Ecological Filtration Systems: Using Freshwater Mussels to Reduce Pollutants

Sai Khay[1], Jessica M. Wilson[1], Alex Byrne[2], John Butler[2], Mary Ng[1]

[1]Department of Civil and Environmental Engineering, Manhattan College

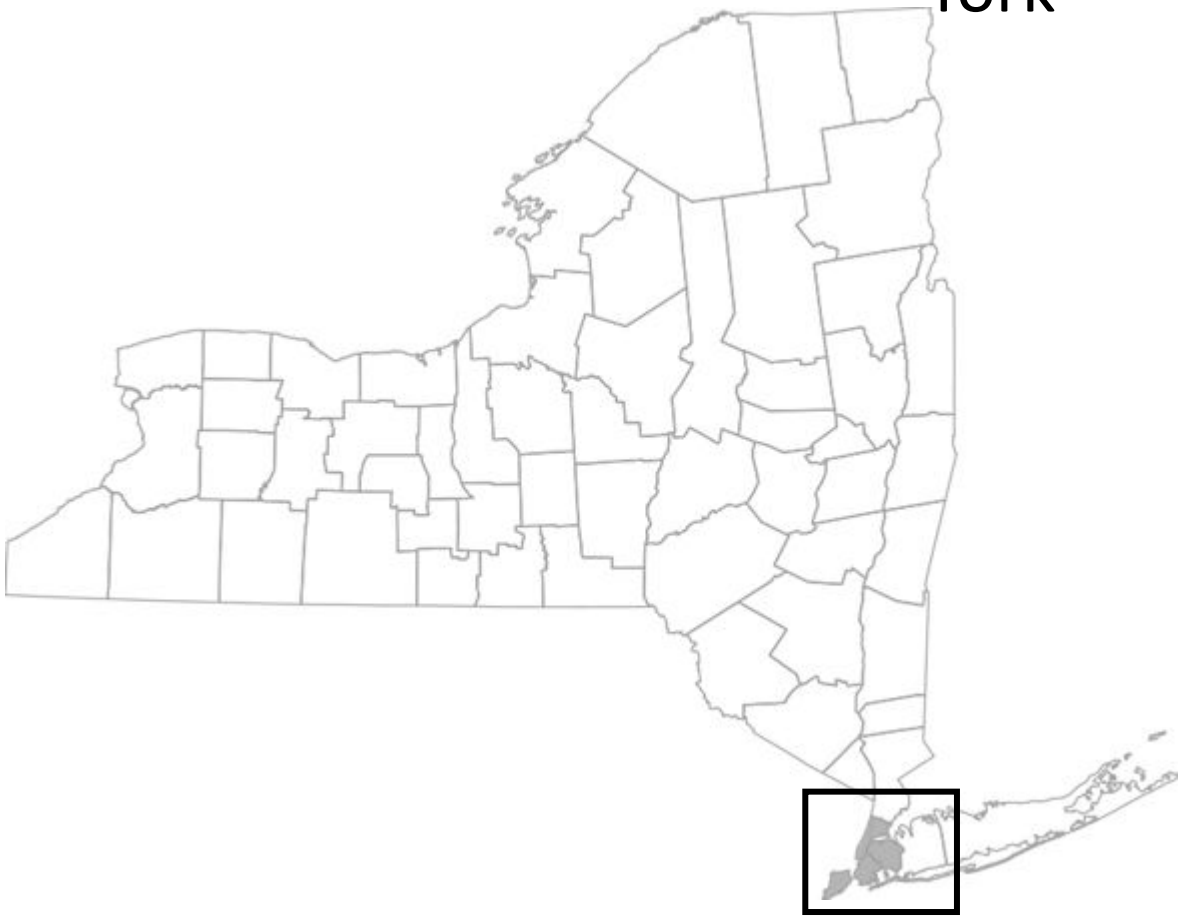
[2]Van Cortlandt Park Alliance (formerly Friends of Van Cortlantdt Park)

MANHATTAN COLLEGE

van cortlandt park alliance

Van Cortlandt Lake

Bronx, New York



Van Cortlandt Lake

Classificatio
n

Freshwater wetland

Class B Waterbody (NYS DEC)

