Watershed and Embayments Workgroup Meeting Summary Wednesday August 9, 2023 Meeting conducted remotely via Microsoft Teams



Attendees:

Kelly Streich, CT DEEP (Co-chair) Esther Nelson, EPA (Support) Jordan Bishop, NEIWPCC Sue Van Patten, NYSDEC Sarah Deonarine, Manhasset Bay Nikki Spiller, Harbor Watch Paul Stacey, Footprints on the Water Michele Golden, NYSDEC Kristin Kraseski, NYSDEC/NEIWPCC Katie O'Brien-Clayton, CT DEEP Braden Lynn, CT DEEP Jim Ammerman, LISS/NEIWPCC Heather Johnson, Friends of the Bay David Dickson, UConn CLEAR Jamie Viens, SWCD Jonathan Morrison, USGS Emily Hadzopulous, TNC Victoria O'Neill, NYDEC Samara Scantlebury, NYSDEC Karen Stainbrook, NYSDEC Emily Marquis, CT DABA Samantha Wilder, IEC

Introduction:

The meeting was called to order at approximately 10:05am in the Teams venue by CT co-chair Kelly Streich. The NY co-chair position is vacant as Mary Arnold has moved on to another position.

Follow-up on Joint Environmental Justice and N Coordination Meeting:

The next steps are for the work group chairs to evaluate the meeting notes and identify priority environmental justice items for the work group to address and/or integrate into their processes.

2025 CCMP Proposal:

The LISS has developed a recommendation to pursue a targeted revision of the 2015 CCMP. The details were provided in the word document named 2025 CCMP Proposal which was circulated to the WEWG. LISS has initiated the revision process which will extend over an 18-month timeline, include public comment, and lead to CCMP adoption in early 2025. Discussion during the meeting circulated around the use of SMART targets, the need to focus on ecosystem function and restoration, utilize appropriate tools to measure outcomes, and the potential to consolidate IAs. The Chesapeake Bay Scientific and Technical Advisory Committee (STAC) report *"Achieving Water Quality Goals in the Chesapeak Bay: A Comprehensive Evaluation of System Response"* was referenced. For those interested in learning more about this report, it can be accessed at: CESR – STAC (chesapeake.org)

Discussion of the WEWG Work Plan:

A copy of the work plan was circulated to the WEWG participants. The FY24 plan will cover 1-year but there's potential to prepare a 5-year plan consistent with the 2025 CCMP. Discussion included specifying outcomes that are measurable, achievable, and consistent with state programs. Specific project ideas and suggestions were discussed and noted within the screen shared work plan. It was requested that any additional thoughts be provided to Kelly by 8/18. The group also discussed the need for volunteers to contribute their expertise to specific topic areas in the work plan. This will be extremely important if the WEWG pursues a 5-year plan beginning in FY25.

Nutrient Bioextraction in Long Island Sound:

Kristin Kraseski, Bioextraction Coordination for NYSDEC/NEIWPCC, provided an update of bioextraction activities that are currently underway. A copy of her presentation is included following the meeting summary.

Next Meeting & Adjournment:

- The next meeting is scheduled for Wednesday 11/8 at Save The Sound's Laboratory in Larchmont, NY. The in-person meeting hours will be 11-2. Peter Linderoth will provide a tour of the laboratory and there will be time for networking with our colleagues. We will be reaching out to the WEWG first to reserve seating before opening the meeting to other work groups. Finally, an agenda will be circulated 2 weeks prior to the meeting.
- The meeting was adjourned at 11:57.



Department of Environmental Conservation



Bioextraction Initiative Update

Kristin Kraseski Bioextraction Coordinator

Presentation to the Long Island Sound Study Watersheds and Embayments Work Group August 9, 2023

Nitrogen Pollution is a Worldwide Problem



Nitrogen Pollution

- Nitrogen is a leading cause of water quality deterioration in the Long Island Sound
- Sources of Nitrogen Pollution
 - Wastewater treatments systems
 - On-site systems
 - Wastewater Treatment Plants
 - Stormwater Runoff
 - Fertilizer Use
 - Atmospheric Deposition



What is Nutrient Bioextraction?

Growth and harvest of shellfish and seaweed to remove nitrogen and other nutrients from coastal waters



Bioextraction vs. Restoration

• At the interface between aquaculture and restoration



Billion Oyster Project www.billionoysterproject.org



Aquaculture in Stamford, CT Photo Credit: Jason Rearick/Hearst Connecticut Media, in the Stamford Advocate

Benefits of Bioextraction

- One of the only *in-water* removal strategies
- Addresses nitrogen already present in surface waters
- Useful in places where land-based strategies aren't enough
- Can be local, small-scale, and very economical
- Co-benefits are numerous (water filtration, wave attenuation, HAB reduction, combats coastal acidification, etc.)



