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

Removal of *Ulva lactuca* from Jamaica Bay

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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.
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
Project Purposes

- 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
2.5 yds$^3$ (1.9 m$^3$) in 90 minutes of skimming.

Offloaded into dumpster in 15 minutes.
Bycatch
Results

- 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 invert/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 yds$^3$ for composting
- Anaerobic digestion
Authors

Chris Cotroneo, Bob Will, John McLaughlin, Peter May Laura Csoboth

Contributors

Terry Doss, Vince DeCapio, Bill Leo, Miller's Launch (Sven van Batavia), Arthur Spangel
Questions?

• Chris Cotroneo
  • Chris.Cotroneo@hdrinc.com
  • (845) 735-8300

• Laura Csoboth
  • Laura.csoboth@hdrinc.com
  • (518) 937-9504

• Bob Will
  • rwill@dep.nyc.gov
  • (718) 595-3185

• John McLaughlin
  • JohnM@dep.nyc.gov
  • (718) 595-4458

• Peter May
  • Pmay@biohabitats.com
  • (410) 554-0156