- Public swimming and contact recreation activities

Hypereutrophic

- Total phosphorus > 0.20 mg/L

Remediation Efforts

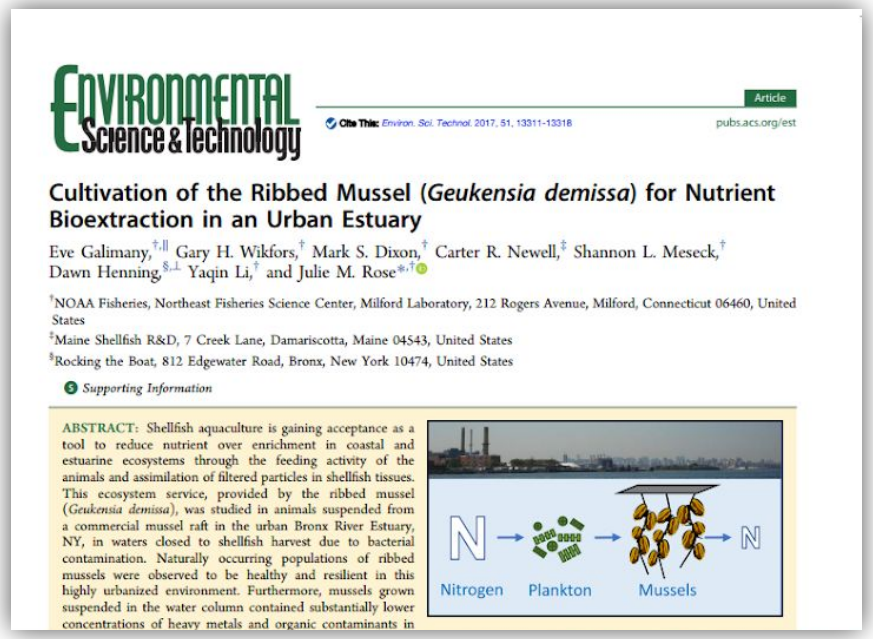
- 20,000 cubic yards of sediment removed in 2001

Objective

Evaluate sustainable **bioremediation** options for **Van Cortlandt Lake**

Approach

Evaluate **freshwater mussels** for potential to **remove pollutants**, phosphorus and turbidity



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Cultivation of the Ribbed Mussel (*Geukensia demissa*) for Nutrient Bioextraction in an Urban Estuary

Eve Galimany,[†,∥] Gary H. Wikfors,[†] Mark S. Dixon,[†] Carter R. Newell,[‡] Shannon L. Meseck,[†] Dawn Henning,[§,⊥] Yaqin Li,[†] and Julie M. Rose[*,†]

[†]NOAA Fisheries, Northeast Fisheries Science Center, Milford Laboratory, 212 Rogers Avenue, Milford, Connecticut 06460, United States

[‡]Maine Shellfish R&D, 7 Creek Lane, Damariscotta, Maine 04543, United States

[§]Rocking the Boat, 812 Edgewater Road, Bronx, New York 10474, United States

Supporting Information

ABSTRACT: Shellfish aquaculture is gaining acceptance as a tool to reduce nutrient over enrichment in coastal and estuarine ecosystems through the feeding activity of the animals and assimilation of filtered particles in shellfish tissues. This ecosystem service, provided by the ribbed mussel (*Geukensia demissa*), was studied in animals suspended from a commercial mussel raft in the urban Bronx River Estuary, NY, in waters closed to shellfish harvest due to bacterial contamination. Naturally occurring populations of ribbed mussels were observed to be healthy and resilient in this highly urbanized environment. Furthermore, mussels grown suspended in the water column contained substantially lower concentrations of heavy metals and organic contaminants in

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Cleaning up aquatic pollution with mussels

"Cultivation of the Ribbed Mussel (*Geukensia demissa*) for Nutrient Bioextraction in an Urban Estuary"
Environmental Science & Technology

Scientists and activists alike have been looking for a solution to the problem of aquatic nutrient pollution. Now one group reports in *Environmental Science & Technology* that ribbed mussels are up to the clean-up challenge.

When it comes to nutrients, like nitrogen and phosphorus, too much of a good thing can be bad. These nutrients end up in rivers and streams as the result of

The ribbed mussel could help clean up excess nitrogen and pollution from water. Joan Muller/NOAA Photo Library/License

Method

Elliptio
Complanata

Average Mussel Profile

Weight: 59 g

Length: 16 cm
Width: 4 cm
Height: 3 cm

Method

Measurements

- Water Quality
  - Temperature
  - pH
  - Dissolved oxygen
  - Conductivity
  - Turbidity
- Nutrients
  - Total phosphorus
  - Ammonia
  - Nitrate

Experiment 1

Phosphorus Removal (6 Hours)

