



Innovative/Alternative septic systems for nutrient pollution

State of the science, technology, and management

Brian Baumgaertel, Sara Wigginton, Alexie Rudman

Massachusetts Alternative Septic System Technology Center (MASSTC)





- Quasi-government entity
 - R&D on I/A systems
 - Testing for companies globally
- County Wastewater Division:
 - AquiFund loan program
 - I/A Tracking database
 - RME
 - MASSTC
- Technical + management support to towns
- Public/stakeholder communication

And we do a **LOT** of groundbreaking ;) research projects....



Research Projects

- Virus research
- Contaminant removal:
 - N
 - CECs
 - P
- Leaching pits vs. Leaching fields
- Eco-sanitation & urine diversion
- Wastewater re-use in dye plants

All in collaboration with partners from different sectors



Viruses

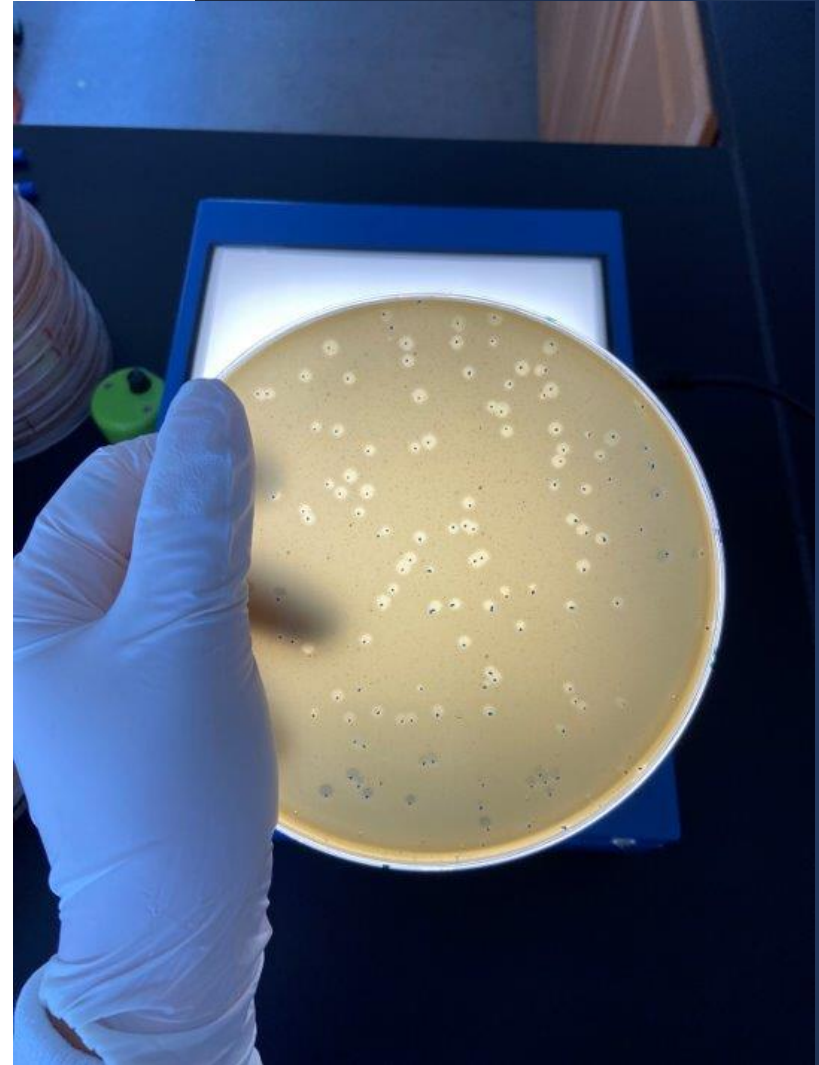
Massachusetts Department of Environmental
Protection Virus Entrainment Study

