LONG ISLAND SOUND PARTNERSHIP

NEW YORK STATE Department of Environmental Conservation

NEIWPCC

Long Island Sound Nutrient Bioextraction Initiative

NEIWPCC Executive Committee & Commission Meeting
September 12, 2025

Presentation Agenda

1. Background
2. Nutrient Bioextraction Initiative
3. Long Island Sound Partnership
4. Project Highlights
5. Looking Ahead

Background

Long Island Sound – An Estuary of National Significance

- Freshwater + salt water = estuary
- Biodiversity – animals, plants, habitats
  - Feeding, breeding, nursery grounds for fish, birds, shellfish
- Coastal communities > 4 million people
  - Commercial, recreation and leisure, environmental stewardship
- Activities in Sound generate > $9B/year
  - Small coastal businesses

Long Island Sound - The Urban Sea


Credit:Seaport

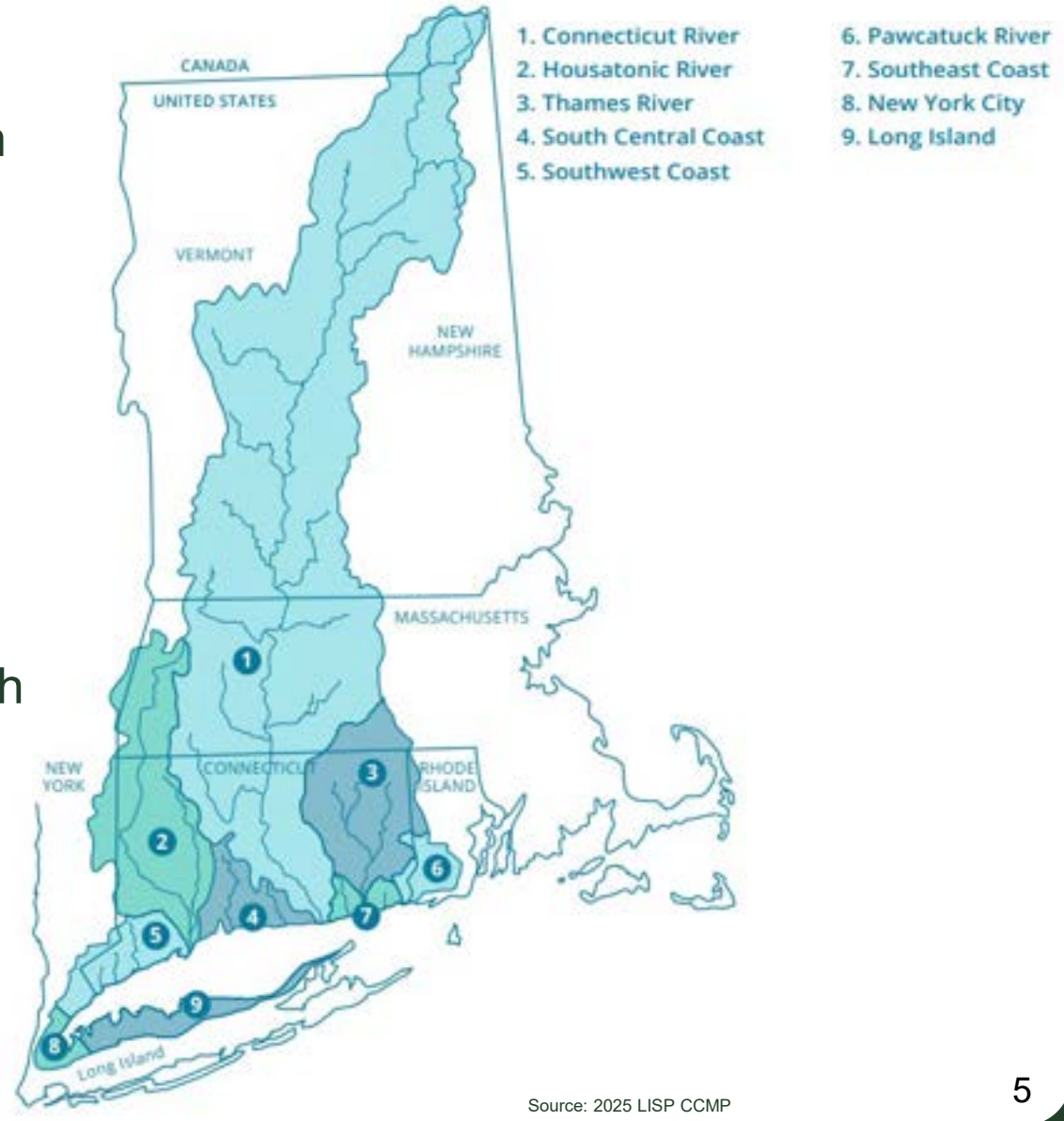

Credit: Welcome to the Bronx


Credit: Captain Joby Vinarski


Credit: Orient By The Sea

Long Island Sound Watershed Across the Northeast

- 2025 LIS CCMP expanded program study area from NY and CT → full watershed
  - NY, CT, RI, MA, VT, NH
  - 16,000 square miles
  - > 9 million people
- Expand communication, cooperation, engagement
- Goal: Protect and restore Long Island Sound through collective actions in watershed