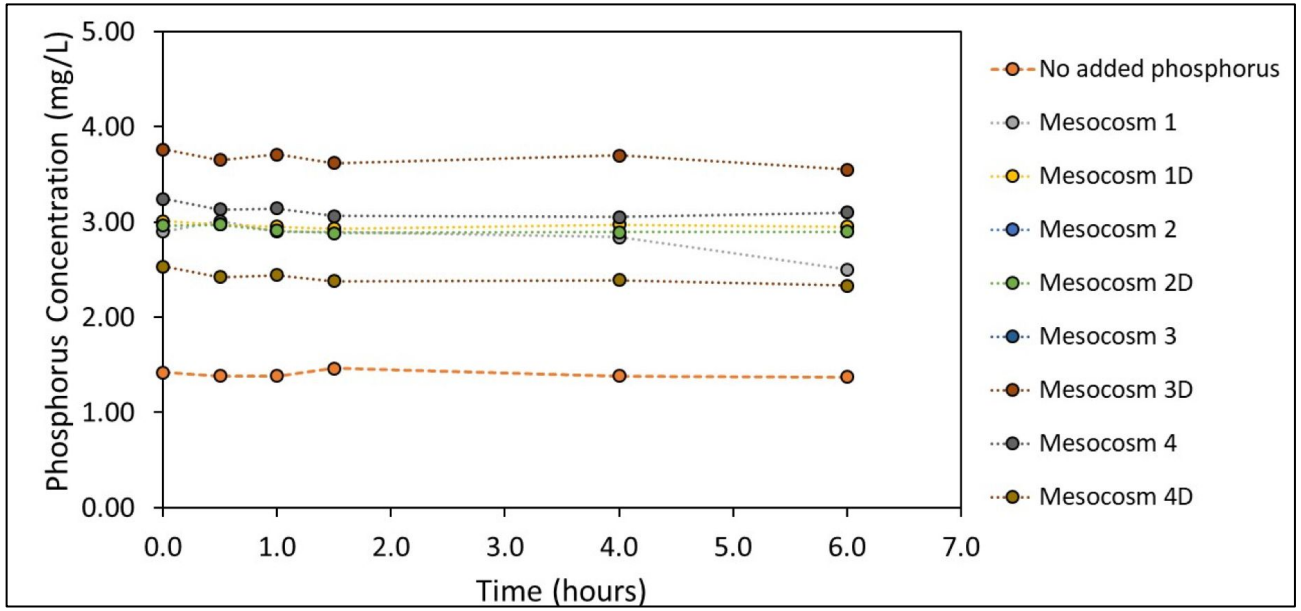
Materials

- 8 mesocosms (1 mussel each)
- 1 mesocosm (control; no mussels)
- Phosphorus at varying concentrations

Removal

- Control = 0.0067 mg/L-hr
- Mesocosm = 0.022 mg/L-hr

- Higher average rate of phosphorus removal for experimental mesocosms than control mesocosm

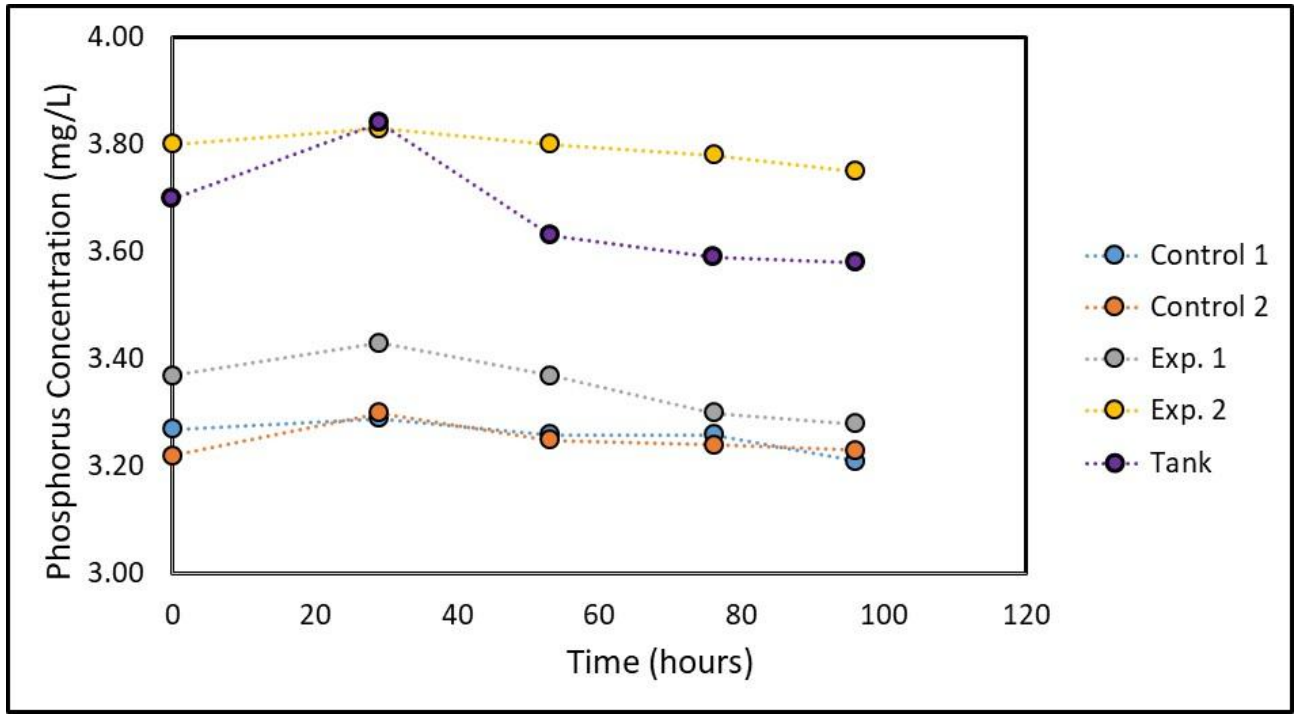


Experiment 2

Phosphorus Removal (7 Days)

