

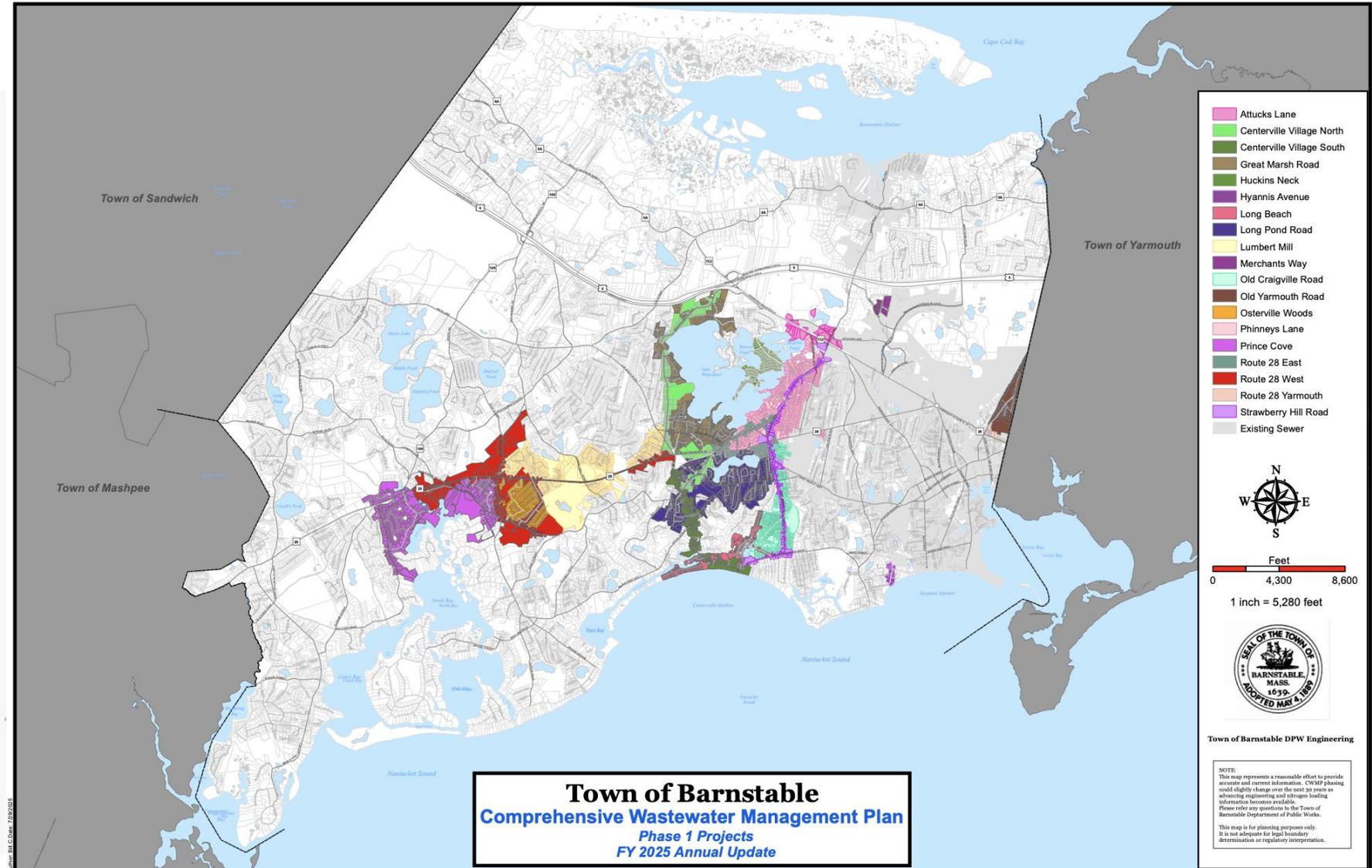
Ad Hoc Comprehensive Wastewater Management Plan (CWMP) Committee

Committee Members

- Scott Horsley (Chair)
- Brian Hughes (Vice Chair)
- Tom Cambareri
- Zee Crocker
- Rob O'Leary
- Louise O'Neil
- Butch Roberts
- Glenn Snell

Town Council

- Kris Clark, Vice President, Precinct 11
- Paul Neary, Precinct 6
- Gordon Starr, Precinct 1



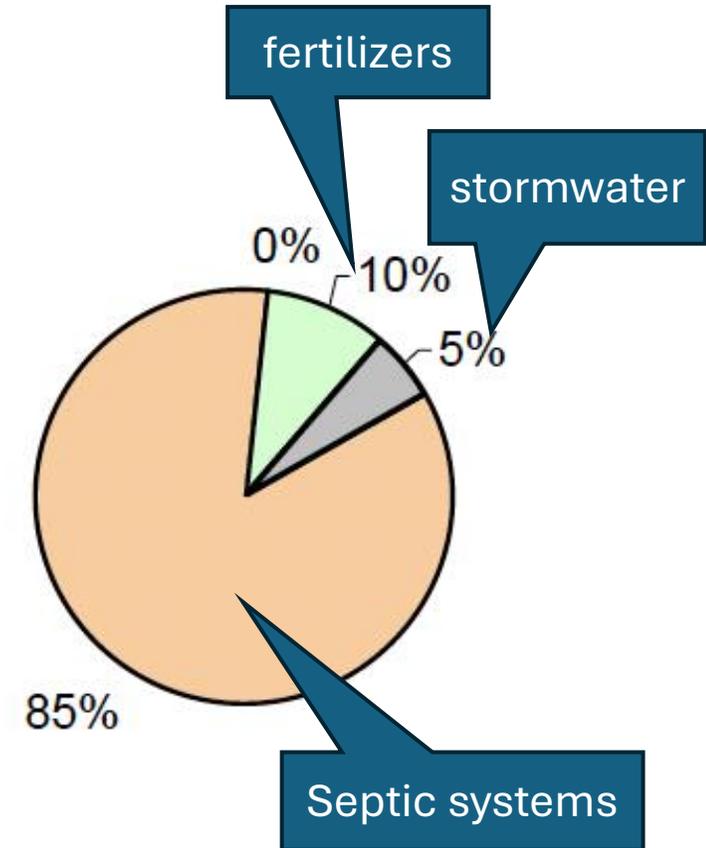
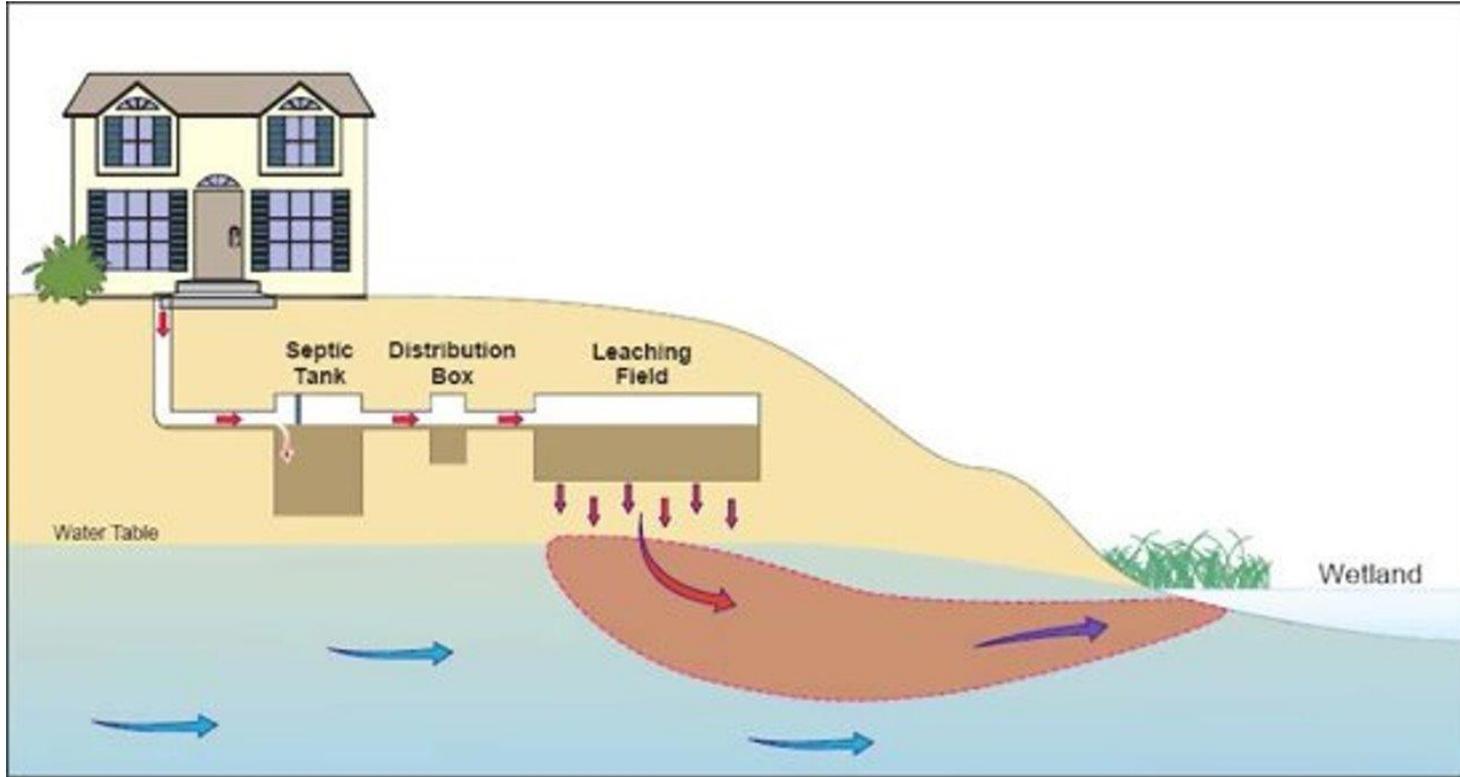
DRAFT RECOMMENDATIONS

