

NUTRIENT BIOEXTRACTION INITIATIVE



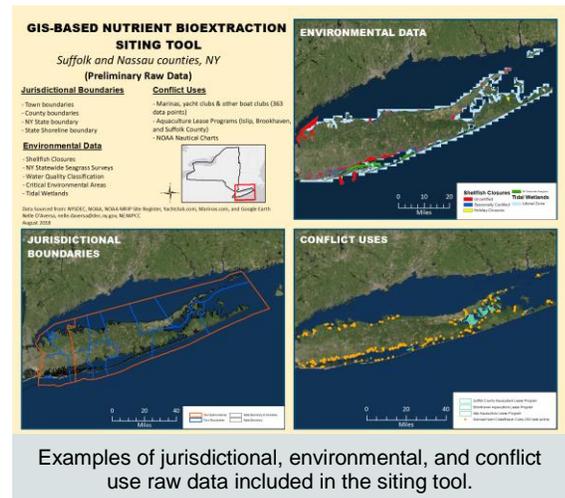
Department of Environmental Conservation

Introduction. In the United States, 65% of estuaries and coastal bays are moderately to severely degraded by nutrients from agriculture and urban runoff, atmospheric disposition, and wastewater treatment plant discharges.¹ Reductions to nutrient loading from land-based sources have been the focus of management strategies to mitigate eutrophication and its effects on coastal ecosystems.² Despite successful efforts to reduce point sources of nitrogen, nonpoint sources continue to enter embayments from stormwater runoff and groundwater discharges.

Nutrient Bioextraction Overview

One way to reduce nitrogen concentrations in New York State and Connecticut marine waters is through nutrient bioextraction – the use of seaweeds and shellfish to extract nitrogen through biological processes.

Nutrient bioextraction is an effective nonpoint nutrient management strategy, in addition to existing land-based nutrient management efforts in urban estuaries, like the Long Island Sound.³ Shellfish and seaweed provide other ecosystem services such as habitat for fish and crustacean species and improved water clarity for submerged aquatic vegetation. This makes nutrient bioextraction a valuable strategy in a comprehensive water quality management program.⁴



Examples of jurisdictional, environmental, and conflict use raw data included in the siting tool.

Purpose



Farmers in training learning how to harvest sugar kelp. Photo by GreenWave.

The Bioextraction Initiative is driven by data and modeling and guided by a technical advisory committee composed of regional experts from academic institutions; local, state, and federal agencies; nonprofit organizations; and the aquaculture industry.

The project will investigate the efficacy of and potential challenges involved in advancing seaweed and shellfish aquaculture to remove excess nitrogen loads from New York and Connecticut surface waters by reporting on the regulatory processes required for bioextraction aquaculture operations and tracking seaweed aquaculture developments. In addition, this project will develop a GIS-based siting tool to identify where bioextraction will be most effective and generate the fewest user conflicts. Finally, the project will deliver market information for bioextracted products and the economics of bioextraction.

¹ Bricker, S.B. et al. "Effects of Nutrient Enrichment in the Nation's Estuaries: A Decade of Change." *Harmful Algae*, vol. 8, no. 1, 2008, pp. 21-32.

² Kim, J.K. et al. "Use of Sugar Kelp Aquaculture in Long Island Sound and the Bronx River Estuary for Nutrient Extraction." *Marine Ecology Progress Series*, vol. 531, 2015, pp. 155-166.

³ Bricker, S.B. et al. "Role of Shellfish Aquaculture in the Reduction of Eutrophication in an Urban Estuary." *Environmental Science & Technology*, vol. 52, 2018, pp. 173-183.

⁴ Rose, J.M. et al. "Comparative Analysis of Modeled Nitrogen Removal by Shellfish Farms." *Marine Pollution Bulletin*, vol. 91, no. 1, 2015, pp. 85-190.

Project Outcomes

The results of this project will contribute to a better understanding of the value of nutrient bioextraction as a nutrient management measure.

The outcomes of the project will provide information and guidelines to help decision makers facilitate public and private seaweed and shellfish farming and harvest operations in their coastal waters. Ultimately, this project will support New York and Connecticut's shellfish and seaweed aquaculture industries, water quality improvements in coastal waters, ecosystem services valuation, and the nitrogen reduction goals of New York State's multi-faceted Long Island Nitrogen Action Plan.

The Bioextraction Initiative is a project of the New England Interstate Water Pollution Control Commission, in collaboration with the NYS Department of Environmental Conservation and the Long Island Regional Planning Council with funding from the U.S. Environmental Protection Agency's Long Island Sound Study.

KEY POINTS

- This project facilitates water quality improvements in New York and Connecticut marine waters by removing excessive nitrogen through bioextraction.
- This project will report on and deliver:
 - GIS-Based Bioextraction Siting Tool
 - Nitrogen removal rate database
 - Current federal, state, and local shellfish and seaweed aquaculture regulatory processes; and new and streamlined permitting needs
 - Market information for bioextracted products and the economics of bioextraction

For more information, please visit: <https://on.ny.gov/NutrientBioextraction>

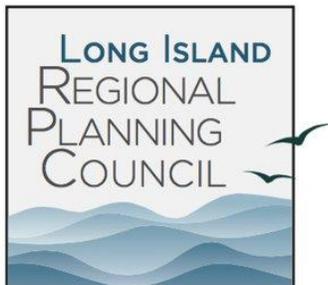
CONTACT INFORMATION

Nelle D'Aversa

Environmental Analyst
Long Island Sound Study
Bioextraction Coordinator

New York State Department of Environmental Conservation

50 Circle Road, Stony Brook, NY 11790
P: (631) 380-3317 | F: (631) 444-0424 | nelle.daversa@dec.ny.gov
www.dec.ny.gov



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