VIRUSES

- Male Specific Phages (MS-2)
- Somatic Phages
- Various animal (human) viruses

BACTERIA

- Escherichia coli
- Enterococcus sp.
- Fecal Coliform

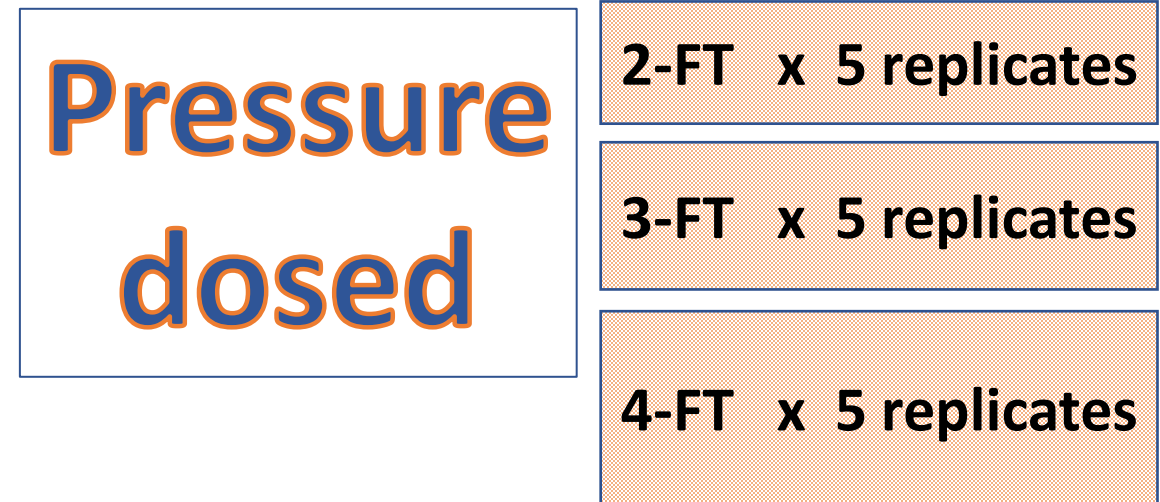
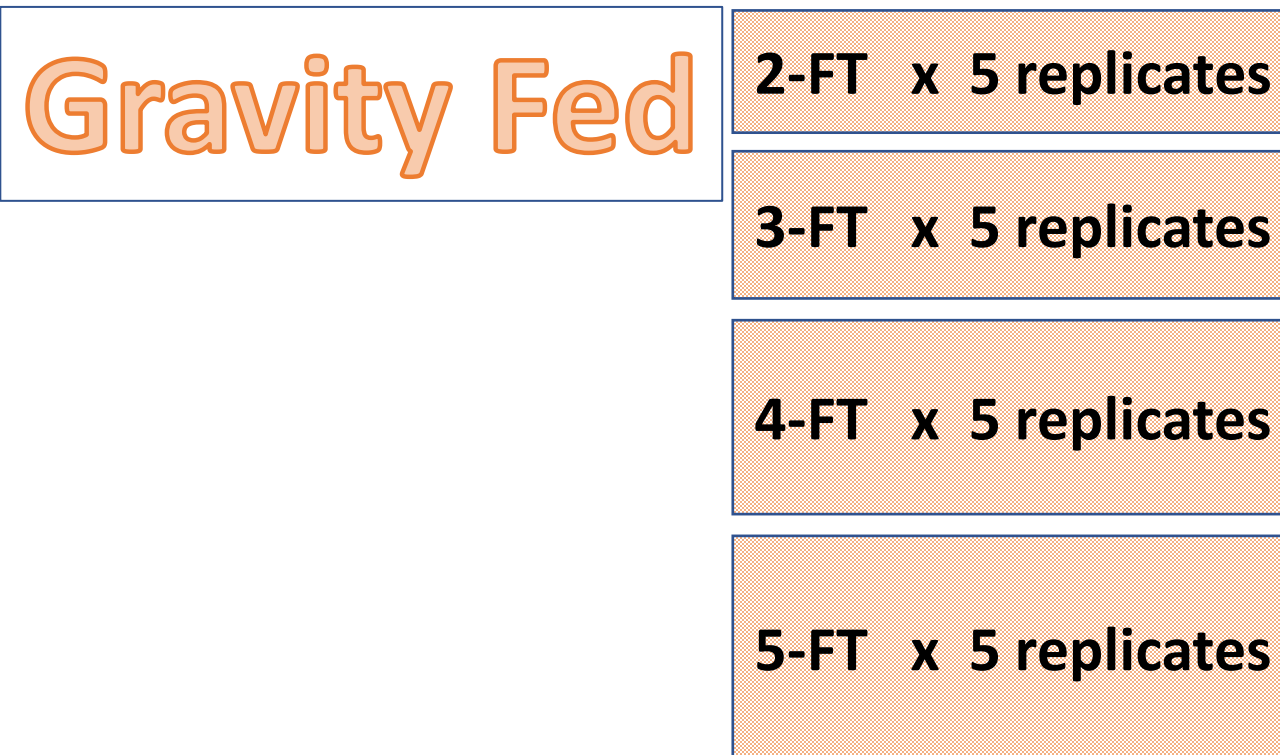