Source: 2025 LISP CCMP

Nitrogen Impaired Waters of Long Island Sound

Excess nitrogen (N) – leading cause of water quality issues in LIS

→ harmful algal blooms

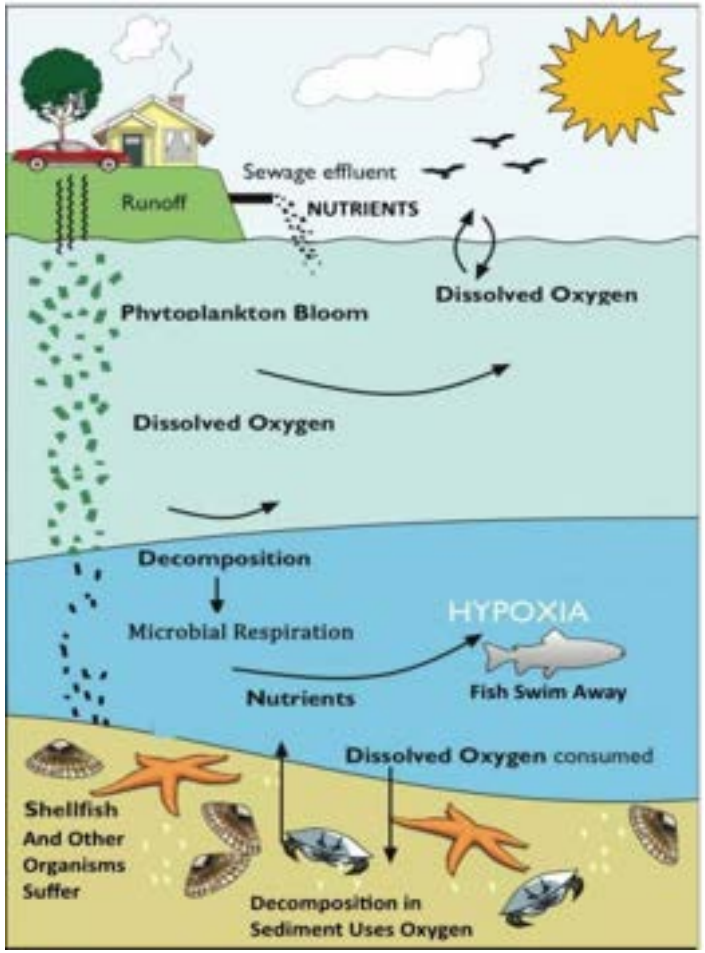
→ low oxygen in water (hypoxia)

→ fish die-offs

→ loss and degradation of vital habitats

→ concerns to human health

Fish die-off in Manhasset Bay/LIS, Credit: Kimarie Yap



Source: National Coastal Condition Report IV, EPA-B42-R-10- 003 (April 2012), modified by CTDEEP.

Sources of Nitrogen Pollution in Long Island Sound

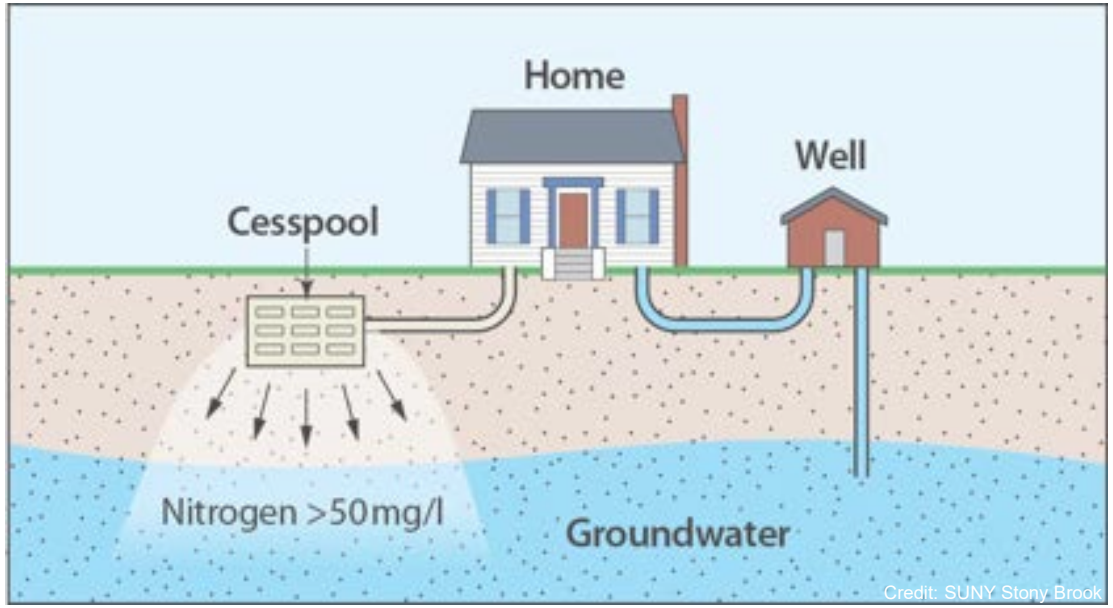
Point Source of Nitrogen – Wastewater treatment plants

- 1990s – NY, CT, and EPA recognized need to improve Long Island Sound water quality
  - Worked together to develop TMDL – set 60% nitrogen reduction goal through wastewater treatment plant upgrades
- 2016 – met goal
- Area of hypoxia reduced, but work left to do for non-point sources and legacy (existing) nitrogen

Sources of Nitrogen Pollution in Long Island Sound

Non-Point Sources of Nitrogen – Septic systems, cesspools, runoff

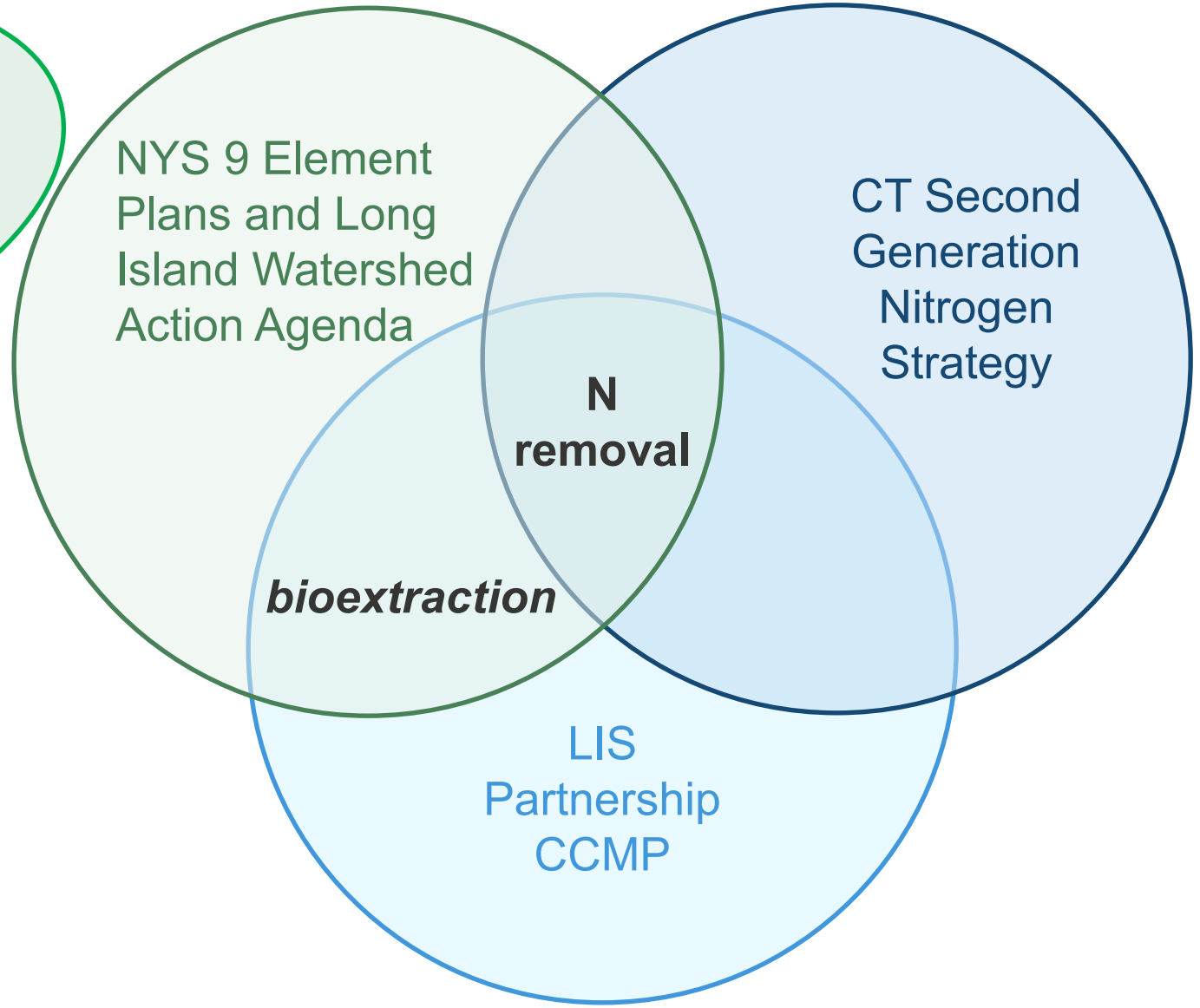
- Remains significant source of N to LIS from NY and CT
- More difficult to manage
- Widely dispersed
- Current focus for reductions



