Seaweed Farming in Long Island Sound – An Update from Connecticut

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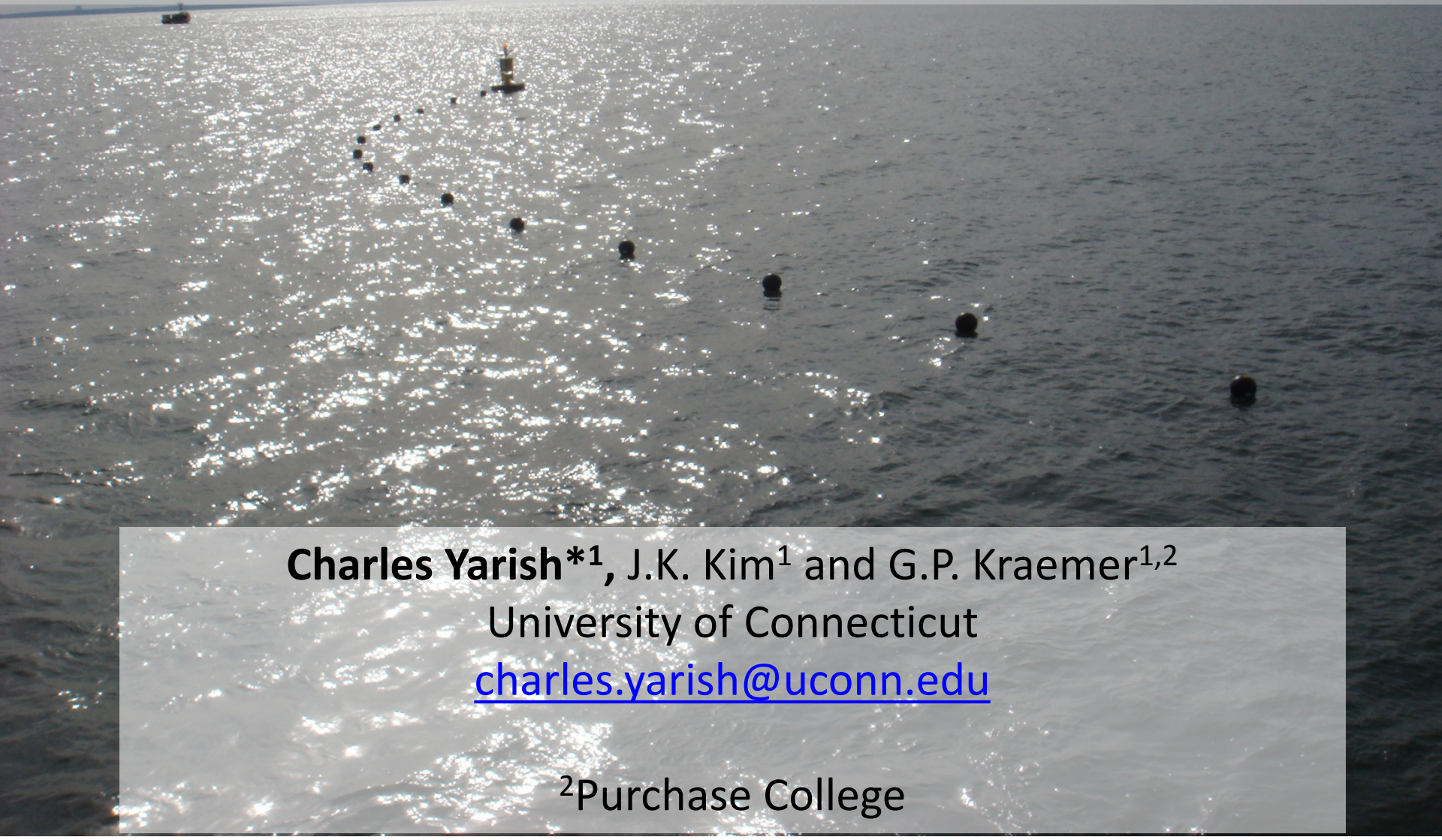
Seaweed Aquaculture for Nutrient Bioextraction in Long Island Sound and the Urbanized Bronx River Estuaries