1. Evaluate a potential Health Regulation to implement septic system upgrades to nitrogen-reducing (NR) systems in coastal areas.
2. Support the restoration of wetlands at the cranberry bogs at the headwaters of the Marstons Mills River.
3. Assist with a pilot project to evaluate alternative phosphorus mitigation approaches and technologies at a freshwater pond.
4. Re-formulate the CWMP Ad Hoc Committee into a standing advisory committee to continue to identify and help develop alternative approaches to achieving the CWMP goals and other water quality initiatives.

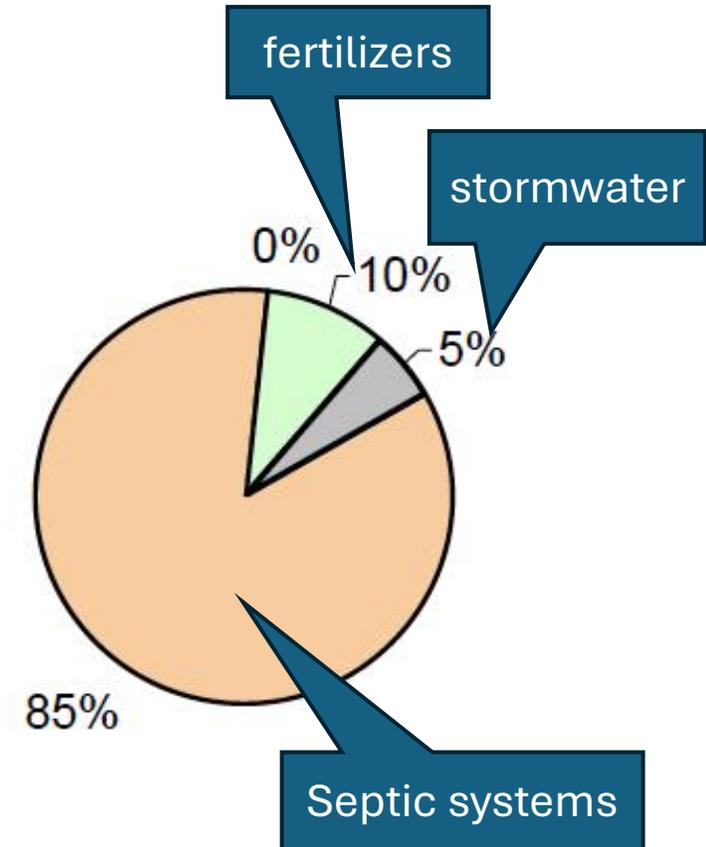
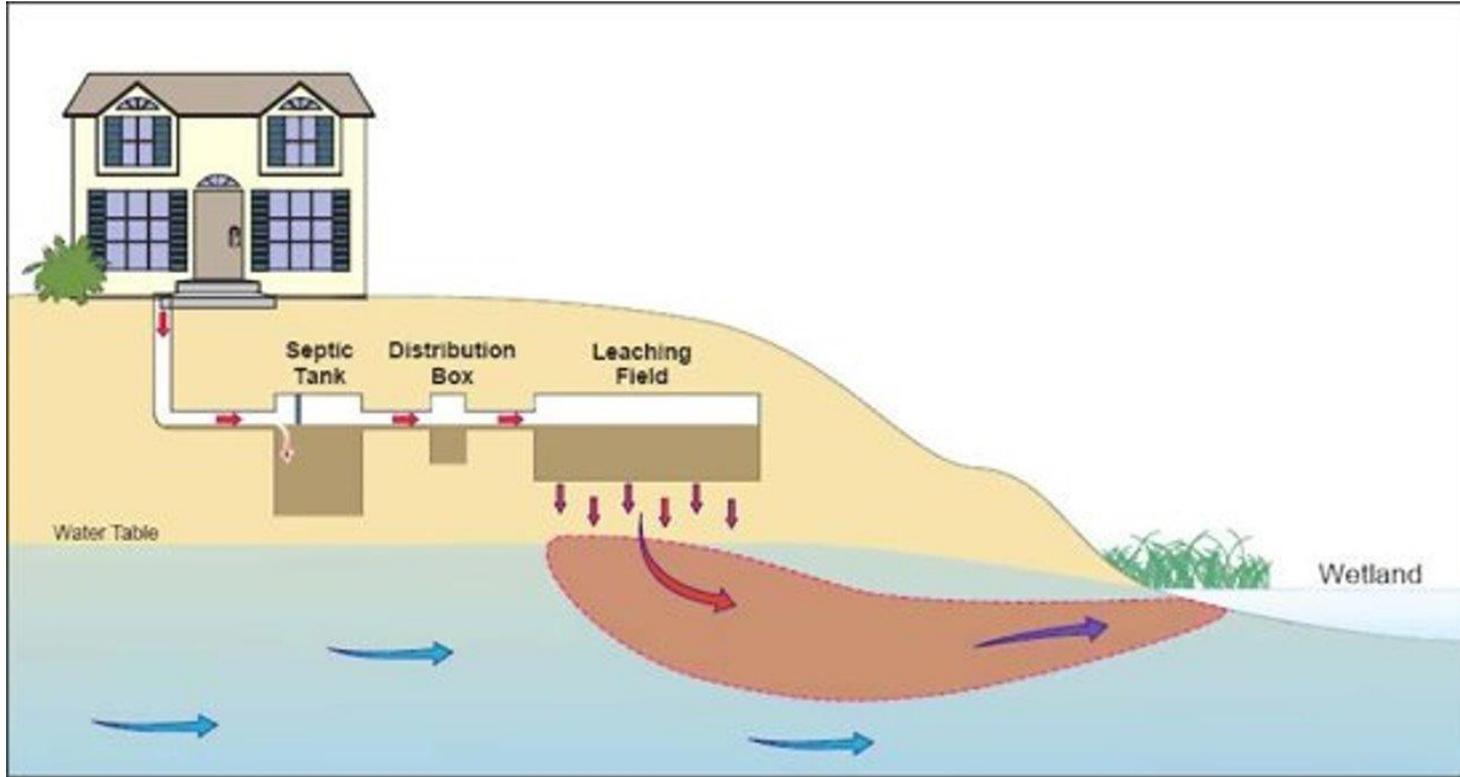
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Septic systems are the primary pollution source