Bi-State and Federal Priority: Nitrogen Removal

Land-based management strategies NOT enough to meet N reduction goals → Need in-waterbody removal strategy!

EPA Nitrogen Reduction Strategy for LIS



Nutrient Bioextraction Initiative

Nutrient Bioextraction


Fish die-off in Manhasset Bay/LIS, Credit: Kimarie Yap

N


Wild ribbed mussels, Credit: NOAA Milford/Mark Dixon

- Shellfish and seaweed take up nitrogen from water as they grow and develop
- Bioextraction – grow and harvest shellfish and seaweed to remove nutrient pollution
- Only in-waterbody management approach to remove existing N in LIS waterbodies
- **Solution: Improve water quality in LIS by growing and harvesting shellfish and seaweed to remove nitrogen pollution where it's most needed**

Nutrient Bioextraction Initiative: History and Goals

- 2018 – NYSDEC Long Island Nitrogen Action Plan launched Bioextraction Initiative
  - In partnership with NEIWPCC and Long Island Regional Planning Council (NY)
  - Funded by LIS Partnership

- **Goal: Establish industry to make bioextraction a sustainable, long-term management strategy**
  - Research technical bottlenecks, nutrient removal rates, market opportunities
  - Create resources on navigating regulations
  - Facilitate communications and partnerships

Bren Smith harvesting sugar kelp off Thimble Islands in Branford, CT. Credit: Ron Gatreau

Current Aquaculture vs Bioextraction Industry

Current Aquaculture Industry in LIS	Bioextraction Industry
Existing NY and CT shellfish and seaweed aquaculture industries with bioextraction co-benefit	Expand existing aquaculture industry to N-impaired waters where bioextraction most needed

Bioextraction Initiative laying foundation to build new bioextraction industry to complement existing management practices and reach N reduction goals

Nutrient Bioextraction Initiative: Vision

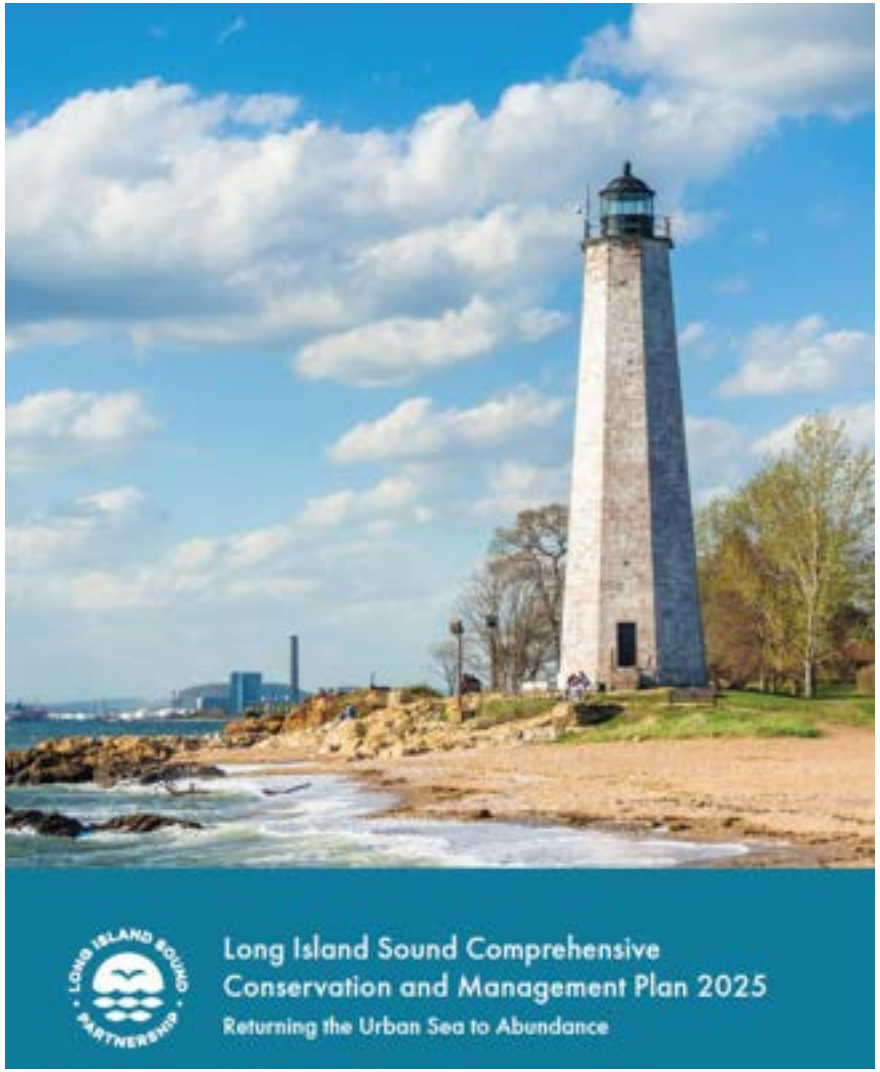
Manhasset Bay sunrise, photo credit: Kimarie Yap