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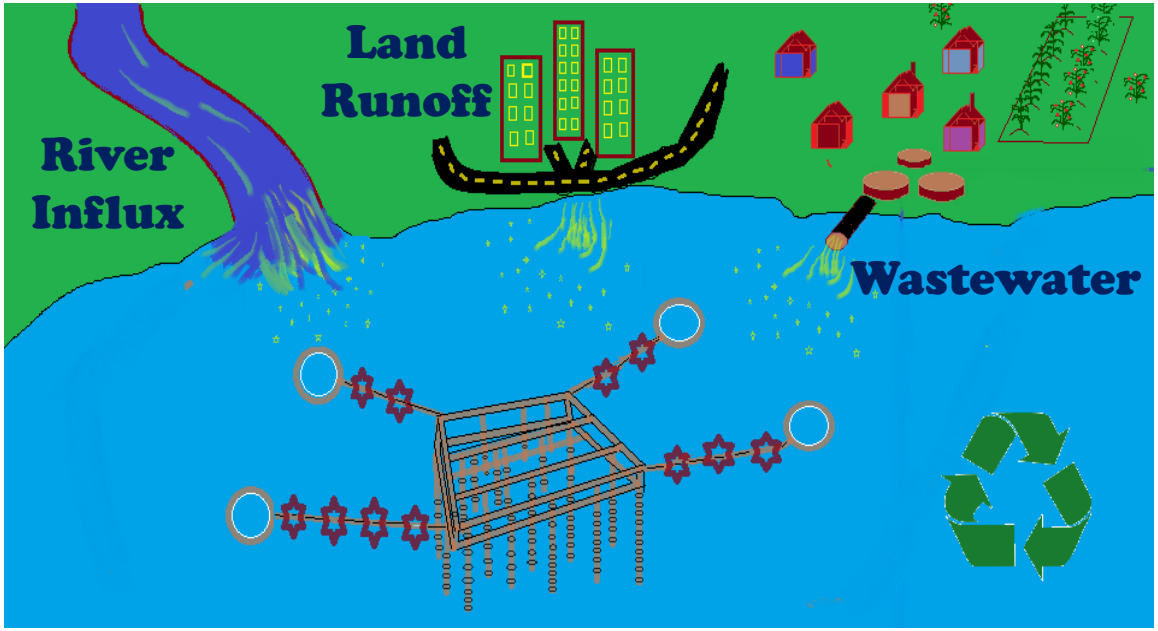
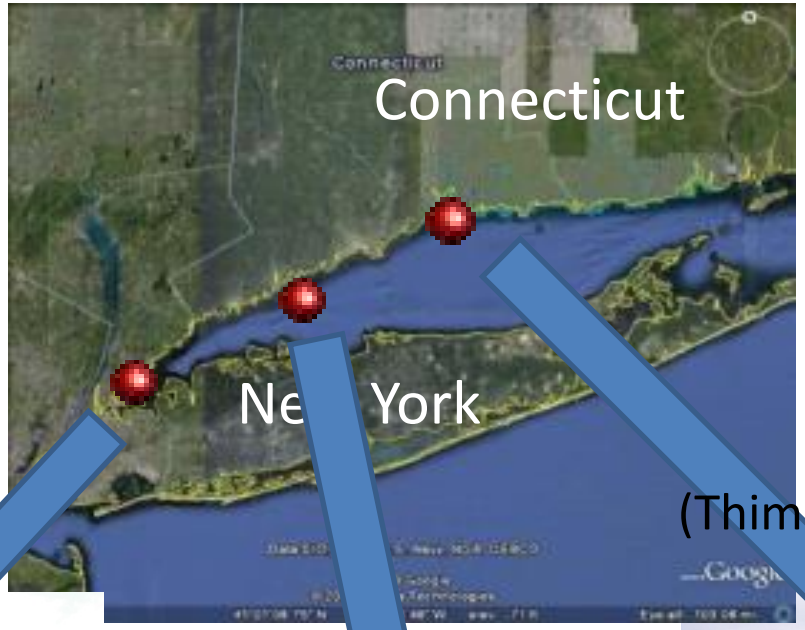
What is nutrient bioextraction?

