



Harvesting Macroalgae as a Means of Reducing Nutrients in Jamaica Bay, New York City

Removal of *Ulva lactuca* from Jamaica Bay

2011 National Conference on Ecosystem Restoration
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Project Background

- ❖ Sea lettuce (*Ulva lactuca*) – green marine algae
- ❖ Jamaica Bay- recurring blooms from February through April, and August through September
- ❖ Grows on hard substrates
- ❖ Floats in dense mats
- ❖ Mesotrophic estuaries- provides habitat for fish and macrocrustaceans
- ❖ Eutrophic estuaries- detrimental effects...



Detrimental Effects of Excessive Blooms

- ❖ Suffocates benthic invertebrates
- ❖ Suppresses spawning/nesting activities
- ❖ Interferes with recreational boating and fishing activity
- ❖ Decomposition releases N and P, decreases DO
- ❖ Noxious odors while decomposing.
- ❖ Food source for Canada geese
 - ❖ JFK Airport- more bird strikes than any other airport since 1990.

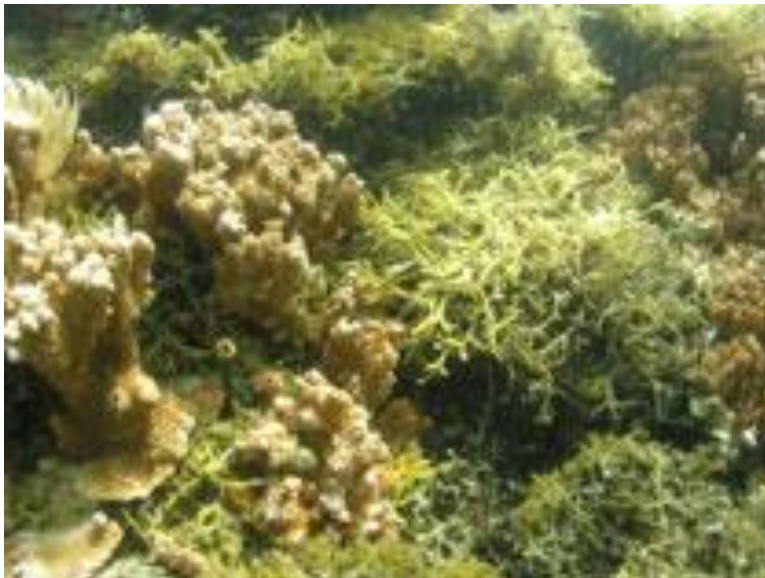


Project Background

- ❖ Delaware Department of Natural Resources and Environmental Control (DNREC) has conducted an annual macroalgae harvesting program since 1997
- ❖ Sea lettuce (*Ulva lactuca*), red weed (*Agardhiella tenera*), *Enteromorpha flexuosa* and *Chaetomorpha* sp.
- ❖ Custom made algae skimmer



- ❖ The Nature Conservancy, through NOAA's Community Based Restoration Program, has implemented a volunteer effort ("Alien Algae Cleanups")
- ❖ Mechanical harvesters are not practical, and the macroalgae is removed by hand



- ❖ Develop program to harvest excess algae and sea lettuce
- ❖ Evaluate harvest methods with minimum impact to other organisms
- ❖ Find a beneficial use for harvested sea lettuce
- ❖ Analyze total N and P reduction



Proof of Concept

Intake conveyor
ramp



Holding area/Ramp up to
dumpster if necessary (14 m³)



Proof of Concept



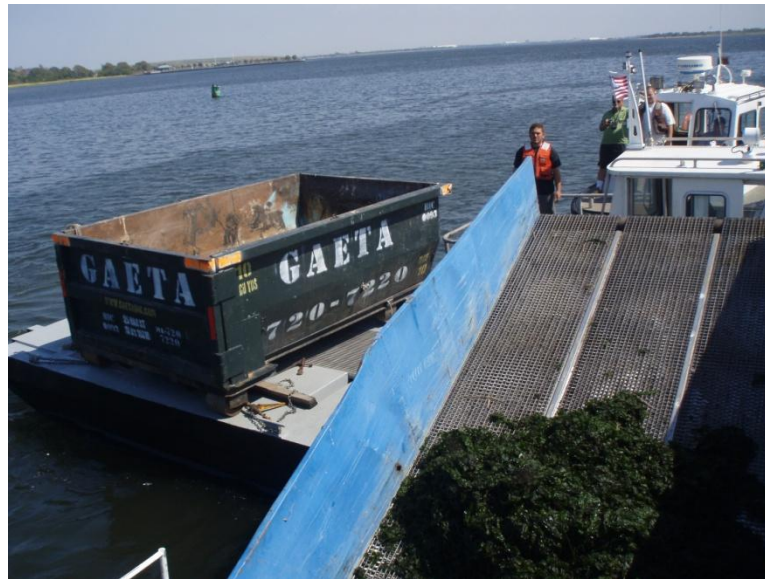
Proof of Concept



Proof of Concept

**2.5 yds³ (1.9 m³) in
90 minutes of
skimming.**

**Offloaded into
dumpster in 15
minutes.**



Bycatch



- ❖ Manual removal- 1.2 m³

- ❖ Skimmer removal- 3 m³

- ❖ Amount of N & P removed
 - ❖ 113 kg of annual N removal for moderate sea lettuce conditions; and
 - ❖ 911 kg of annual N removal for heavy sea lettuce conditions.

- ❖ Beneficial Use (describe program DEP could implement long term) Recreation, noxious aesthetics (DY checking for slides from his April presentation)

- ❖ Cost Benefit Analysis. Could be cost effective due to overlap with floatables removal program

Summary

- ❖ Proof of concept
- ❖ Removed shading and smothering of benthic inverts/fishes
- ❖ Possibly apply to oyster & eelgrass projects.

- ❖ Beneficial uses
 - ❖ Waste-to-energy
 - ❖ Biofuel production- ~3000 liters of biobutanol could be produced annually from skimmer use.

 - ❖ Composting/fertilizer-NYCDOS took 2.5 yds³ for composting

 - ❖ Anaerobic digestion



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HAZEN AND SAWYER



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