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Does it make sense to continue installing more of them???



House Vent

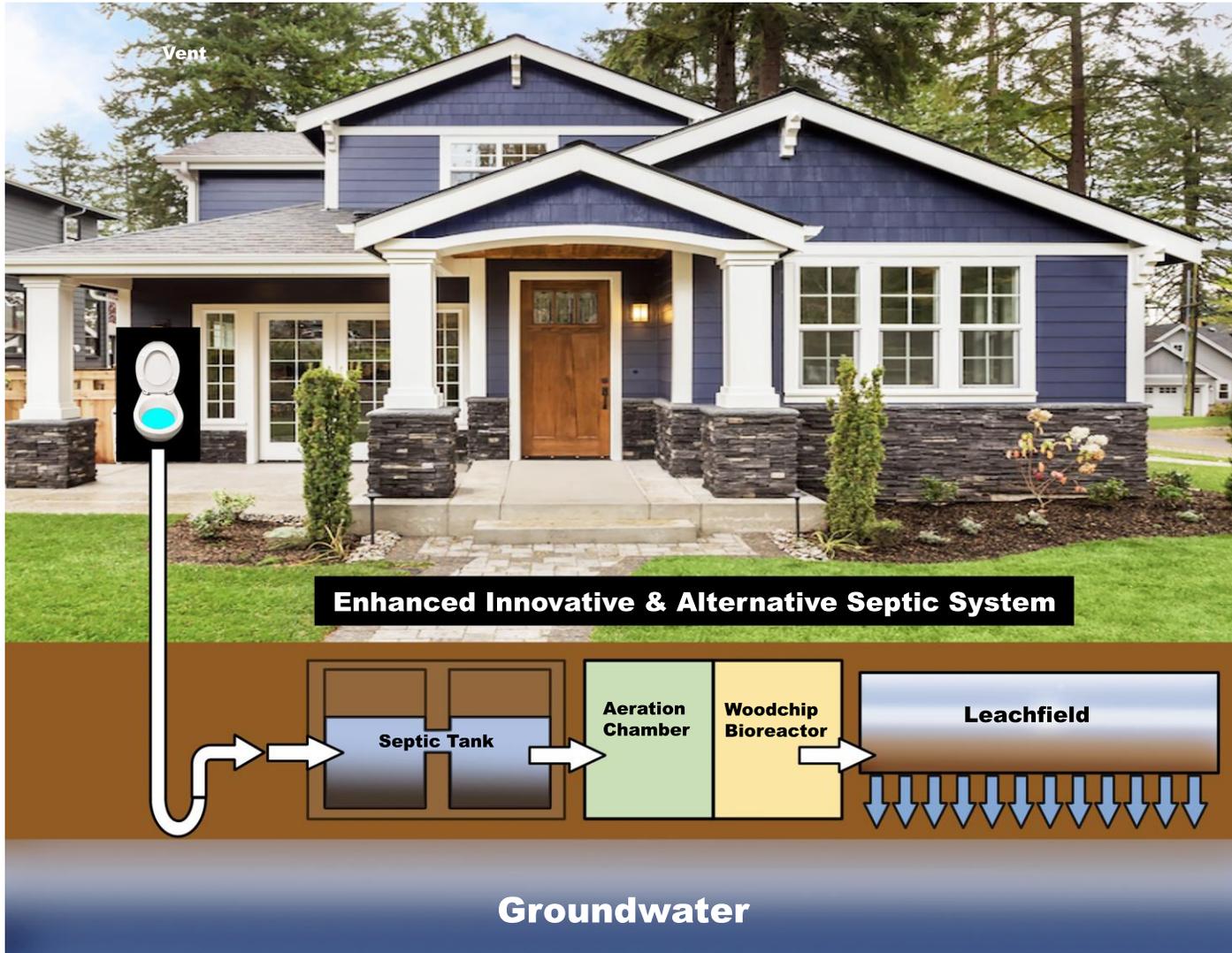


Septic Tank

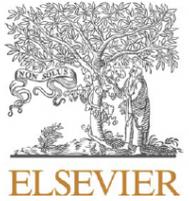
Conventional Title 5 Septic System

Leachfield / Drainfield
Effluent Absorption

Groundwater



Innovative & Alternative (I&A)
or
Nitrogen Reducing (NR)
Septic Systems



Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Journal of Environmental Management

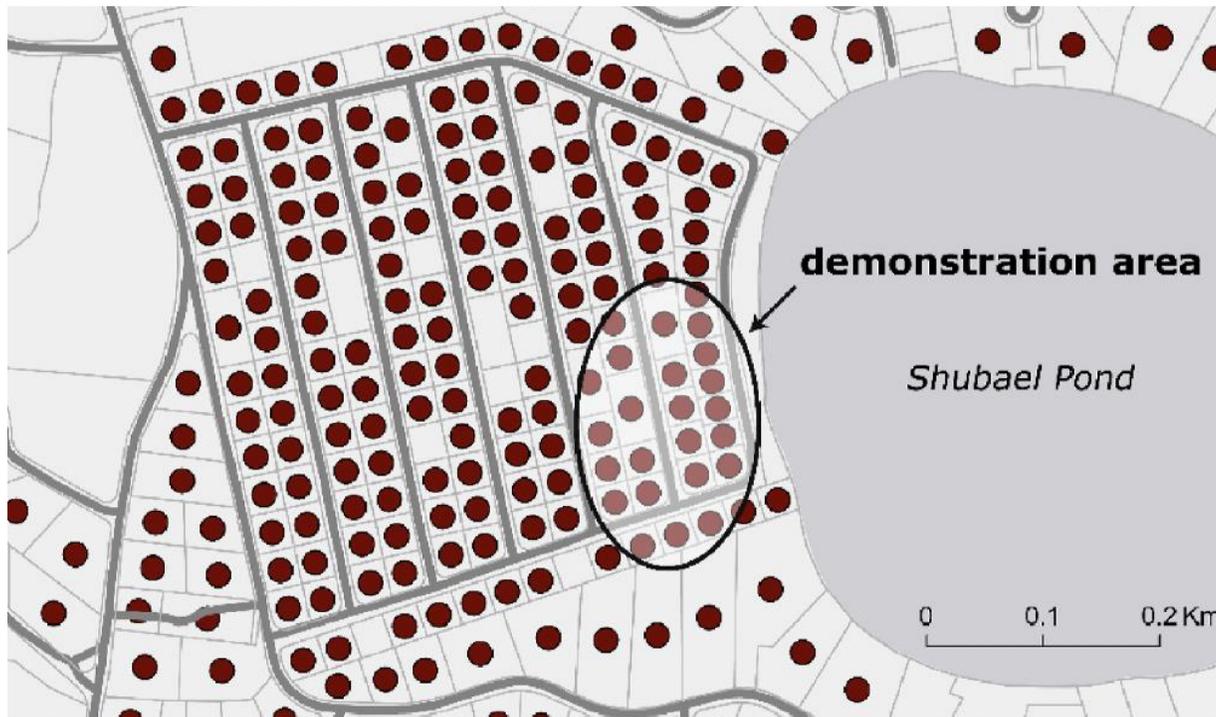
journal homepage: www.elsevier.com/locate/jenvman