- The removal of nutrients from an aquatic ecosystem through the harvest of enhanced biological production (aquaculture of seaweed and/or shellfish)



Open water seaweed farms



Bronx, NY

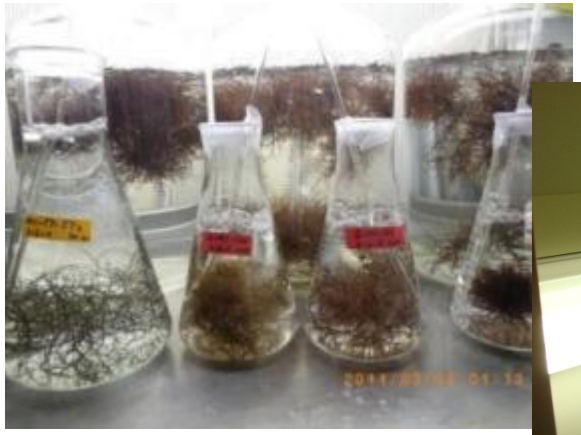
Fairfield, CT

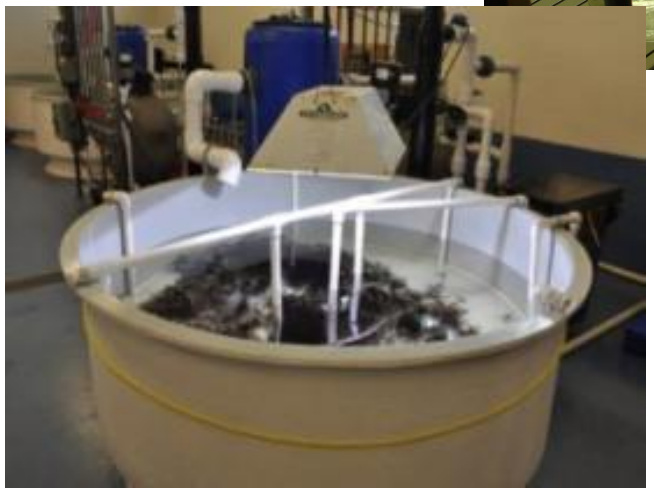
Branford, CT
(Thimble Island Oyster Co.)

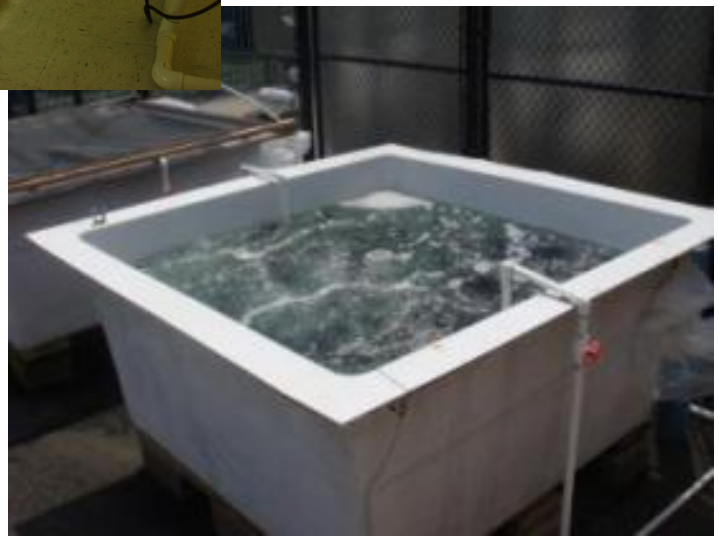
Gracilaria tikvahiae (red seaweed, a summer crop)

- Growing season: June – Oct. (> 15 °C)
- Economically important genus (~ $645 million annual value, FAO 2012)
- Commercial source of agar (both for food & biotechnology)
- Potential for sea vegetable and animal feeds

Gracilaria Nursery Systems







Productivity (*Gracilaria*)