Limitations of Bioextraction

- Spatial limitations and use conflicts
- Seasonal limitations
- Some gear and boat travel required
- Markets for harvested materials needed



Hood Canal experimental kelp farm. Credit: John Mickett, APL UW



Redmond et al. 2014

Figure 3.14. Culture plan for the kelp growing season (data from http://neracoos.org).

Historical Context of Bioextraction in LIS

2009 International Workshop on Bioextractive Technologies for Nutrient Remediation

Sponsored by LISS, NOAA, NEIWPCC, and UCONN





Photo by NOAA Milford/Mark Dixon

Current Bioextraction Initiative

Mission: To improve water quality in NY and CT marine and coastal waters by removing excess nitrogen through the cultivation and harvest of ^소 seaweed and shellfish.

Bioextraction Coordinator hired in 2018







Department of Environmental Conservation

Development of a Bioextraction Industry in Long Island Sound

December 2009: LISS International Workshop on Bioextractive Technologies for Nutrient Remediation March 2018: Bioextraction Coordinator hired, and Bioextraction Initiative begins*

2025-2027: As progress on regulations and viable markets is made, this period will focus on the development of guidance materials for permitting and best management practices

June 2016: Long Island Nitrogen Action Plan Scoping Document released

2020-2025: Establishment of accepted bioextraction species and uses (includes technical pilot projects and economic feasibility study)

2027+: When markets are available (or have been determined to be feasible) for bioextraction projects, focus will shift to building the industry by supporting growers, processers, and users of the materials Goal:

Bioextraction

Industry within LIS

*Note that there are others beyond LISS working towards this goal as well

LISS Funded Initiative Projects

2017	2019*	2020	2021	2022	2023**
Original funding for Coordinator position	Additional funding for Coordinator position Economic feasibility study Seaweed Symposium	Bioextraction pilot studies with sugar kelp and ribbed mussels	Field test of kelp fertilizer amendments Refinement of ribbed mussel culturing Phase 2 of economic study	Long-term quantification of bioextraction activities Bioextraction through wild harvest Long-term storage of kelp gametophytes	Sugar Kelp Direct Seeding Project Heavy Metals/ Fertilizer Study Feasibility of Large-Scale Bioextraction Study

**Funding to be awarded in October

Future Directions Guided by Bioextraction Advisory Committee



Completed Projects

Resources and Events

- Long Island Sound Seaweed **Bioextraction Symposium**
- LISS Website updates (including interactive project map)
- A Guide to Marine Shellfish Aquaculture in New York
- New York and Connecticut Seaweed and Shellfish Aquaculture Viewer



Summar

he Long Island Sound Seawe

oextraction Symposium, facilitated

y NEIWPCC in partnership with the

EPA Long Island Sound Study, is two

The agenda includes sessions on th

latest research, beneficial uses.

regulations, and economics, and

discussion among participants

alf-days focused on hearing from

xperts in the seaweed and oextraction communite

Sugar Kelp Pilot

- In-water Saccharina latissima cultivation from December 2020 – June 2021
- Three sites in LIS
 - East River, Northport Harbor, and Milton Harbor
- Successful growth at East River site
- Kelp analyzed for nitrogen content, carbon, other nutrients, pathogens, and pollutants



Sugar Kelp Fertilizer Amendment Project

- With Cornell Cooperative Extension of Suffolk County
- Experimentally tested on greenhouse and field crops
- Trials at the Long Island Horticultural Research and Extension Center in 2020 and 2021
- Amendments compared to other commercial seaweed amendments



Current Projects: Sugar Kelp

- Continuation of kelp fertilizer amendment work on commercial farms
- Field and greenhouse trials
- With Cornell Cooperative Extension







Current Projects: Ribbed Mussels

- Ribbed mussels (Geukensia demissa) for bioextraction
 - Field sites at Northport and Huntington Harbors
 - Analysis for nitrogen, carbon, other nutrients, pathogens and pollutants
- Ribbed mussel culturing in a hatchery
- Analyses for animal feed appropriateness



Current Projects: Economics

- Commercial Feasibility of Commercial Bioextraction in Long Island Sound
 - Farmingdale State College
 - Recommendations for species and markets with most potential
 - Expected report later this year