Applying LIS-grown kelp fertilizer to Bayville, NY native plant garden, photo credit: Kimarie Yap

- Improved water quality and cleaner waters in Long Island Sound
- Strengthen coastal economies, local businesses, and communities
- Provide environmental stewardship opportunities

Long Island Sound Partnership

Bioextraction in LIS Partnership CCMP - Goal



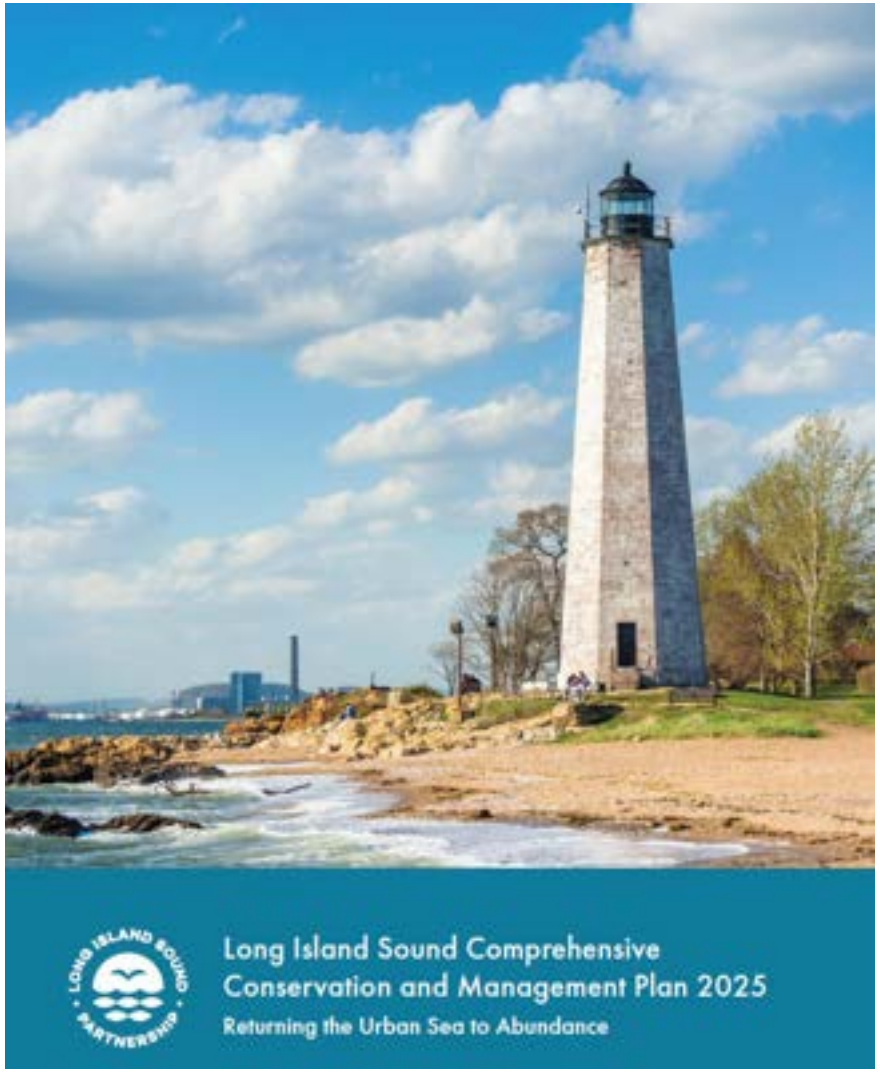
1 CLEAN WATERS AND HEALTHY WATERSHEDS

2 THRIVING HABITATS AND ABUNDANT WILDLIFE

3 SUSTAINABLE AND RESILIENT COMMUNITIES

4 INFORMED AND ENGAGED PUBLIC

Bioextraction in LIS Partnership CCMP - Objective



1 CLEAN WATERS AND HEALTHY WATERSHEDS

Nutrients: Reduce nutrients across the watershed to restore and protect water quality and mitigate impacts on ecosystem health in Long Island Sound and its embayments.

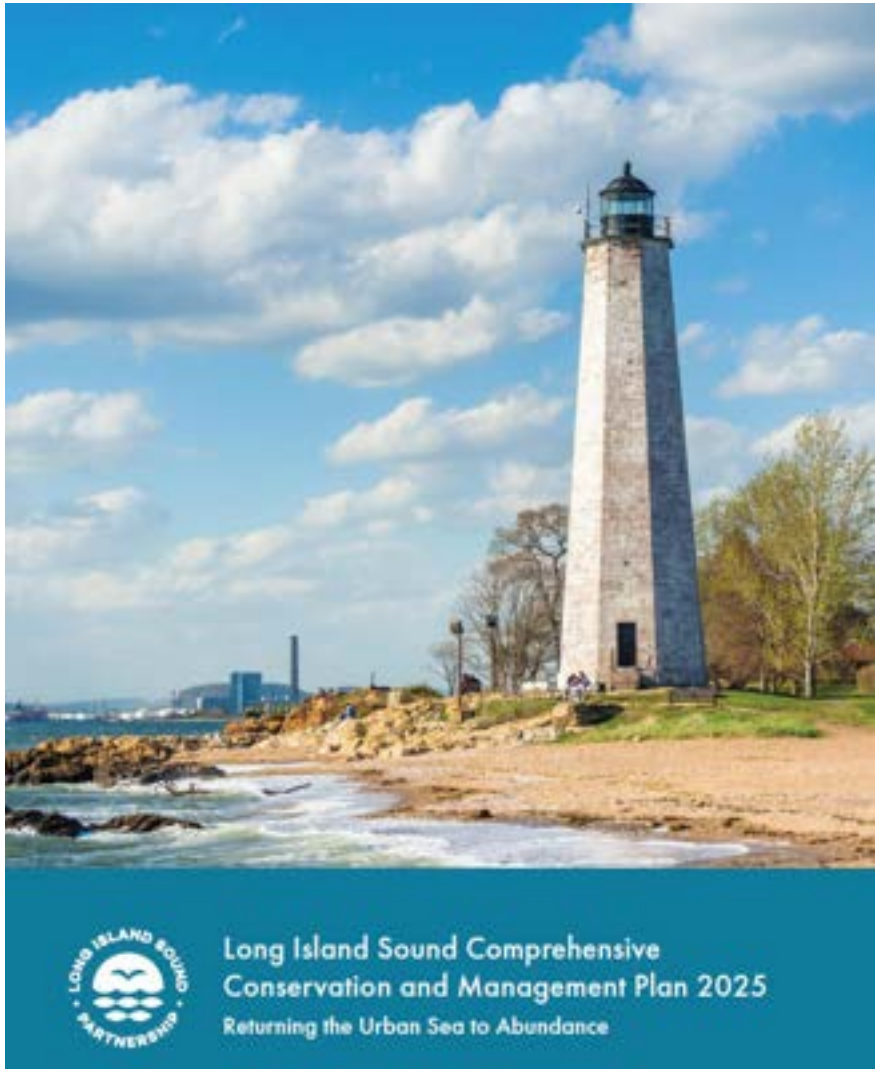
Watershed Health: Improve the ecosystem health of Long Island Sound and its watershed through protection and positive land use practices.