Bronx, NY

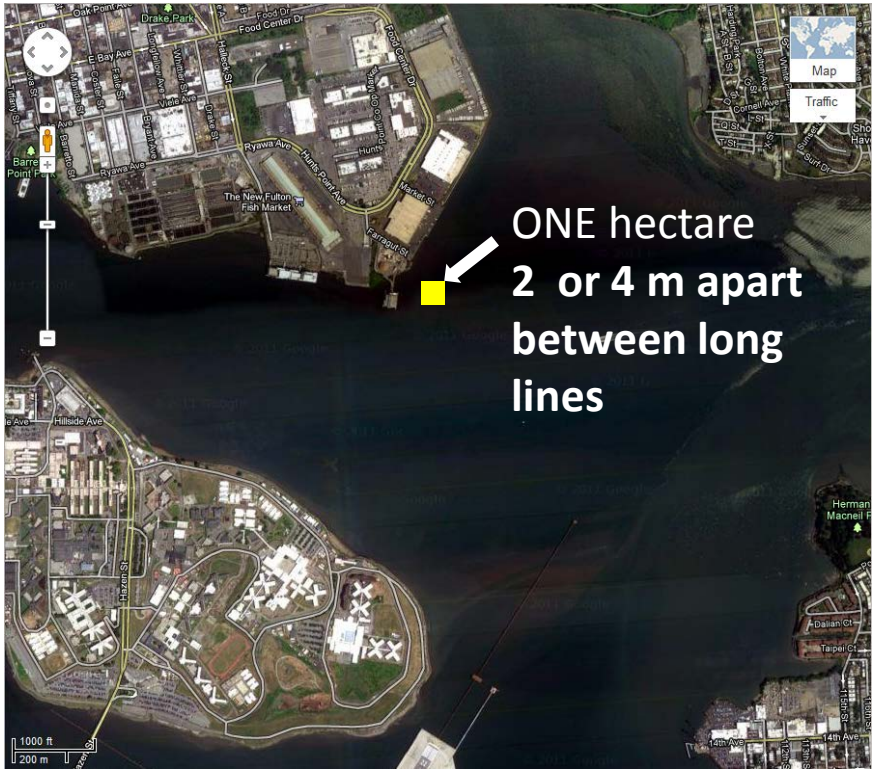
~ 365 kg per month per 100 m longline (July)

Long Island Sound

~ 73 kg per month per 100 m longline (July)

2 or 4 m

Nitrogen Removal (hypothetical one ha *Gracilaria* farm)



Bronx

- 33 – 66 kg N ha^{-1} mon^{-1} (July)
- 8 - 16 kg N ha^{-1} mon^{-1} (Oct.)

LIS

- 4 - 8 kg N ha^{-1} mon^{-1}(Aug.)
- 6-12 kg N ha^{-1} mon^{-1} (Oct.)