Viruses – Project Phase 1

Research funded by the Mass Department of Environmental Protection

Research question:

“Are the groundwater separation requirements in MA appropriate?” (current regs requires 5’ separation for gravity systems and 4’ for pressurized systems)



Total 35 replicate test cells

Viruses

Test Cell Construction



Viruses – Project Phase 2

- Funded by the EPA STAR (Science to Achieve Results)
- Expanded analysis to include systems in addition to test cells
 - Drip dispersal, Membrane Bioreactor, Nitrogen Removing Systems, and Municipal Treatment Plants

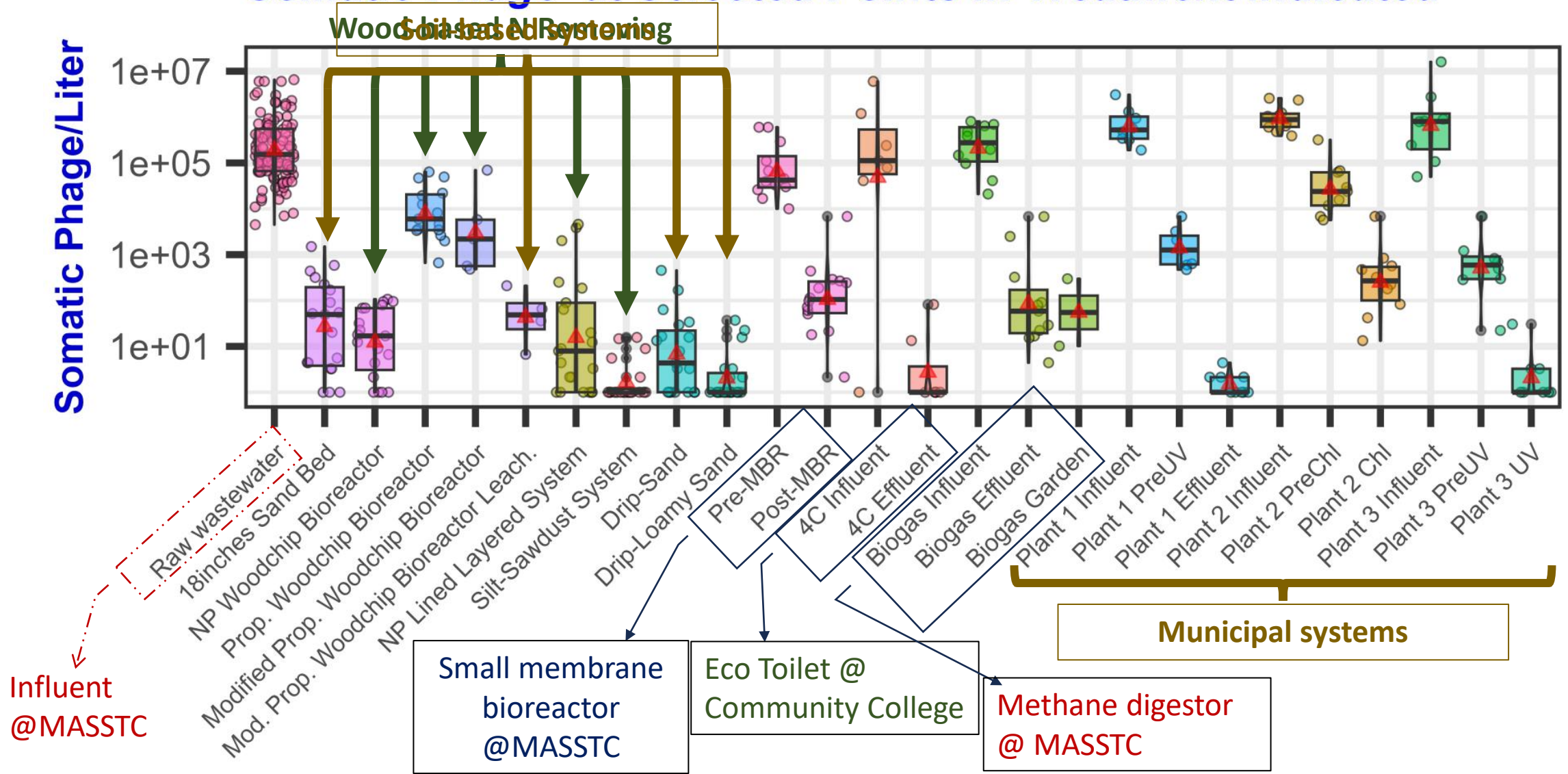
Two research questions:

- What are the water re-use potentials of wastewater treatment technology?
- Is there any correlation between cultured coliphages (analyzed at MASSTC) and enteric viruses (analyzed by MassDEP)



Virus Project – Preliminary Results

Somatic Phage at Selected Points in Treatment Indicated



Enhanced N Removal Pilot: Shubael Pond Project

- **Key partners:** US Environmental Protection Agency, the Nature Conservancy, the US Geological Survey, the town of Barnstable, and Barnstable Clean Water Coalition
- **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

Learn more w. Sara in the poster session!

*Any mention of a name, product, service, company, or institution does not constitute an endorsement by MASSTC or Barnstable County Regional Government



BARNSTABLE COUNTY

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



By [Jason Brewer](#), [Boston 25 News](#)

June 28, 2022 at 5:49 pm EDT

Notice

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.



MARYLAND

Septic system frustrations boil, state and local changes proposed



Jenna Miller

The Daily Times

Published 6:14 a.m. ET Feb. 26, 2019 | Updated 2:18 p.m. ET Feb. 27, 2019

'From Bad To Worse:' Hawaii's \$1.75 Billion Cesspool Problem

The risks posed by the state's 88,000 remaining cesspools will likely be amplified by climate change.

The issues of nutrient pollution from decentralized wastewater infrastructure extend far beyond our coast

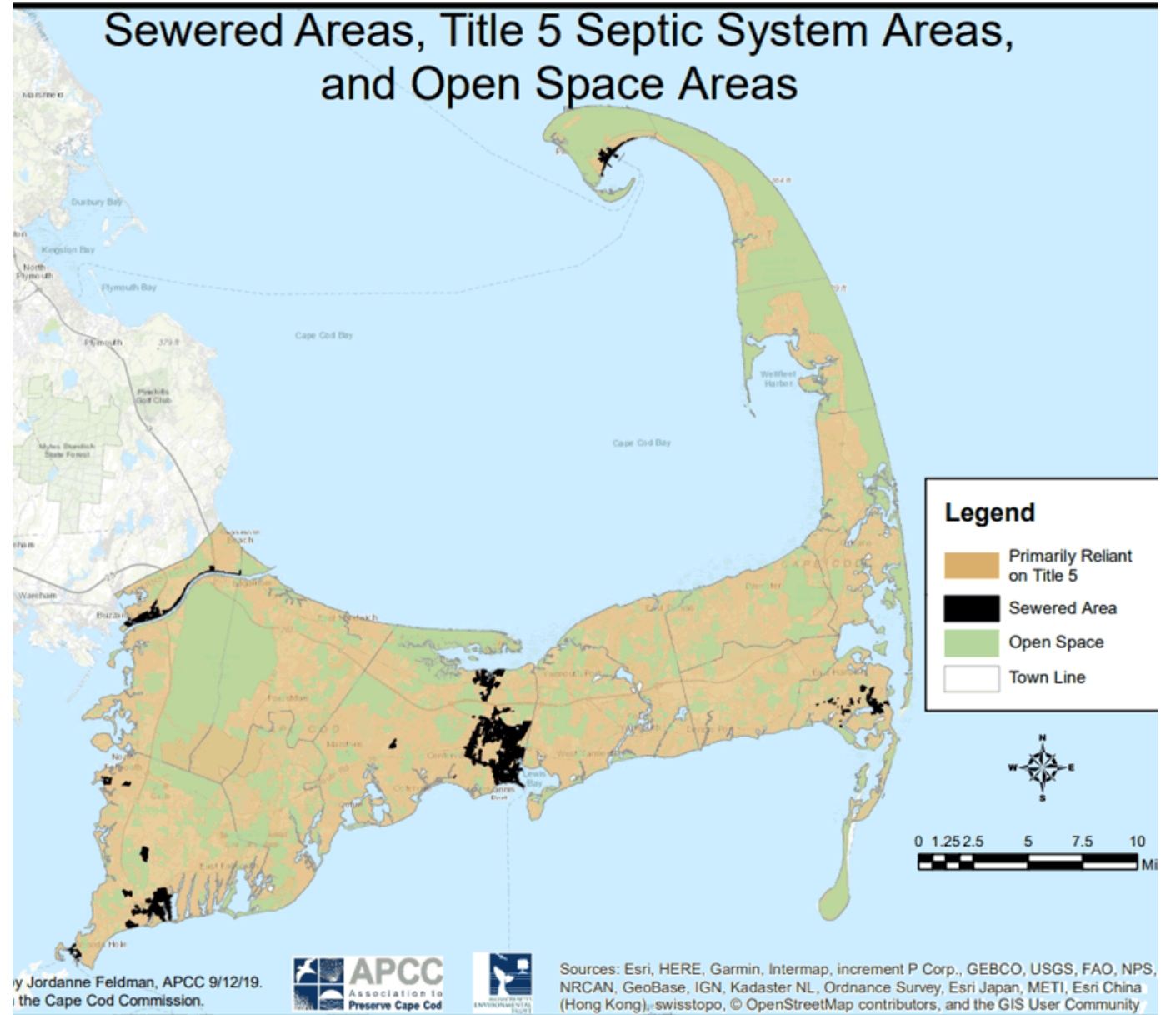
'Dead Rivers, Closed Beaches': A Water Crisis on Long Island