Research article

Reducing wastewater nitrogen loading by >90% with carbon-amended septic systems: A field demonstration in Barnstable (Cape Cod), Massachusetts

Laura E. Erban^{a,*}, Sara K. Wigginton^b, Brian Baumgaertel^b, Bryan Horsley^b, Timothy D. McCobb^c, Zenas Crocker^d, Scott Horsley^e, Timothy R. Gleason^a

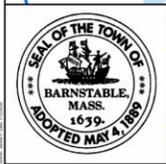
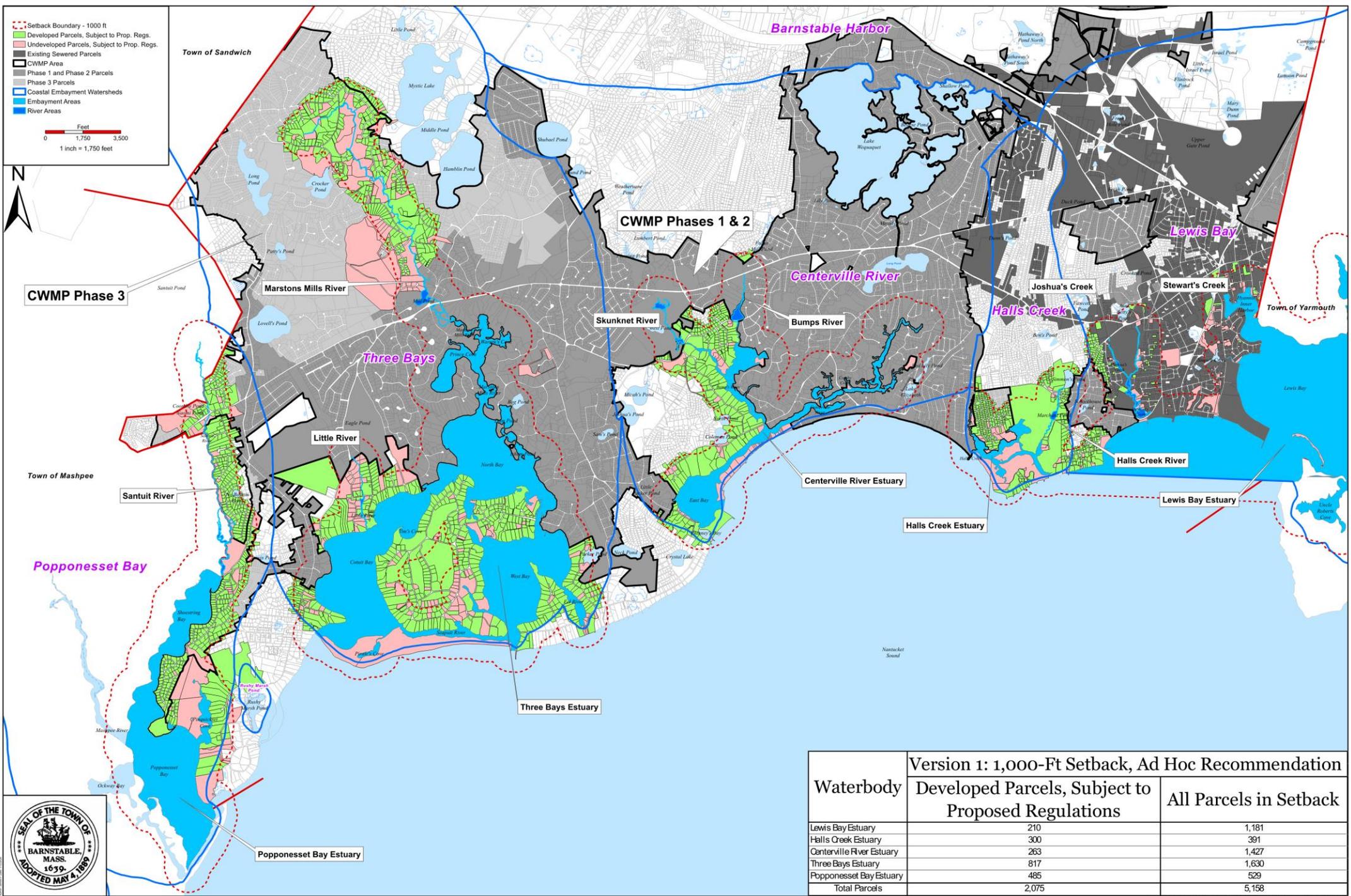
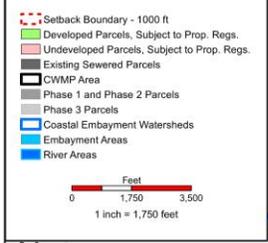


Average Influent: 97.8 mg/liter
Average Effluent: 7.6 mg/liter
Nitrogen Reduction: 92%



5 Days, \$22K





Waterbody	Version 1: 1,000-Ft Setback, Ad Hoc Recommendation	
	Developed Parcels, Subject to Proposed Regulations	All Parcels in Setback
Lewis Bay Estuary	210	1,181
Halls Creek Estuary	300	391
Centerville River Estuary	263	1,427
Three Bays Estuary	817	1,630
Popponeset Bay Estuary	485	529
Total Parcels	2,075	5,158

Possible Regulatory Approach

- Potential NR septic system installation triggers
 - New construction
 - Additions to existing homes (or ADU)
 - Replacement required by system failure
 - Real estate transfers

Results of Life Cycle Analysis

Design, Construction, Operation, Maintenance, and Monitoring over 80 years

Net Present Value (NPV) Comparison

Wellfleet Targeted Watershed Management Plan

- Approximately 730 Sewer Parcels
- Capitol Cost Sewer (2024\$): \$90,600,000
- 80-Year O&M Present Value Sewer: \$64,400,000
- NPV Sewer: \$155,000,000
- **NPV Sewer per Parcel: \$212,329**

- 2061 Nitrogen Reducing (NR) Septic System Parcels
- Capitol Cost: NitROE at \$53,934 and Nitrex at \$70,000
- 80-Year O&M Present Value: NitROE at \$35,069 and Nitrex at \$15,041
- NPV: NitROE at \$89,030 and Nitrex at \$85,041
- **NPV of both NR systems per Parcel \$87,036**
- Total NPV for NR at \$179,400,000 (*considering 10 mg/l N effluent*)