Materials

- 2 mesocosms (1 mussel each)
- 2 mesocosms (control; no mussels)
- 1 tank (10 mussels)
- Phosphorus at varying concentrations



Removal

- Control < 0.001 mg/L-hr (no removal)
- Tank = 0.032 mg/L-hr
- Mesocosms = 0.021 mg/L-hr (Comparable to Exp. 1)

Higher rate of phosphorus removal for tank mesocosms when compared to control

Experiment 3

Turbidity Removal (3 days)

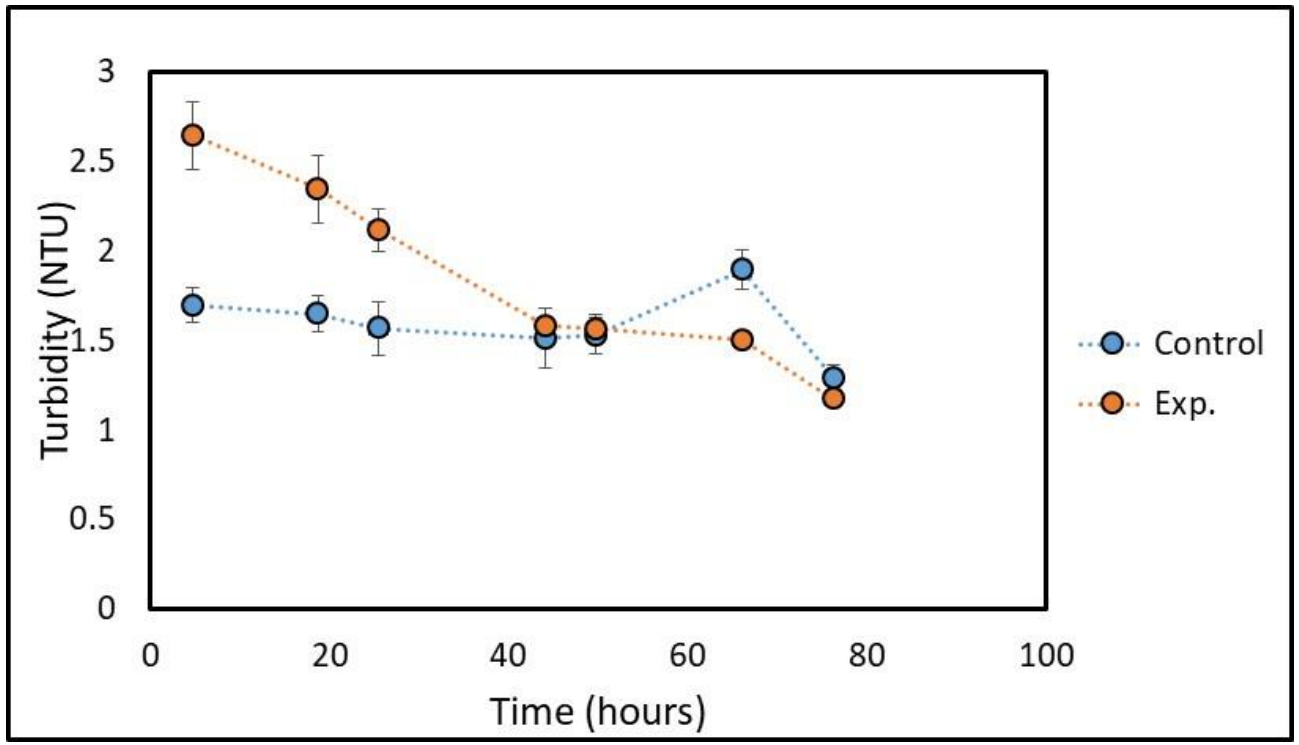
Materials

- 2 mesocosms (1 mussel each)
- 2 mesocosms (control; no mussels)
- Kaolin clay

Removal

- Control = 23% removal
- Mesocosm = 56% removal

Higher average amount of turbidity removed for experimental than control



Summary

Bioremediation may be a viable option for **phosphorus and turbidity removal**

Research ongoing for effect of **other water quality parameters** (e.g., pH, nitrate) on pollutant removal

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