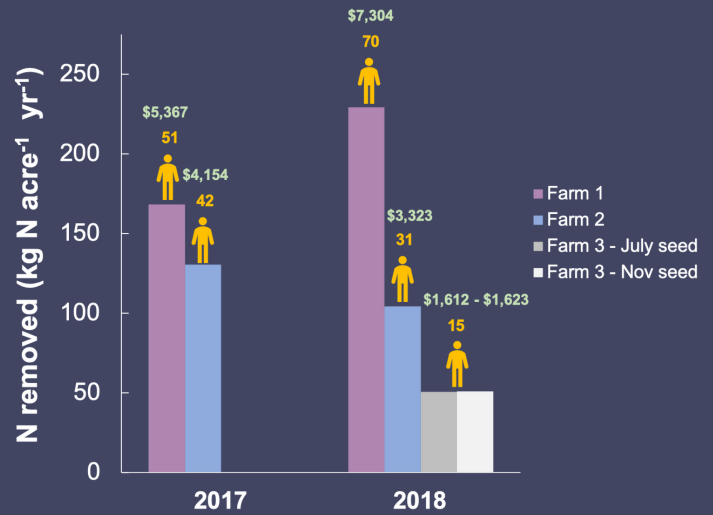


Higher abundance of motile animals around structures: wild reefs and farms

OYSTER STRESS BIOMARKERS



NITROGEN OFFSET

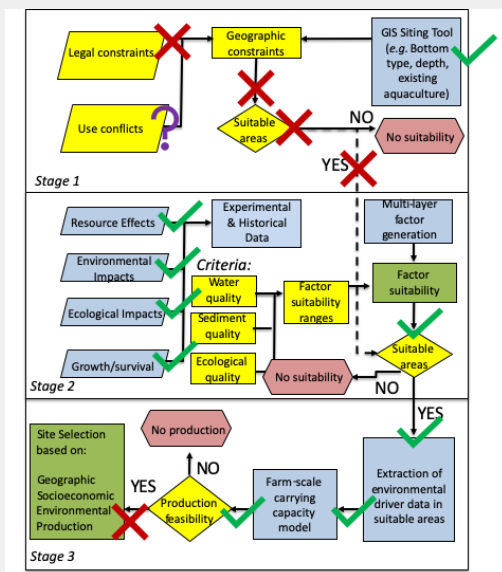


- Few environmental changes were observed due to shellfish aquaculture
- One exception was molecular biomarkers, some of which were elevated in wild oysters grown nearer to farms
- Watershed nitrogen removal by oysters was 50 - 230 kg N (15 - 70 population equivalents) per leased acre per year
- A conservative valuation of this avoided nitrogen treatment cost is \$1,600 - \$7,300 per leased acre per year

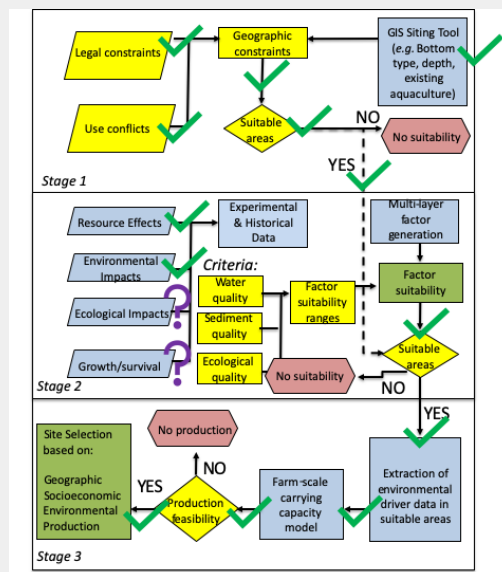
IMPLICATIONS

Prior to the project's end, a decision was made about leases in Masonboro NCNERR that did not incorporate proposed environmental criteria, but was based on Masonboro's status as a Dedicated Nature Preserve. These Legal constraints are shown in our Decision-Support Tool (below) for **Masonboro** indicating that *these leases were unable to proceed beyond that consideration (Stage 1)*. This decision was made before project data were available, which showed a *lack of environmental or ecological impacts (Stage 2)* as well as *successful growth, harvest, and nitrogen sequestration by farmed oysters (Stage 3)*. The **New River** lease had *limited legal constraints (Stage 1)* or *environmental impacts (Stage 2)*, and had *suitable production and substantial nitrogen sequestration (Stage 3)*.

MASONBORO



NEW RIVER



Stakeholders' Takes on Project Findings:

"There is possibly less environmental impact of shellfish aquaculture within a Reserve than outside, but also less opportunity to have a positive effect on water quality."

"The sites that are most preferable for aquaculture siting could be sites where water quality could benefit the most."

For more information: <http://www.nerrsciencecollaborative.org/project/Darrow16>

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