Scott Horsley
Water Resources
Consultant

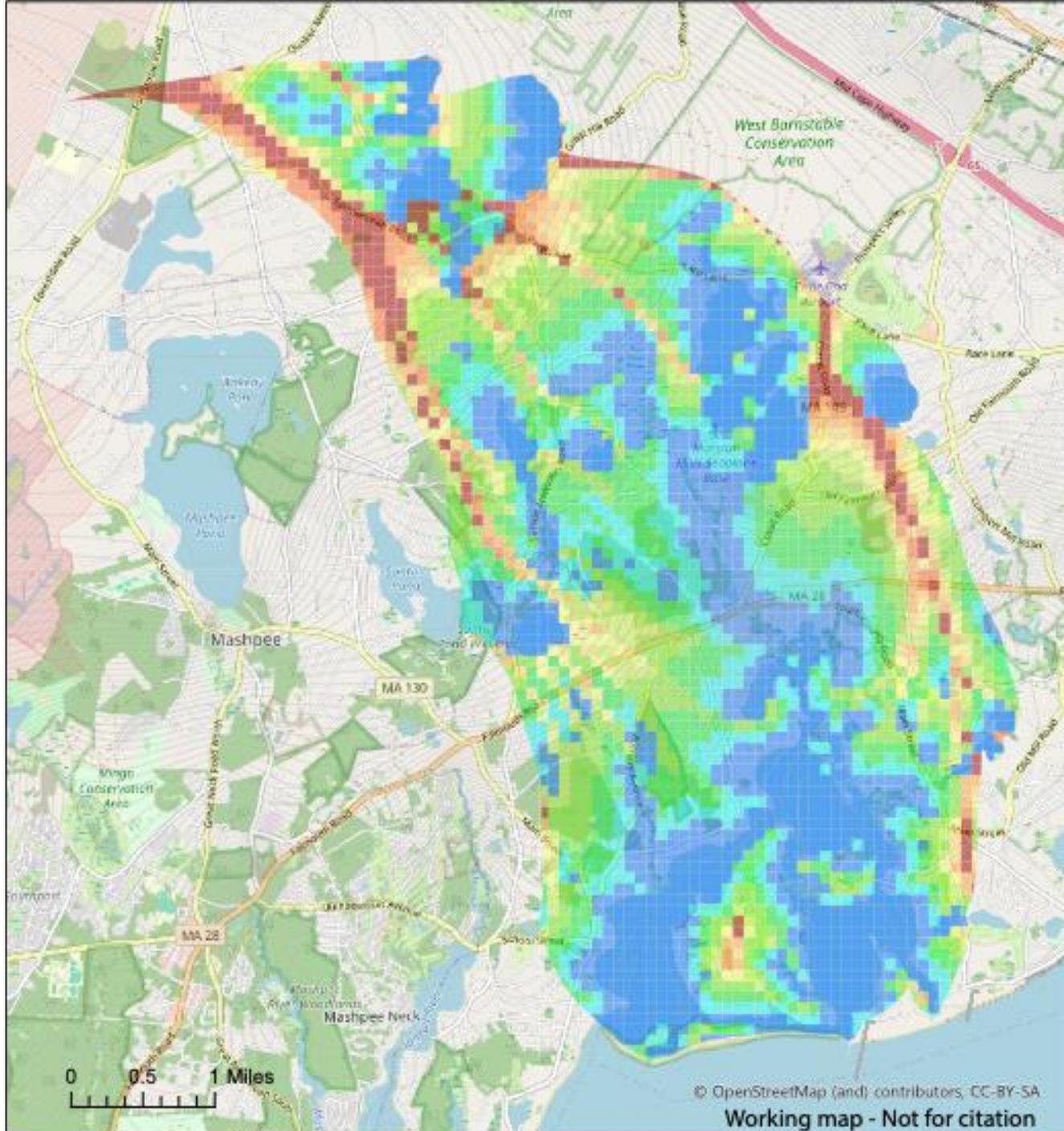
COST CONSIDERATIONS

New Title 5 System: \$25,000 – 30,000

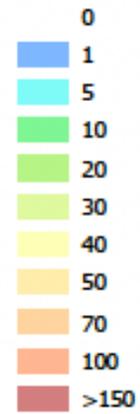
Marginal Cost adding NR technology: +\$25,000

MA Tax Credit: \$18,000

Net Cost for NR technology: \$7000



Upgrading septic close to shore will result in water quality improvements sooner



Time of Travel
(years)

Groundwater moves slowly (1 foot/day)

Advantages of Nitrogen Reducing (NR) Septic Systems

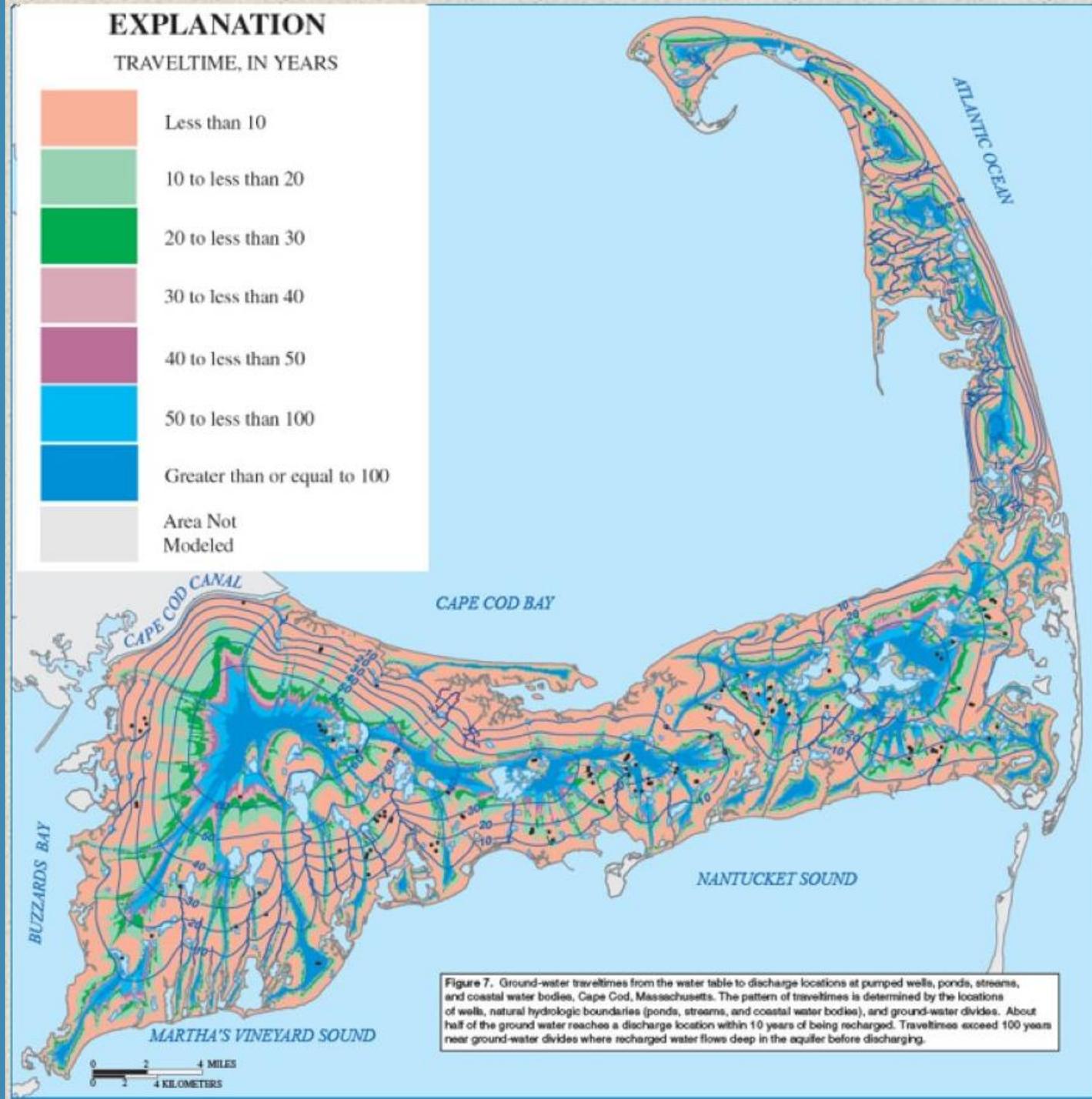
- Time of Travel – water quality benefits sooner
- Provides supplementary nitrogen removal as hedge against uncertainties – provides for adaptive management
- Could reduce Phase 3 sewerage needs and costs
- Marginal Cost of adding N treatment when upgrading a septic system is approximately \$25K (minus tax credit of \$18K = \$7K)