Pathogens: Reduce pathogens and increase monitoring to protect water quality and human health, ensuring safe recreational and commercial use.

Toxic Contaminants: Research, monitor, assess, and support mitigation efforts on emerging and legacy toxic contaminants to reduce impacts on water and habitat quality in Long Island Sound.

Marine Debris: Achieve trash free waters by increasing clean-up efforts and preventing marine debris from entering Long Island Sound.

Bioextraction in LIS Partnership CCMP - Actions



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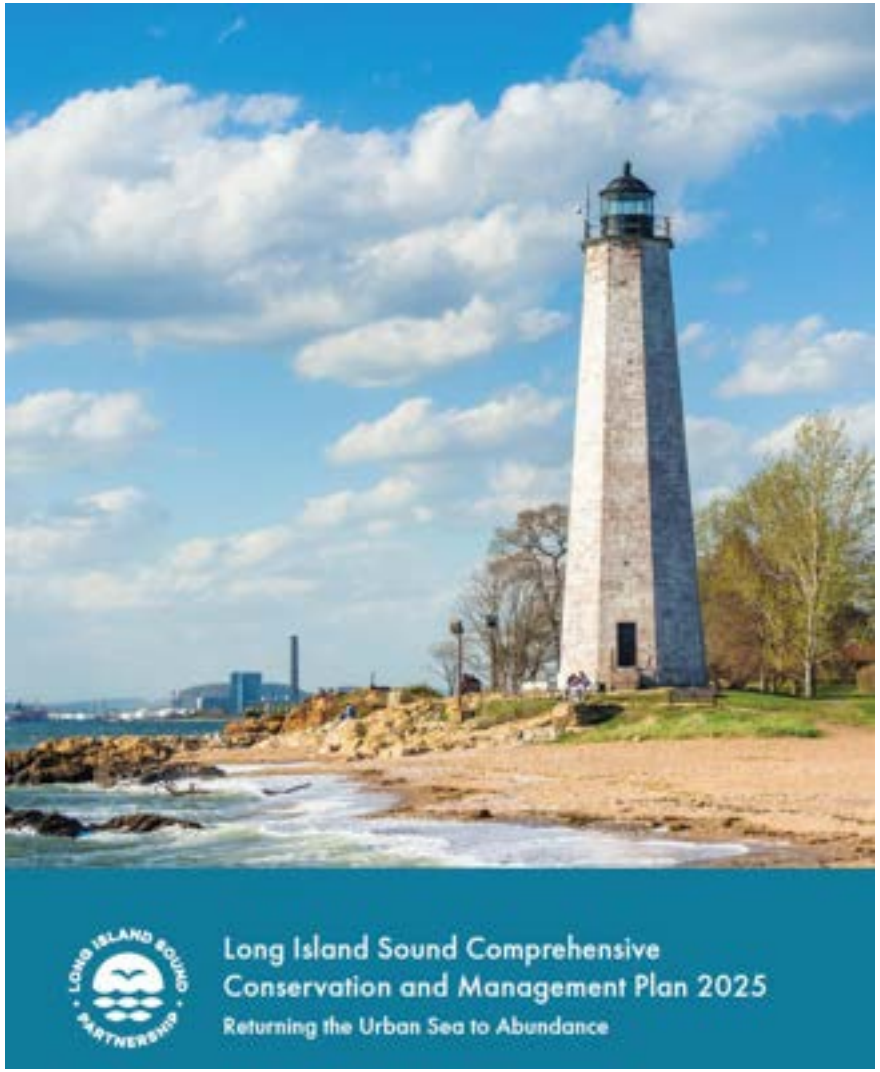
ACTIONS

- Implement nutrient reduction actions across the LIS watershed focusing on the most impactful sources.
- Support monitoring, modeling, and research, to improve understanding of source contributions, their impacts to ecosystem health, and the benefits of nutrient reduction actions.
- Collaborate with stakeholders and partners to develop plans, tools, and strategies that support nutrient reduction actions.