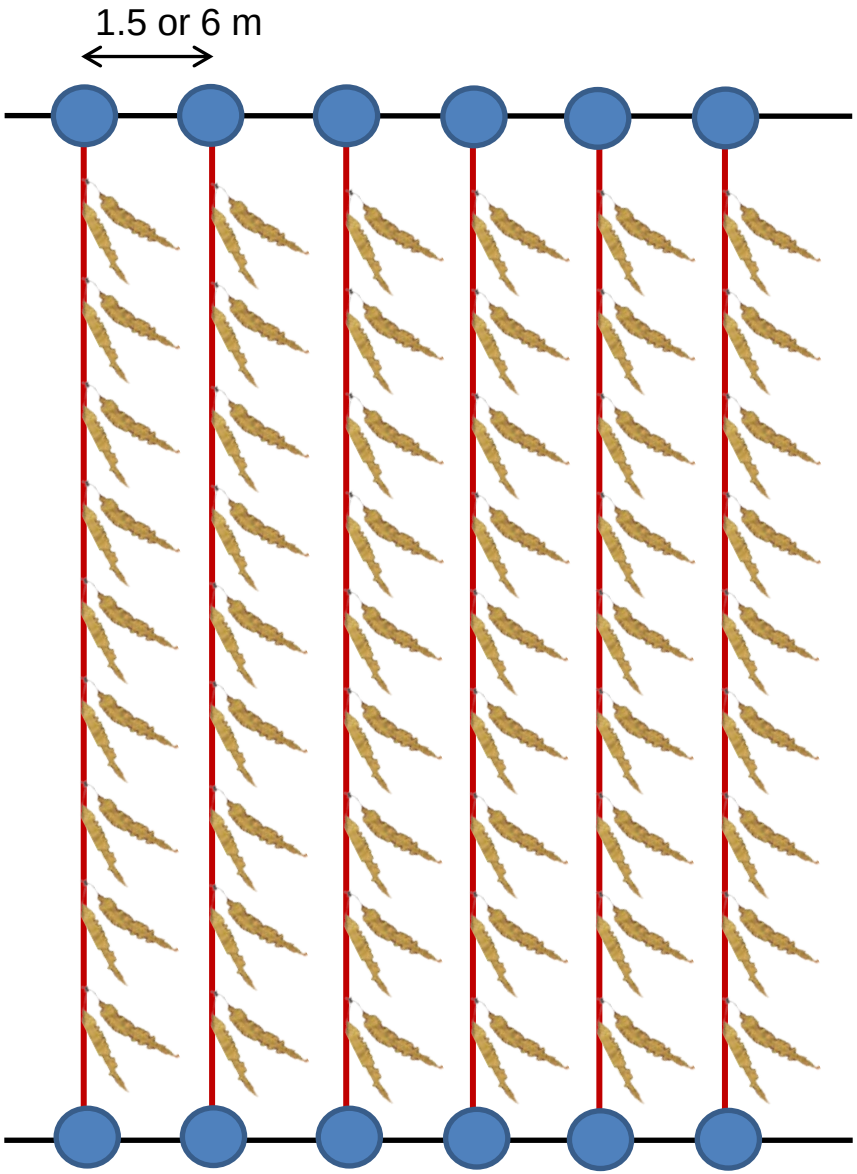
Saccharina (sugar kelp, brown seaweed, a winter crop)

- Growing season: Nov. – May (< 15 °C or < 60 °F)
- Kelp is the most widely cultivated species
- Significant potential for the cultured sea vegetable industry in Long Island Sound and the Northeast
- Human food and source of alginates (colloid & biomedical)
- Nutrient bioextraction (ecosystem services)
- Biofuels

Productivity (2011-2012)

~ 1,752 kg per 100 m longline
(Dec. – May growing season)