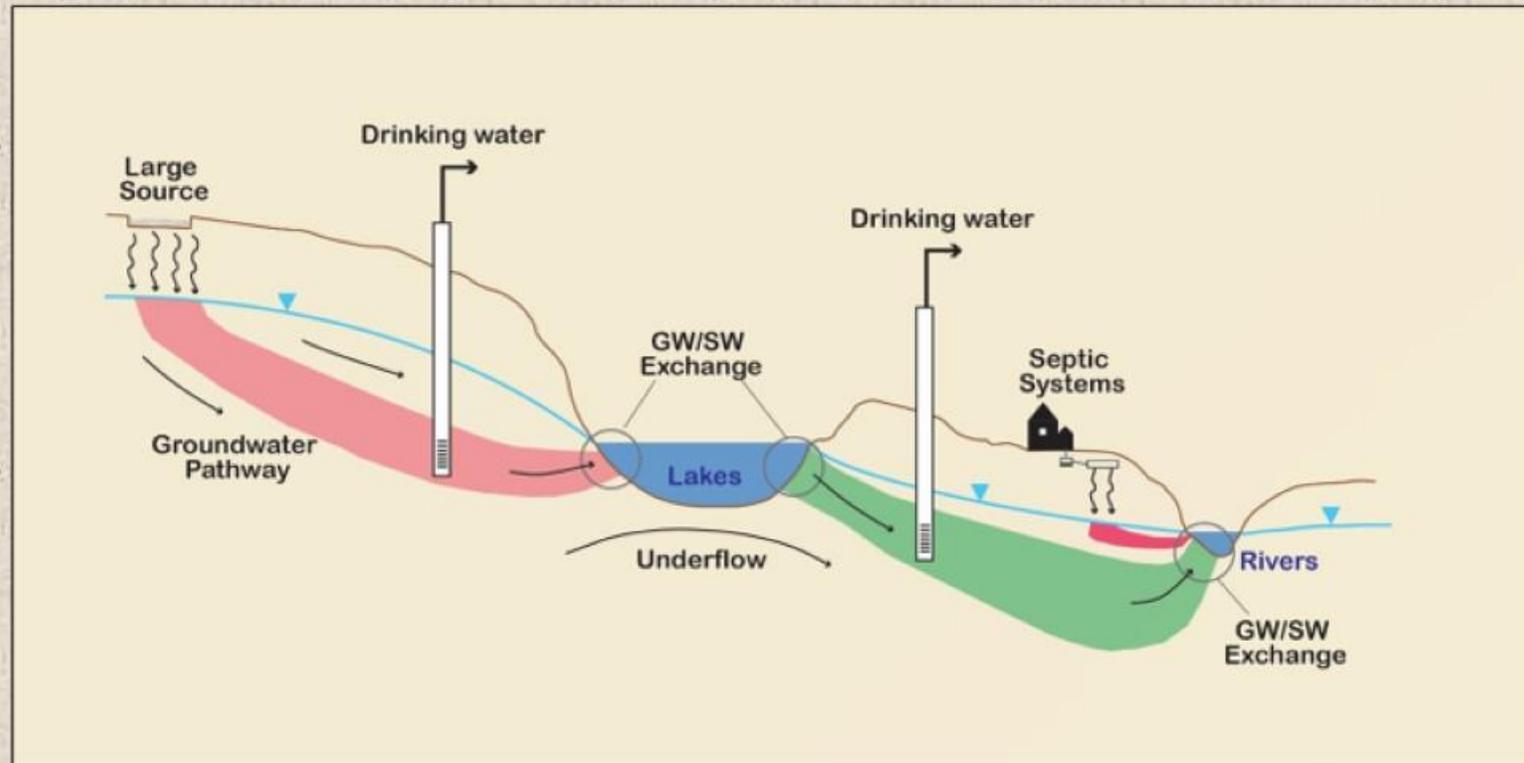
Zee Crocker
Water Quality Advisory Committee
Member
Board of Health
March 16, 2026

**WE HAVE A SICK
PATIENT**

**LIKELY REQUIRING
VARIOUS
TREATMENTS TO
ACHIEVE HEALTH**



The Unseen Lifeline: Groundwater's Role in Cape Cod's Freshwater Resources



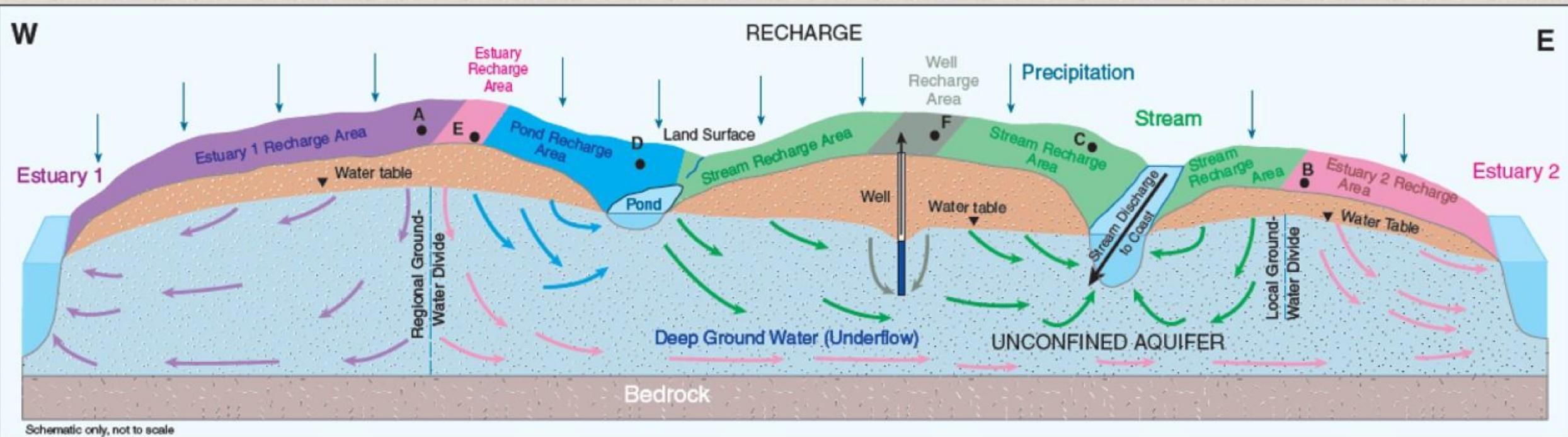
Marcel Belaval and Denis LeBlanc
U.S. Geological Survey



