# Expanding the Nutrient Reduction Toolbox:

Nature Based Approaches and Next Generation Septic on Cape Cod

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nature.org

**BARNSTABLE COUNTY** 

Holiday travelers will find two Cape Cod ponds closed due to toxic algae blooms

Image: Second systemImage: Second systemBy Jason Brewer, Boston 25 NewsJune 28, 2022 at 5:49 pm EDT



An algae bloom has made this area potentially unsafe for water contact. Avoid direct contact with visible surface scum. The New York Times

#### A Toxic Stew on Cape Cod: Human Waste and Warming Water

Climate change is contributing to electric-green algae blooms. Massachusetts wants a cleanup of the antiquated septic systems feeding the mess, but it could cost billions.

As temperatures rise, a 'nightmare' of toxic algae plagues the hidden gems of Cape Cod

By David Abel Globe Staff, Updated July 31, 2020, 10:43 a.m.

The issues of nutrient pollution and wastewater management extend far beyond the coast. Our focus today will be on the Cape, where we do most of our work.



# Nutrient Pollution - too much of a good thing



- Wastewater
- Erosion/Sediment
- Fertilizer & animal waste
- Fossil fuels

- Harmful algae blooms
- Dead zones
- Loss of species

- Public health threats
- Loss of recreation, tourism, fisheries income
- Cultural impacts

### Climate change



Harm to Ecosystems Harm to People

- Wastewater
- Erosion/Sediment
- Fertilizer & animal waste
- Fossil fuels

- Harmful algae blooms
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# Cape Cod waters are impaired by excess nitrogen



Locally controllable nitrogen sources



Figure and chart data from the Cape Cod Area Wide Water Quality Management ("208") Plan Update (2015)

## More than half of the watersheds have nitrogen TMDLs



Septic load reduction to meet Total Maximum Daily Loads: > 50% Cape-wide

Source: CCC, 2015. 208 Plan Update

Figure from: Twichell JH, Mulvaney KK, Hubbell B, Erban LE, Berry W, Chintala MM, Crocker Z, Gleason TR, Horsley S, Munns, Jr. WR, Rea AW, Smith SN, Soto Reyes S. 2019. "Solutions-Driven Research Pilot Problem Formulation Workshop: Report and Evaluation." U.S. Environmental Protection Agency, Office of Research and Development, National Health and Environmental Effects Laboratory, Atlantic Ecology Division, Narragansett, RI. EPA/600/R-19/107.

# No silver bullets

# We need a **combined approach** for rapid, cost-effective nitrogen reduction which meets each community's unique needs.



# No silver bullets



Explore the Matrix: http://www.cch2o.org/Matrix/explore.



Nature-based solutions work with nature to provide long-term solutions that benefit both people and the environment.

# Retired Cranberry Bogs --->Nutrient Sponges





Restoring these historic wetlands could provide up to 37% of nitrogen reductions required under the Three Bays TMDL







Map courtesy of Marstons Mills Historical Society



PRESCRIBED MICROTOPOGRAPHY

CHANNEL FILLING

PROPOSED CHANNEL ALIGNMENT

TOTAL PEAT DEPTH

### <u>Cost Savings Through Non-Traditional Technologies</u>



Sewer Construction does NOT include annual collection, O&M, or monitoring. Cranberry Bog Restoration and I/A Septic System Upgrades include annual O&M and monitoring costs. Comparisons are based on the cost of financing the capital costs of the subject project at 5% over a term of 20 years, plus any available annual costs (e.g. O&M and monitoring).

The Massachusetts Alternative Septic System Test Center

- We do the science on I/A tech
- Research
  - N, CEC, P removal
  - Virus removal
  - Wastewater hydroponics
  - partnerships
- Development of non-proprietary systems
- Technical support to towns
- I/A System data base
- Launching septic system utility: RME!