Sugar kelp

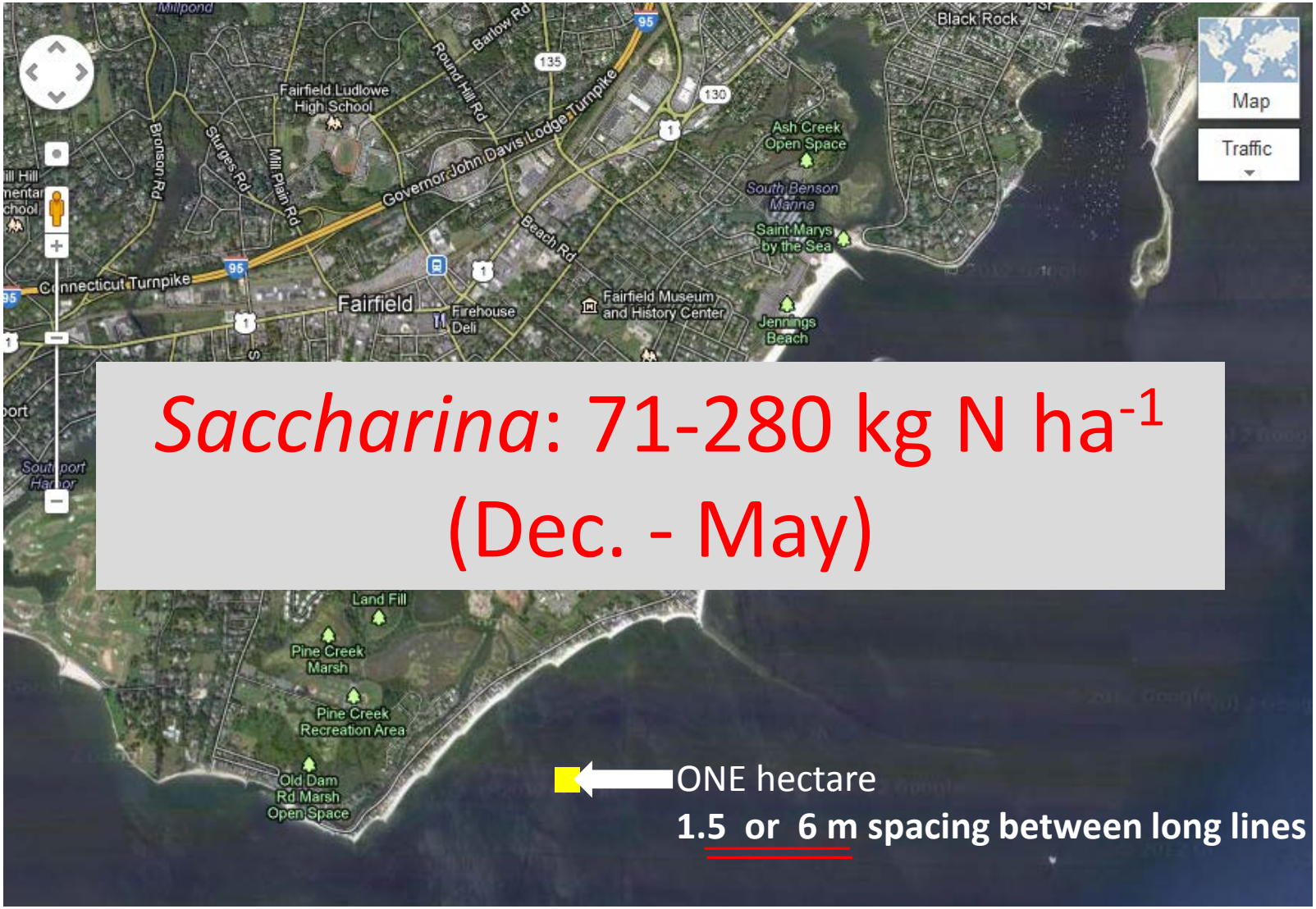


Productivity (sugar kelp)

*29.2 – 116.7 MT FW ha^{-1}
(Dec. – May growing season)

* Assumption: 1.5 or 6.0 m spacing between longlines

Nitrogen Removal (hypothetical one ha sugar kelp farm)



Saccharina: 71-280 kg N ha^{-1} (Dec. - May)

Nitrogen Removal

- *Saccharina latissima*
- Fairfield, CT (Western LIS)
- 6m or 1.5m spacing between longlines

2011-2012 growing season

71 - 280 kg N ha^{-1}

2012-2013 growing season

19 - 74 kg N ha^{-1}

Nor'easter in Jan. 2013 moved longlines

Ecosystem Services

- Nutrient Bioextraction
- Habitat Restoration
- Integrated Multi-trophic Aquaculture (IMTA)

Going **Really** Green: *Sea Farming for Environmental and Economic Benefits*

Brief Description:

The key elements of this best practice are: 1) key partners' recognition of the need for a comprehensive approach that combines traditional water pollution control methods with innovative strategies in a cost-effective and economically sustainable manner; 2) the vision to foresee a different approach that combines science and business in synergistic partnerships to achieve mutual goals—clean water and economic benefits, including new jobs; 3) the willingness and ability to use limited resources to conduct on-the-ground scientific empirical experiments in cooperation with the business community; and 4) moving from practical experimentation to actual implementation and development.