Bioextraction in LIS Partnership CCMP – Action Descriptions



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ACTION DESCRIPTIONS

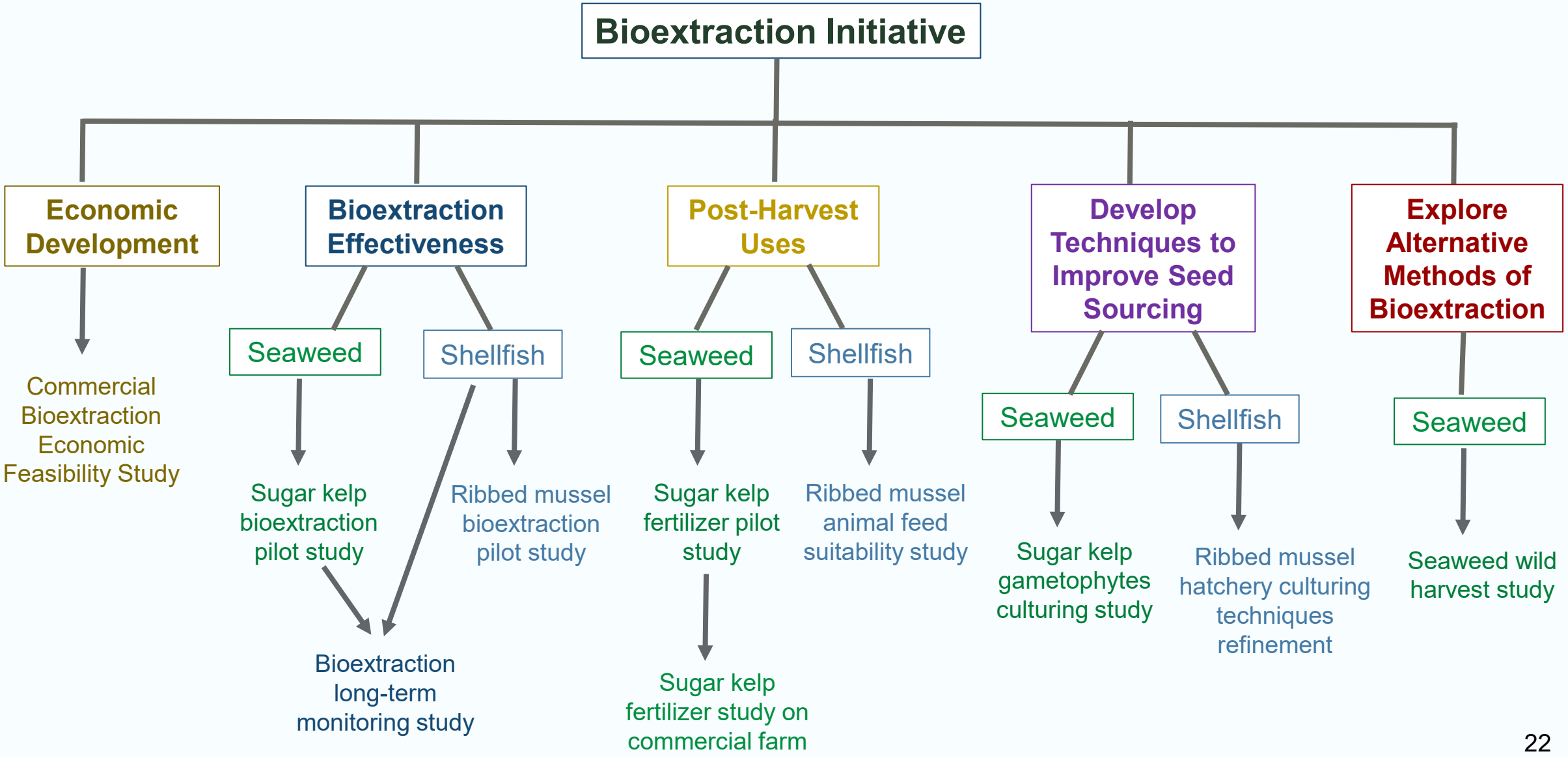
- **Implement methods (e.g., bioextractive aquaculture) for in-water nutrient reductions.**
- **Support research to meet the goals of the nutrient bioextraction initiative.**
- **Through collaborations, develop policies and strategies that alleviate barriers or expedite implementation of land- and water-based nutrient reducing practices, including bioextraction and water reuse.**

Funding the Nutrient Bioextraction Initiative

- Primarily funded by LIS Partnership (EPA) with match from NYSDEC
  - Projects contracted through NEIWPCC
- Exploring and leveraging more funding opportunities
  - LIS Research Grant
  - State grants
  - Agricultural block grants

Project Highlights

Research Projects



Commercial Bioextraction Economic Feasibility Study (SUNY Farmingdale)

[Report uploaded to NEIWPCC Resource Library]

Findings:

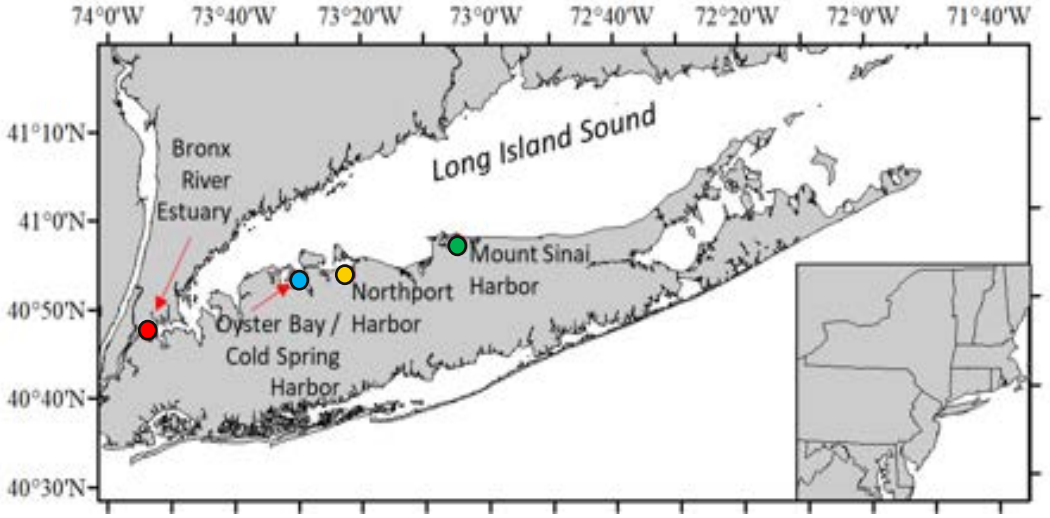
- Most effective: seaweed = *Ulva* (sea lettuce); shellfish = ribbed mussels
- Recommended profitable, feasible product markets
- Barriers to industry establishment: access to startup resources, lack of processing facilities, regulations
- Bioextraction can be profitable industry!