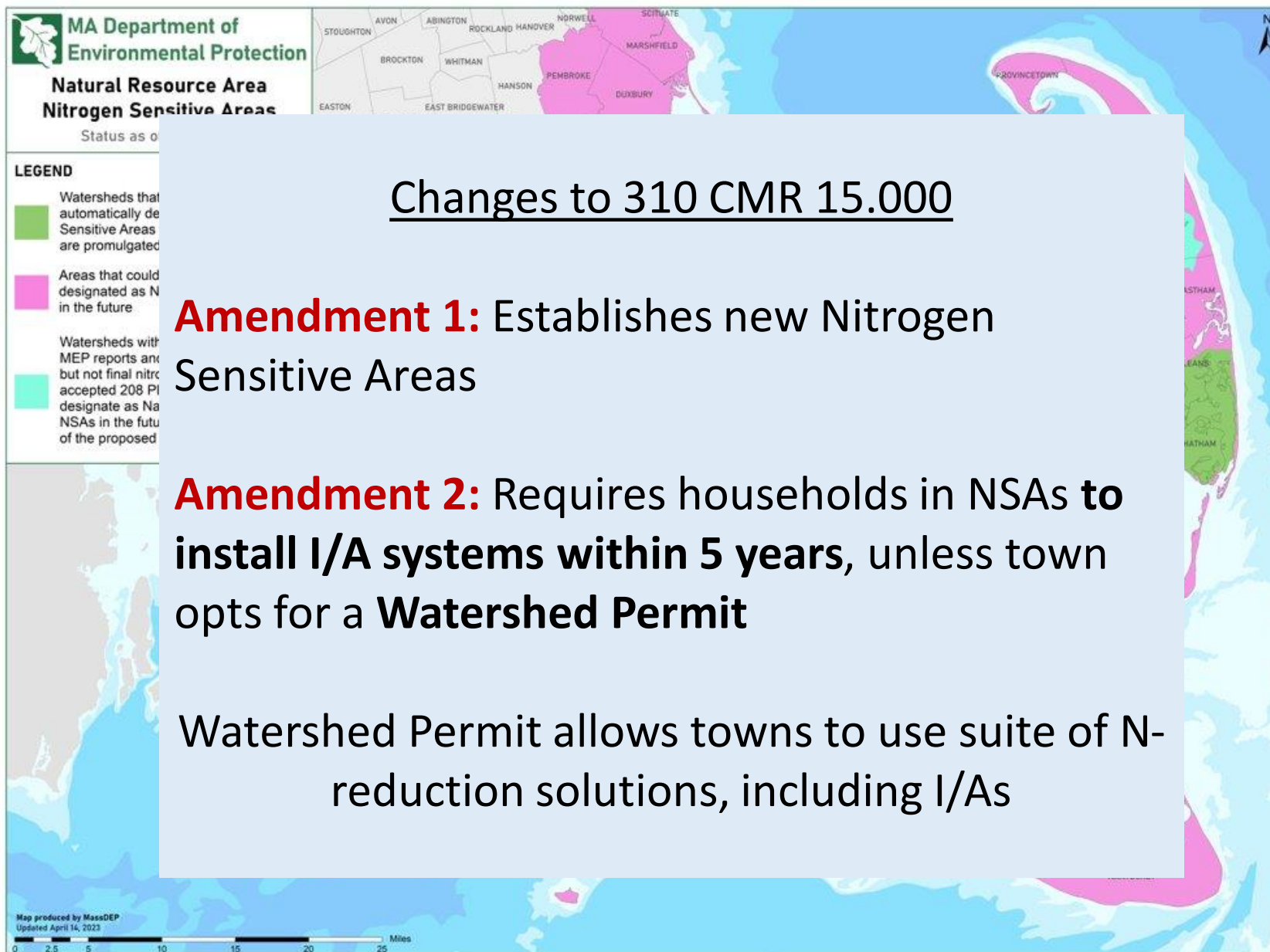
Septic tanks leak nitrogen into Florida's springs