MASSTC Groundwater Awareness Week
March 12, 2026

From Recharge to Discharge

A COMPLICATED
CIRCULATORY SYSTEM



THE CULPRIT

OUTHOUSE



CESSPOOL



TITLE 5



THE FUTURE



200+
Installations

20,000+
To Go

**Proven and Patented
Performance**

SOLUTIONS

HOLISTIC APPROACH

GROUNDWATER

LAKES & PONDS

ESTUARIES

GENERATIONAL CHANGE

MULTIPLE TOOLS

NON-TRADITIONAL SOLUTIONS

NITROGEN REDUCING SYSTEMS

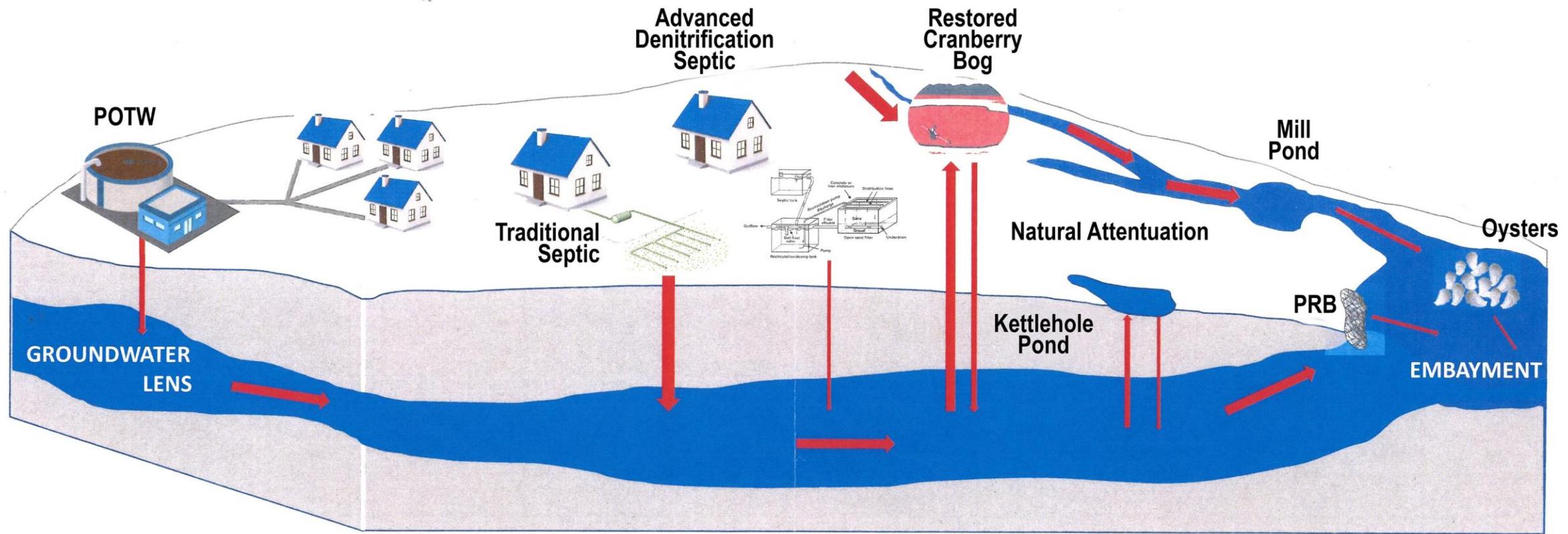
WETLANDS

- **GOES WHERE SEWER CAN'T**
- **TARGETED**
- **RAPID TREATMENT**

**LIMITATIONS: COST, PERFORMANCE,
SYSTEM MANAGEMENT**

A SIMPLIFIED VIEW

Symbol Key