# BARNSTABLE COUNTY



### Better septic: An essential part of the solution

- 80% of preventable N load
- How the heck did we get here?
- Early I/A systems vs. Nextgen systems
- On-site systems ARE infrastructure
- Toolbox of solutions





#### **Traditional Septic**

#### I/A N-Reducing Septic



# Next- Generation I/A Systems

- First gen systems @ 19 mg/l
- Next gen systems @ <12 5 mg/l</li>
  - Mini WWTP in your backyards
- Site-specific pilots or provisional approval
  - Shubael, MA; Martha's Vineyard, MA; West Falmouth, MA; Charlestown, RI
- Some are nature-based:
  - Woodchips & sawdust
  - Bacterial activity to off-gas N

### Next Generation Systems: Shubael Pond Project

• Key partners:

US EPA, USGS, TNC, BCWC, Barnstable

• Objective:

Measure GW footprint of clustered systems

• Site selection:

N in GW, phase II sewer

• Implementation:

12 installations, engagement-intensive

• Results:

Avg influent: 71.4 mg/l Avg effluent: 3.7 mg/l % removed: 94% Avg removal: 9.3 kg/yr



## Next Gen Systems: Advantages & Challenges

#### Advantages:

- Replenish our single-source wifer
- Solution at the source
- Can save \$\$ & provide effect

#### **Challenges:**

- Not financed like
- Developer capacity
- Scaling up
- Reliable operation, manneed

# Responsible Management Entity

- Management utility for decentralized systems
- Goal: manage I/A systems for better performance and reliability to help Barnstable County communities meet environmental and public health goals
- Why do we need it?









# I/A System Deployment: How it Works Now



The RME is a **FREE** resource for BC towns

# **Primary Goals**





Become financially self-sustainable



Reduce risk to homeowners



# A Holistic Approach

- Cradle-to-grave management
- Enhanced & traditional I/As
- Meet regulatory requirements:
  - Recommended Tech Committee
  - Performance
- What does this look like?
  - 1. Town opts into RME
  - 2. Homeowner pays utility fee
  - 3. RME hires contractors and service providers
  - 4. RME oversees installation
  - 5. RME sets expectations
  - 6. RME monitors, tracks performance, maintains system and makes minor repairs



# Components of an RME



**Planning & Design** 

Operation & Maintenance

Monitoring & Compliance

Inspections

Education & Participation

Inform user on care & use of system

Review developer plans

Criteria for system

acceptance into RME

Hire certified/licensed operators & contractors

O&M according to permit

Submit monitoring reports

Submit compliance reports prior to renewals

Remote monitoring tech?

Education & certification

# Components of an RME: Record Keeping & Inventory



### How Will the RME... Maintain **Flexibility**?



#### Offering a menu of options

But keeping a baseline of services

Example:

Town A : Homeowners should be responsible for design and installation

Town B: RME should be responsible for design and installation

Click <u>here</u> for a menu of services the RME can provide

# Where are we now?

- 5 pilot towns/areas
  - Wellfleet, Bourne, Shubael Pond, Falmouth, Brewster

**MASSTC IS HIRING!** 

- Existing I/A tech
- Recommended tech committee
- Remodeling I/A database
- SRF Funding
- Workforce Dev. & Education Programs
- Transferable model as end goal

# Some Final Thoughts

- There are <u>no silver bullets</u>
- Next-gen I/A systems are part of the toolbox
  - RME as support infrastructure
- <u>Need:</u>
  - Funding for this critical infrastructure
  - Better communication
    - People are being left out
  - Climate change adaptation





### To Learn More

- MASSTC Website
- <u>NEOWTP Classes</u>
- <u>EPA</u>
- TNC Massachusetts
- Southeastern MA septic pilots:
  - <u>Barnstable Clean Water</u>
    <u>Coalition</u>
  - Buzzards Bay Coalition











### Thank You!





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# **Breakout Discussion**

- 1. Which, if any of these nitrogen-reduction tools/technologies, are being considered in your communities? How are they being perceived?
- 2. If you are thinking about installing I/A systems in your community, or if you have installed I/A systems, what are your town's needs?

(information, capacity, plan review, monitoring, etc...)

3. What methods of communication work best in your communities to reach your constituents? What has traditionally worked, and what hasn't?

a. What types of communication products on nitrogenreducing technologies or on the Responsible Management Entity would be helpful for you?



# **Breakout Discussion**

4. Imagine implementing a Responsible Management Entity in your community- What do you perceive as potential hurdles and driving factors? What specific support would you need from the RME?

5. If you're interested in nature-based approaches to reduce nitrogen pollution in your community, what support or information do you need? What factors influence your decisions about this?

a. If you are actively implementing NBS in your community, what have your successes been?
 What are your challenges?