Upcoming Projects

- Economic Project, Phase 2
- Year-round bioextraction with multiple species
- Bioextraction through wild harvest
- Long-term storage of kelp gametophytes
- Large-scale bioextraction feasibility*
- New kelp cultivation methods*
- Heavy metals in fertilizer amendment study*
 *For October 2023 award





Shellfish Bioextraction : Oysters vs. Ribbed Mussels



Crassostrea virginica

- Have existing markets (for food)
- High-value, when used for food
- Well-established hatchery and aquaculture methods



Geukensia demissa

- Non-commercial species
- Less danger of being poached and eaten by people
- Shells are thinner and easier to grind
- Hatchery culturing methods are in experimental phase

Ribbed Mussels Field Work

- Floating docks installed at Northport and Huntington Harbors
- Water quality measured
- Ribbed mussel samples collected
- Three sampling dates throughout season
- Analyses done by Eurofins Laboratory



Ribbed Mussel Sample Processing

- Samples frozen and ground in-house
- Shipped to Eurofins overnight
- Tissue and shell processed together is most likely if used as animal feed





Ribbed Mussel Laboratory Analysis

- Nutrients
 - Nitrogen
 - Carbon
 - Phosphorus
 - Potassium
 - Sulfur
 - Calcium
 - Magnesium
 - Boron
 - Copper
 - Iron
 - Manganese
 - Zinc

- Organic Pollutants
 - PCBs
 - PAHs
- Trace Metals
 - Arsenic
 - Cadmiun
 - Chromium
 - Mercury
 - Lead
 - Nickel

- Pathogens
 - Vibrio species
 - Total coliform
 - Fecal coliform
 - Enterococci
 - *E. coli* O157:H7
 - Total Plate Count
 - Salmonella
 - Shiga toxigenic *E. coli*
 - Shigella
- Pesticides Scan

- Animal Feed
 - Amino Acids
 - Carbohydrates
 - Total Crude Protein Content
 - Ash
 - Fiber

Ribbed Mussel Collection and Conditioning



- Adult mussels collected from natural marsh in Huntington Harbor
- Conditioning was 8 weeks
- Water temperature increased from ambient to 20°C
- Cultured algae added, and tanks cleaned every other day

Ribbed Mussel Spawning



- Bin-Silo Method developed by Brenda J. Landau (Landau, 2014)
- Spawning method preserves broodstock
- Temperature shock triggers spawning
- Gametes and larvae sink to bottom of bin
- Larvae then raised in conicals

Lessons Learned (so far)

- Note that these are preliminary results from about halfway through the study; we do not yet have complete results from this study
- No *E.coli, Salmonella*, or *Shigella* detected in any of samples, but Vibrio detected in all samples
- There were no pesticides or PCBs detected in any samples
- Mercury was not detected in any samples
- Other metals were detected, but in levels below those seen in complete animal feeds

Bioextractive Species Considerations



Saccharina latissima

- Common name: sugar kelp
- Winter/Spring species
- Fast growing
- Food markets exist



Gracilaria tikvahiae

- Summer species
- Increased surface are may mean increased pollutant uptake
- Food markets exist
- Tank-based cultivation only (for food) in CT



Ulva lactuca

- Common name: sea
- Summer species
- Food markets exist
- Potential to cause blooms



Geukensia demissa

- Common name: ribbed
 mussel
- Little danger of poaching
- No commercial hatchery methods established yet
- No current markets

Future Directions

Bioextraction Advisory Committee Meeting held on July 31st, 2023

- Outcomes included:
 - We have a good understanding of nursery practices and cultivation of sugar kelp, especially
 - Next focus should be on processing
 - We need a better understanding of how bioextraction compares to existing aquaculture and between species, and other environmental effects of bioextraction
 - Lack of markets and access programs (the ability to cultivate in certain waters) should remain a focus

Next Steps

- Based on input from the Bioextraction Advisory Committee and our strategic planning document, we will develop proposals for LISS FY24 funding
- As bioextraction is included in the WEWG workplan and priorities, the proposals will go to the work group for review
- We will continue to work to progress our existing projects to allow for bioextraction to become a more widely-used strategy

Take-Home Messages

- Unlike many other nitrogenreduction strategies, bioextraction is an *in-water* strategy
- It is an economical solution to nitrogen removal
- Co-benefits are numerous
- More work is needed to build industry; but an industry is the ultimate goal of the Initiative



For more information on bioextraction, please visit: https://on.ny.gov/NutrientBioextraction

LINAP Webpage: https://www.dec.ny.gov/lands/120992.html

Resources and Final Reports: <u>Resource Library • NEIWPCC</u>

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