This multi-partner project has shown that sea farming in highly urbanized waters is feasible and practical. Conflicts with recreation can be minimized or avoided. Farming seaweeds and shellfish species improves water quality while developing new consumable and nonconsumable products and markets that enhance the economic value of the water-

Subobjective:

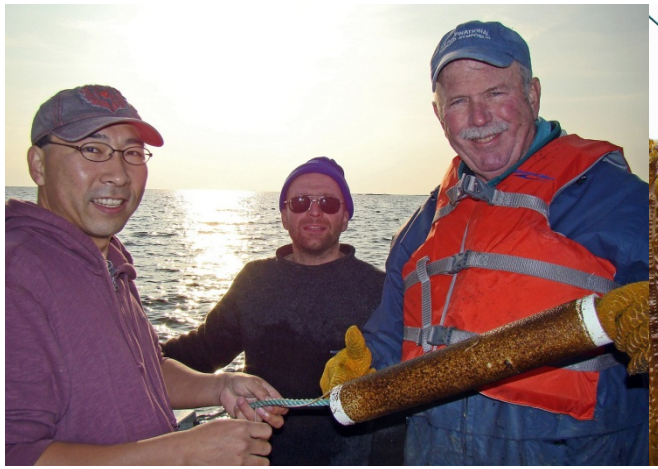
Long Island Sound

Type:

Nutrient Reduction—Ecological Services

Highlights:

- **What:** This best practice demonstrates the potential for sea farms, shellfish, and seaweeds to improve water quality in coastal areas of the United States. Pilot projects on Long Island Sound are evaluating the feasibility of sea farming in coastal waters, quantifying the potential for nutrient bioextraction, evaluating use conflicts, and researching new markets for products, considering suppliers and consumers. Enhancing sea farming can reduce nutrient pollution, have ancillary ecosystem benefits by creating habitat, support sustainable jobs, and potentially reduce the national seafood trade deficit.



(Photo credits: R. Gautreau)

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Life Down on the Kelp Farm

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By JOSEPH DE AVILA

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Seaweed And The Sound

ONE FISHERMAN EMBARKING ON NEW ENTERPRISE.

By WNPR Staff
Published: May 21, 2013

Slideshow

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Long Island Sound delicacy on NYC menus, and it isn't fish, it's seaweed

By Judy Benson

Publication: The Day

Published 05/27/2013 12:00 AM Updated 05/27/2013 08:13 PM

THIMBLE ISLAND KELP

Baby Kelp Leaf

thimbleisland

DJ King & Lobsters
Branford, CT

Marine Macroalgae:
The Ocean's Most Versatile Resource

Sea Vegetables

Concerns

- Harvested batches will need tissue analysis
- Test for different areas, different times of year
- Look for : heavy metals of concern, pesticides, fungicides, chemical residues, etc.
- Test for levels of macro- and micronutrients
- Important to verify safety for general public, emphasize opportunity of the resource (invasive species, blooms, contributing to water quality through N removal, etc.)

Standard Microbial Food Testing: Analyzed by CT Department of Public Health Environmental Microbiology Laboratory

- *Salmonella*
- *E.coli* O157:H7
- *Listeria*
- *Shigella*
- Total Coliform
- Fecal Coliform