Once pristine waters are slowly being choked by high nitrogen levels brought on by septic systems

Regional Context & Challenges

- 80% of preventable N load
- How the heck did we get here?
- On-site systems **ARE** infrastructure
- Toolbox of N-removal solutions
- Enhanced N removal systems





A Toolbox of Solutions: Cape Cod Commission Technology Matrix



Cape Cod Commission Technology Matrix

I/A System Advantages & Challenges

Advantages:

- Replenish our single-source ac
- Solution at the source
- Can save \$\$ & provide en

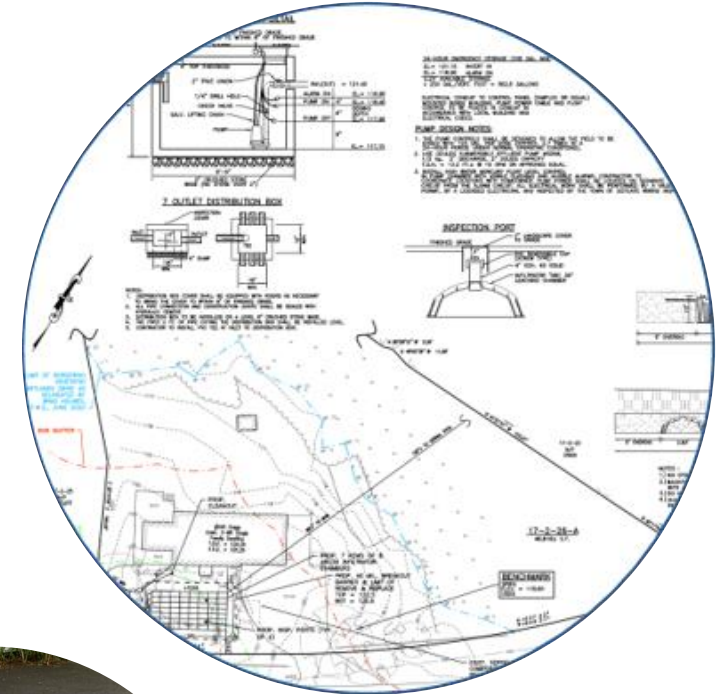
Challenges:

- Not financed like traditi
- Developer capacity
- Scaling up
- **Reliable operation, maintenance, monitoring**

**Enter the
RME!!!!**

Responsible Management Entity (RME)

- Management utility for OWTS and I/As
- Support system for rollout of I/As assoc. w/ regulation changes
- 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 an RME?

1. I/A system management is inconsistent
2. Homeowners are currently responsible for I/A installation and O&M
3. Municipalities have limited capacity to ensure compliance
4. RME will help implement and monitor wider I/A system adoption
5. Simple errors during design and installation can lead to system underperformance
6. To collect and distribute independent data to support environmental decision-making