Next Steps:

- Research on LIS *Ulva* as seaweed fertilizer and continue investing research on ribbed mussels
- Share findings with aquaculture growers to gauge interest in diversifying production

Long-Term Monitoring of Seaweed and Shellfish Bioextraction
(SUNY Stony Brook)

Objective: Quantify N and C removal by year-round cultivation of seaweeds and oysters across LIS



Sugar kelp harvested from East River (red), Oyster Bay (blue), Northport Harbor (yellow), and Mount Sinai Harbor (green).
Photo Credit: Mike Doall/Gobler Lab

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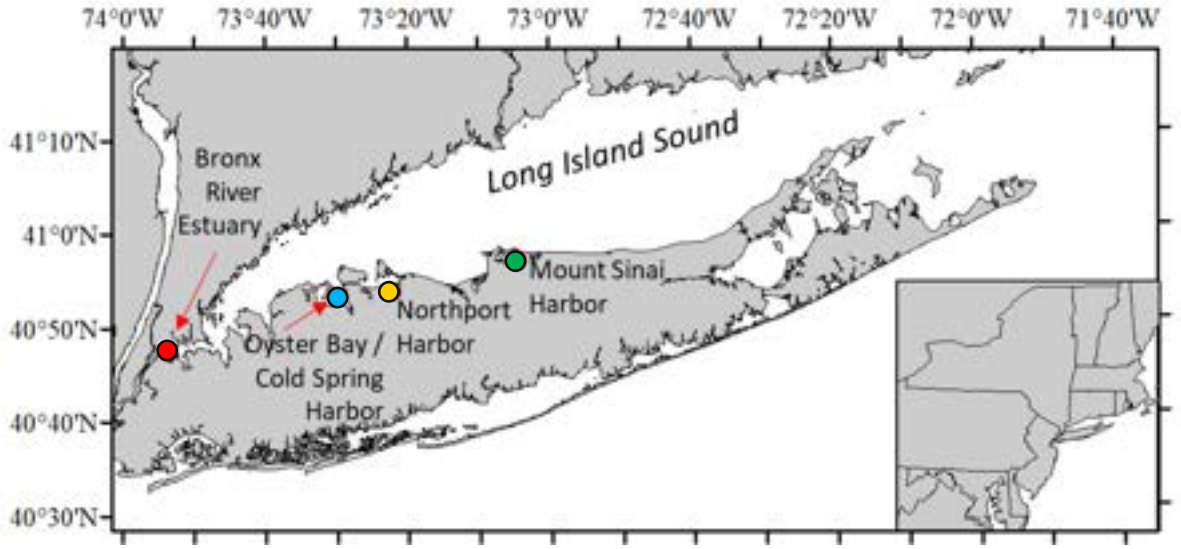

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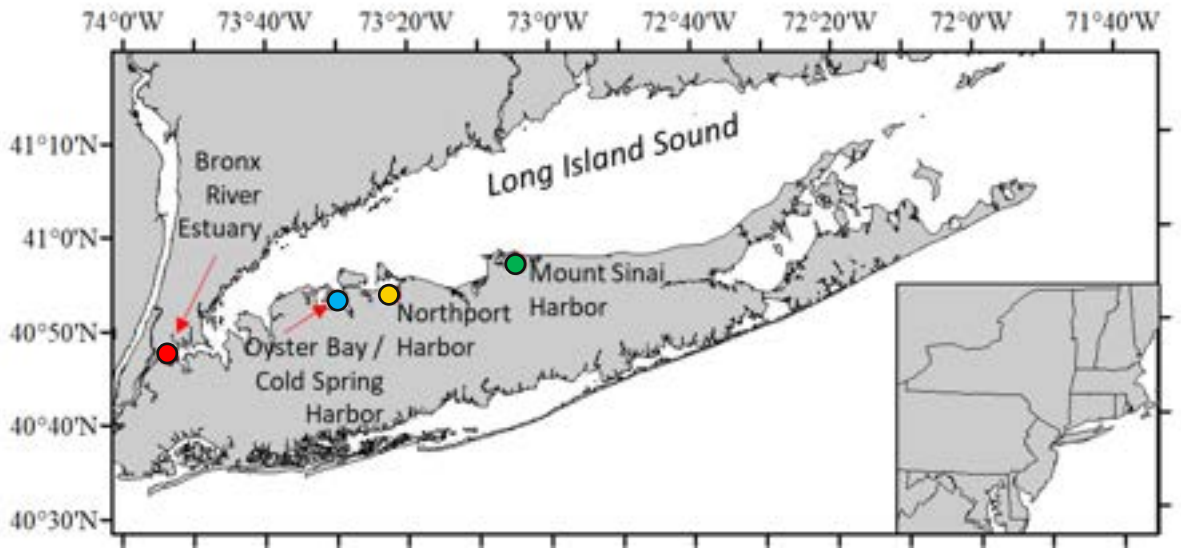