All Results NEGATIVE/Not Found

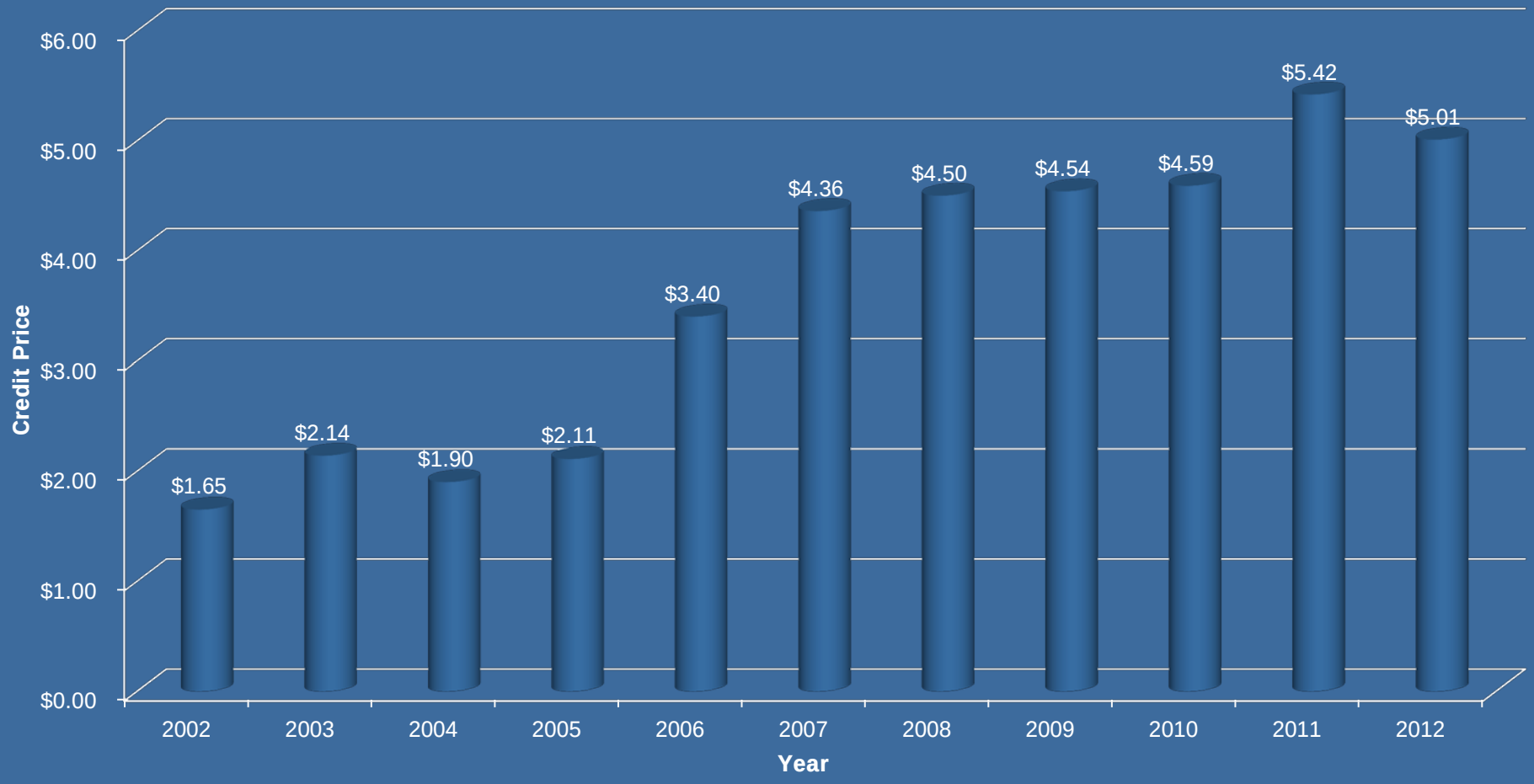
Total Coliform <1 MPN/mL

An Act Concerning Aquaculture and the Cultivation of Seaweed SB 803, Public Act. No. 13-238

- Leasing
  - Currently, no mechanism to lease water column for seaweed cultivation exists
- Application for Permits
  - Joint Programmatic Permit for Aquaculture
  - Structures, Dredging & Fill and Tidal Wetlands
  - Marker Permit
- USACE Review
  - Individual Permit

Lisa Tran, JD/MBA Candidate
Gabrielle White, JD/MBA Candidate

Cost of a Credit 2002 - 2012





What's Next in Coastal Management? Bioextraction technologies that move towards a balanced ecosystem approach

In nutrient rich coastal waters we can use extractive organic aquaculture of shellfish and extractive inorganic aquaculture of seaweed to provide invaluable ecosystem services and produce unique suite of commodities!

Project Partners

University of Connecticut

Bridgeport Regional Aquaculture Science & Technology Education Center

Purchase College State University of New York

Rocking the Boat

Project Sponsors

National Fish and Wildlife Foundation

Sea Grant Connecticut

Long Island Sound Study — A Partnership to Restore and Protect the Sound

National Oceanic and Atmospheric Administration — NOAA — U.S. Department of Commerce