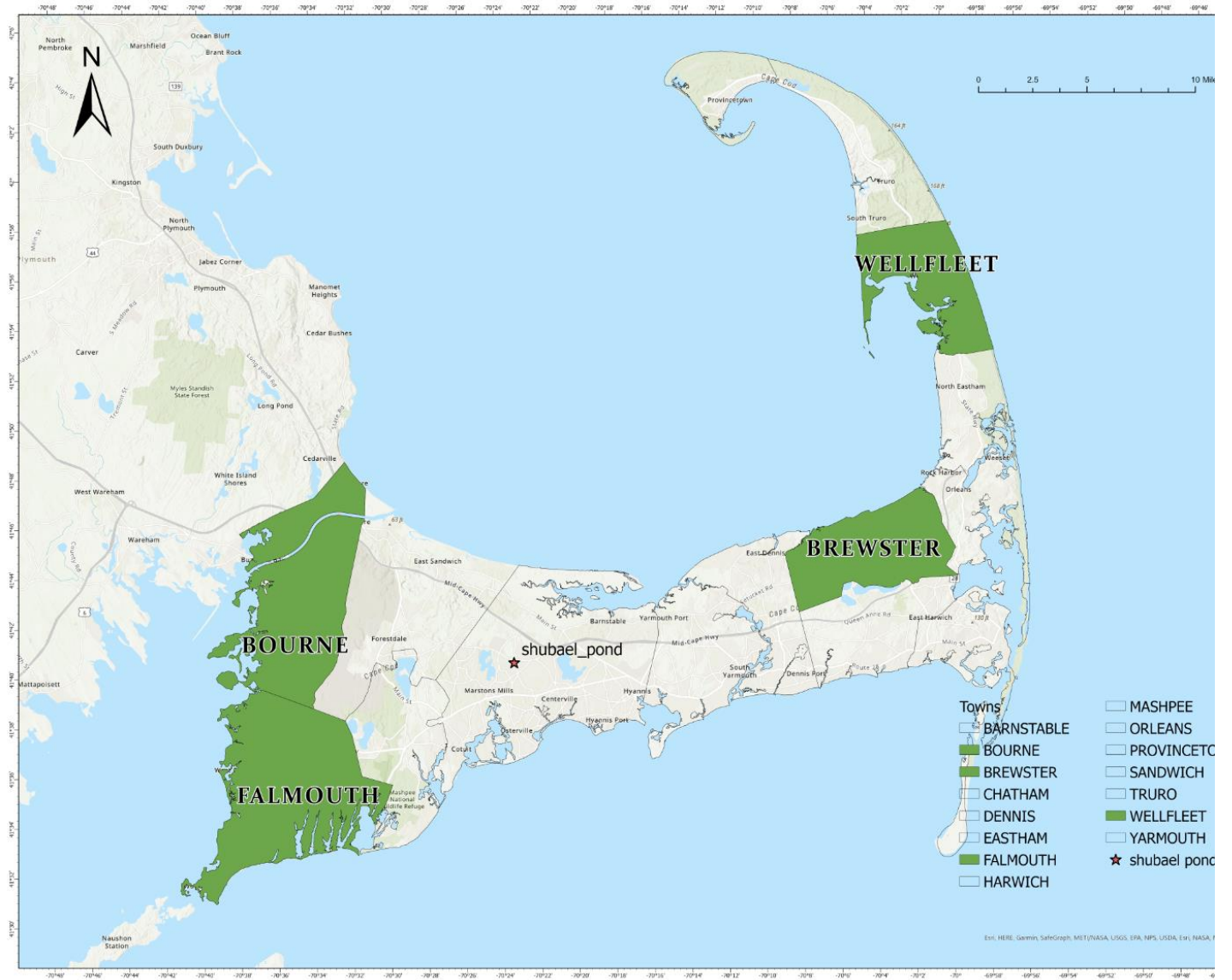
A Holistic Approach

- Cradle-to-grave management
- Flexibility
- Addresses homeowner & municipality information + capacity gaps
- What does it look like?
 1. Towns opts into RME
 2. Homeowner pays fee
 3. RME hires service providers, oversees install through O&M
 4. RME samples, monitors, makes repairs and adjustments



Where are we now?

- Implementation – 4.5 pilot towns
 - Delayed by reg changes
- Heavy focus on 3 pillars:
 - Technology: recommended tech panel
 - Management: infrastructure & training
 - Communication: many stakeholders, constantly



Credit: Lisa Chen, Boston University



Credit: BCWC

Onsite Wastewater Needs & Challenges

- Workforce development- ASAP!
- Research on climate resilience
- Changing public perceptions on I/A tech
 - Targeted communication strategies
 - Multi-disciplinary collaboration
- Funding:
 - Support homeowners
 - Help developers w/ state approval process
 - Non-proprietary tech



Thank You!

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bbaumgaertel@capecod.gov

sara.wigginton@capecod.gov