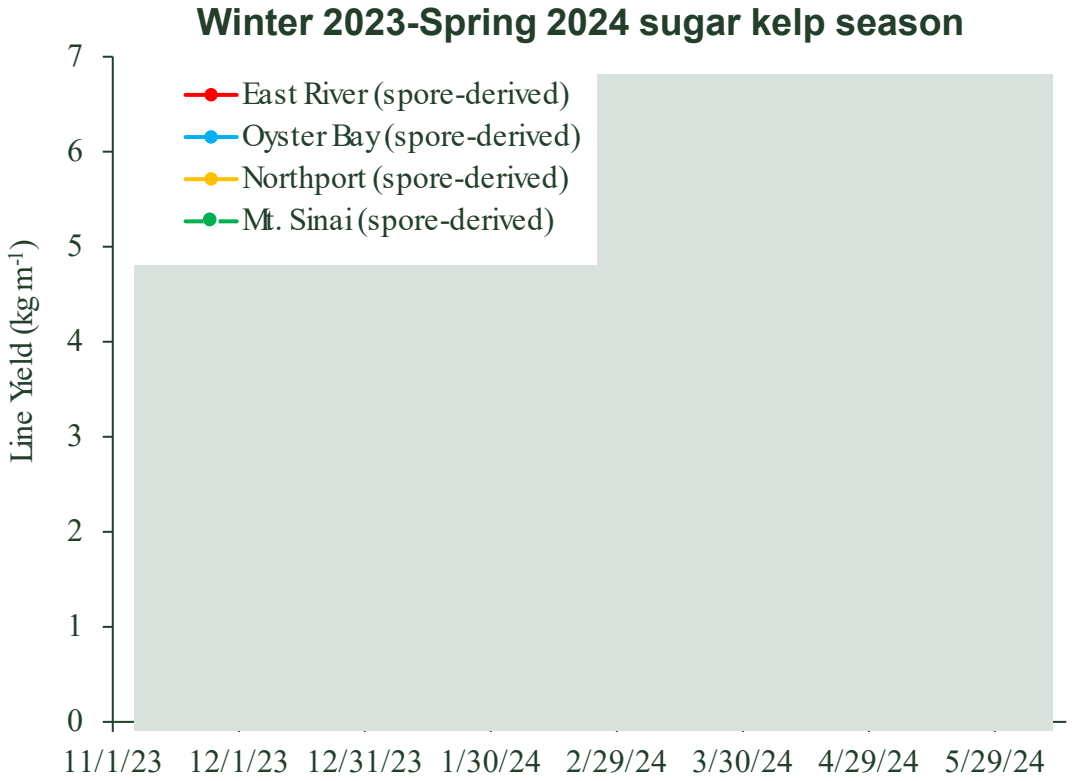

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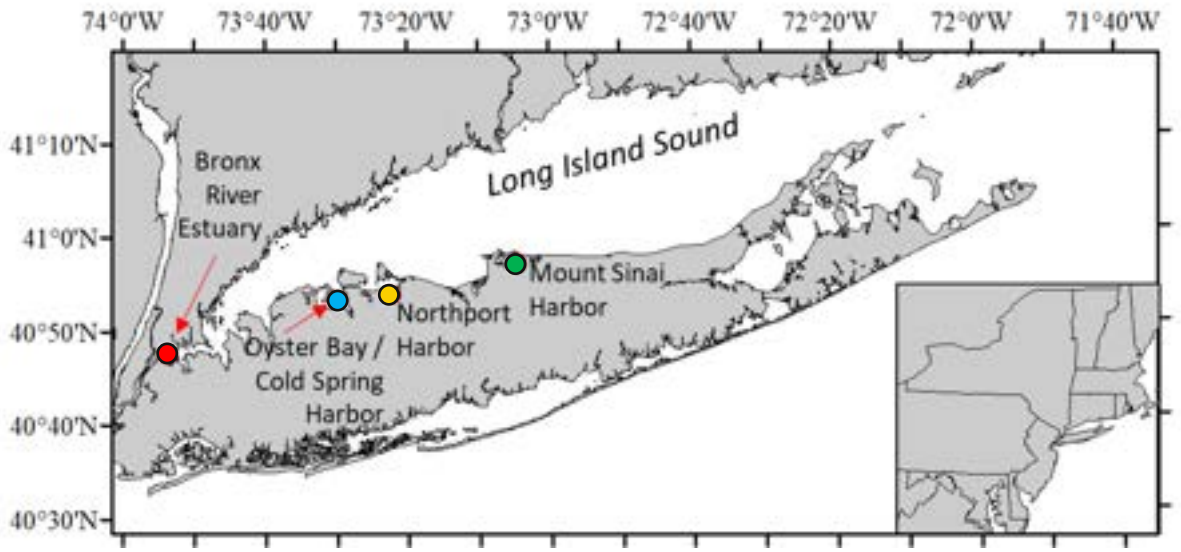

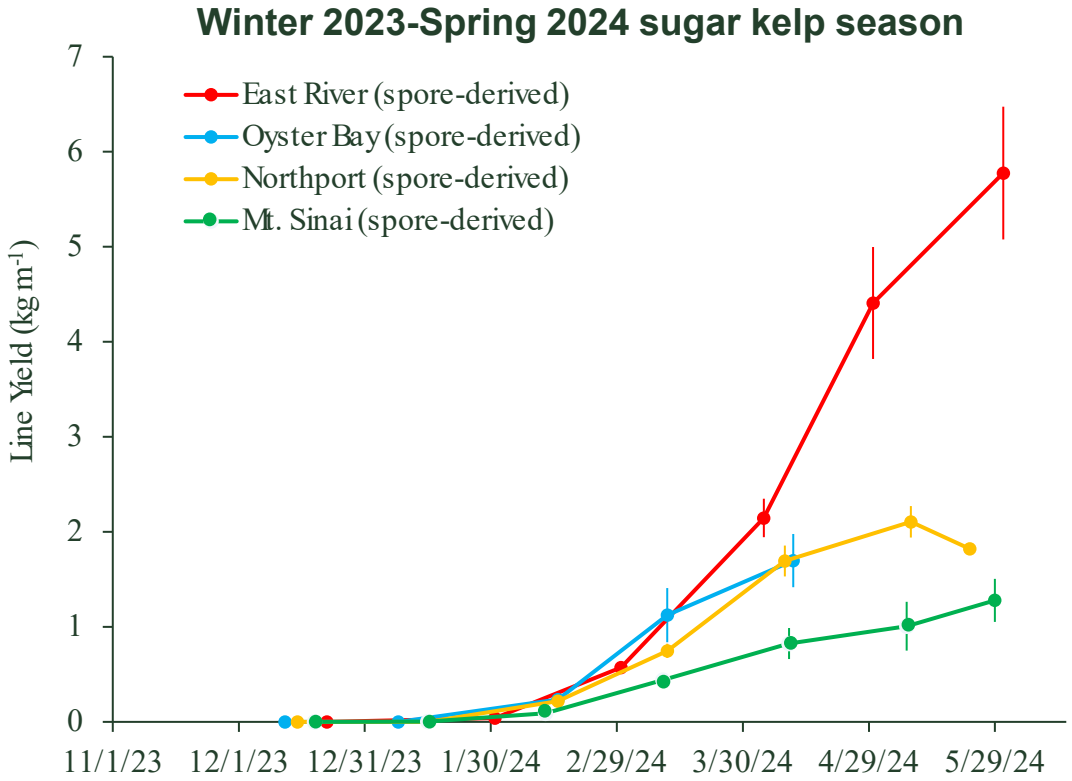

Successful growth at all sites, highest growth in East River (most N impacted)

Project will continue for 2 more years with LIS Partnership FY25 funding

Looking Ahead

Northeast Interstate Cross-State Efforts

Leverage communication and information-sharing across states:

- Connect regulatory agencies, researchers, aquaculture + agriculture farmers
- Research to inform policies and safety standards
- Economic studies and new products for market development
- Processing facility methods

Expanding Communications across LIS Partnership and Beyond

- Hired new Bioextraction Assistant to start next month – focus on outreach
- Launch new Bioextraction Newsletter
- Create fact sheets on completed projects
- Develop social media presence and resource hub
- Connect with more shellfish and seaweed growers and researchers to coordinate partnerships
- Bring together regulatory agencies and researchers to share research and knowledge

LIS-grown kelp drying in Long Island greenhouse, Credit: Garret Chelius

Thank You!

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If interested in joining Bioextraction Initiative newsletter listserv, reach out to Kimarie at: kimarie.yap@dec.ny.gov


Q & A