↓ Thickness of arrow indicates nitrogen load



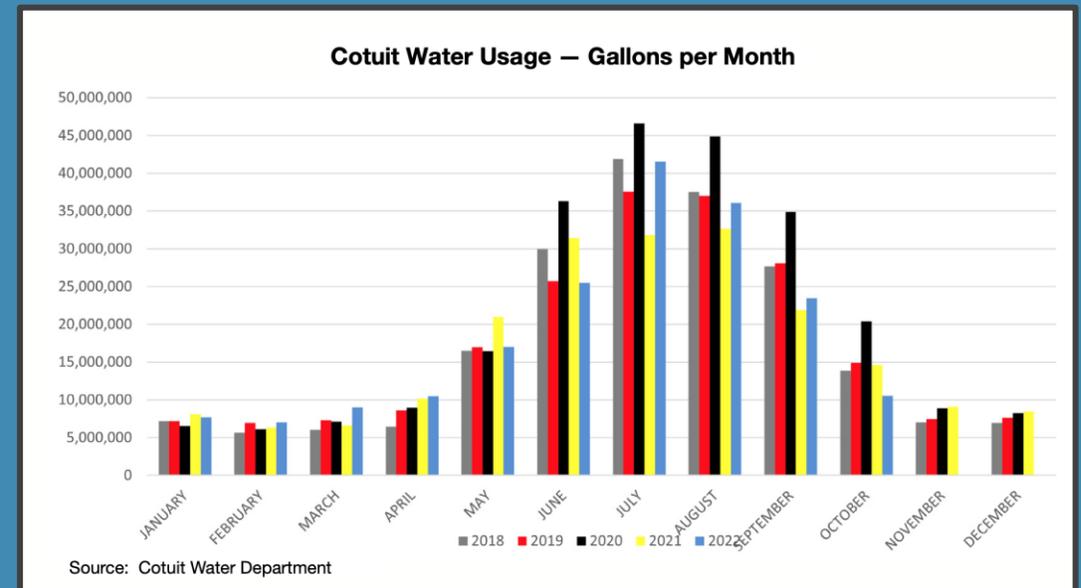


TARGETED TREATMENT

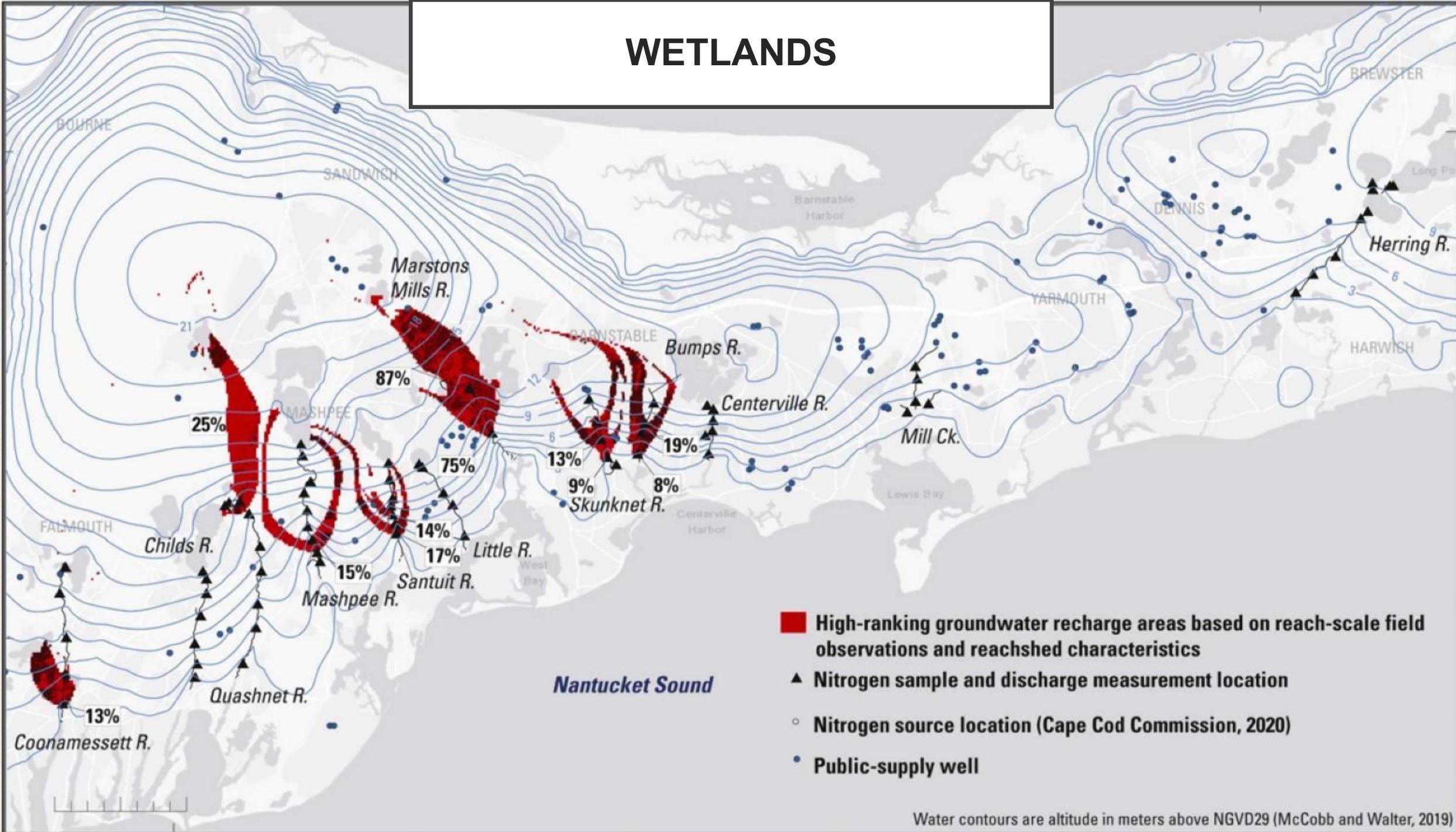
- 106 single family homes within 400 feet from the shores of Cotuit Bay

4,500 pounds (2.5 tons) of nitrogen going into Cotuit Bay annually

- I/As performing at 4 mg/L **could eliminate 3,600 pounds**



WETLANDS



TIME IS OF THE ESSENCE: A NUMBERS GAME

NEW REGULATIONS

INCENTIVES

FUNDING: SUBSIDIZE TO EQUALIZE

ACCESSORY DWELLING UNIT

**STATE TAX CREDIT, AQUIFUND, FUTURE
TOWN HELP**

ADD 1+ BEDROOMS

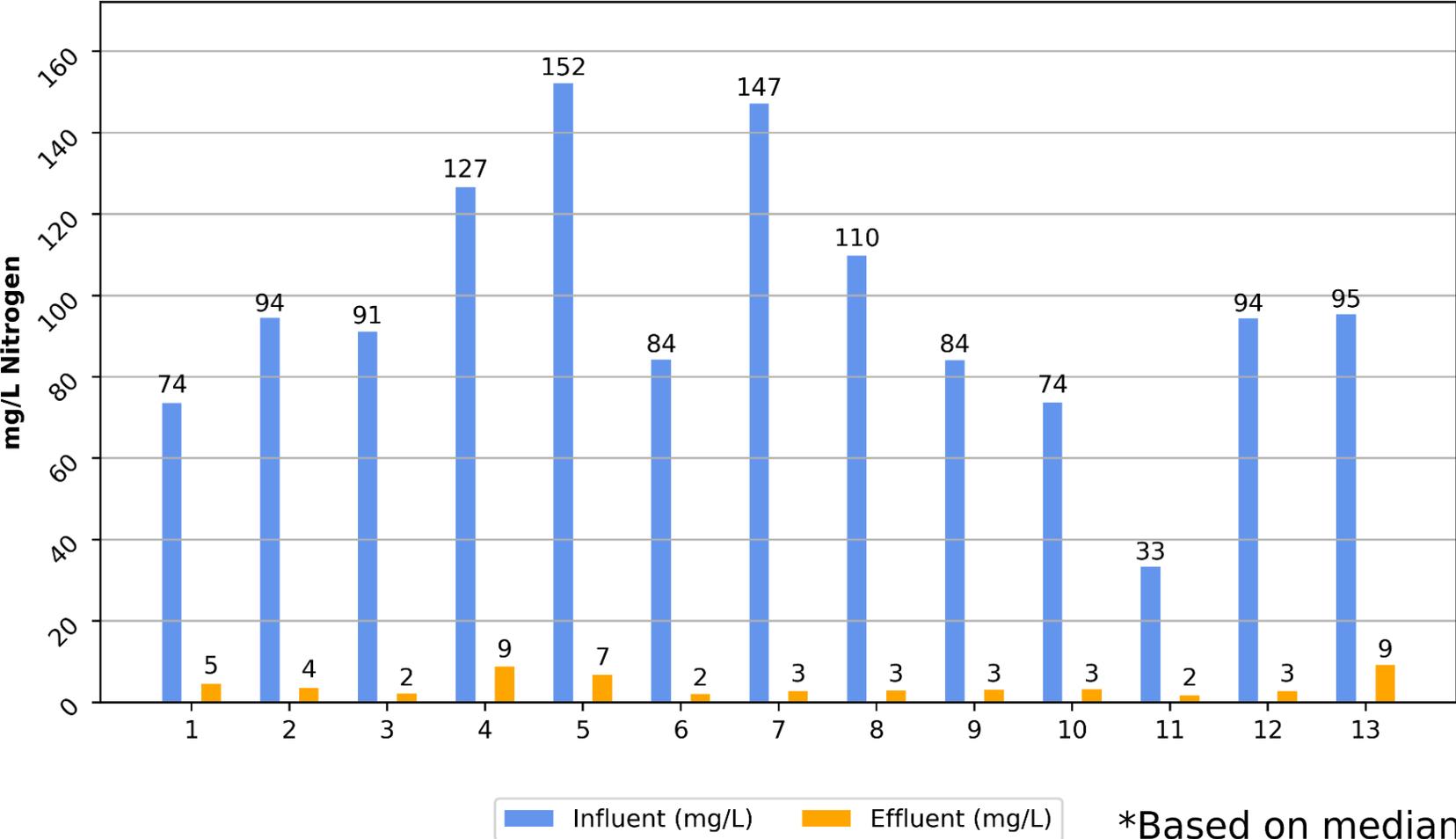
GRANTS, DEBT, SRF FUNDING, ETC.

THANK YOU

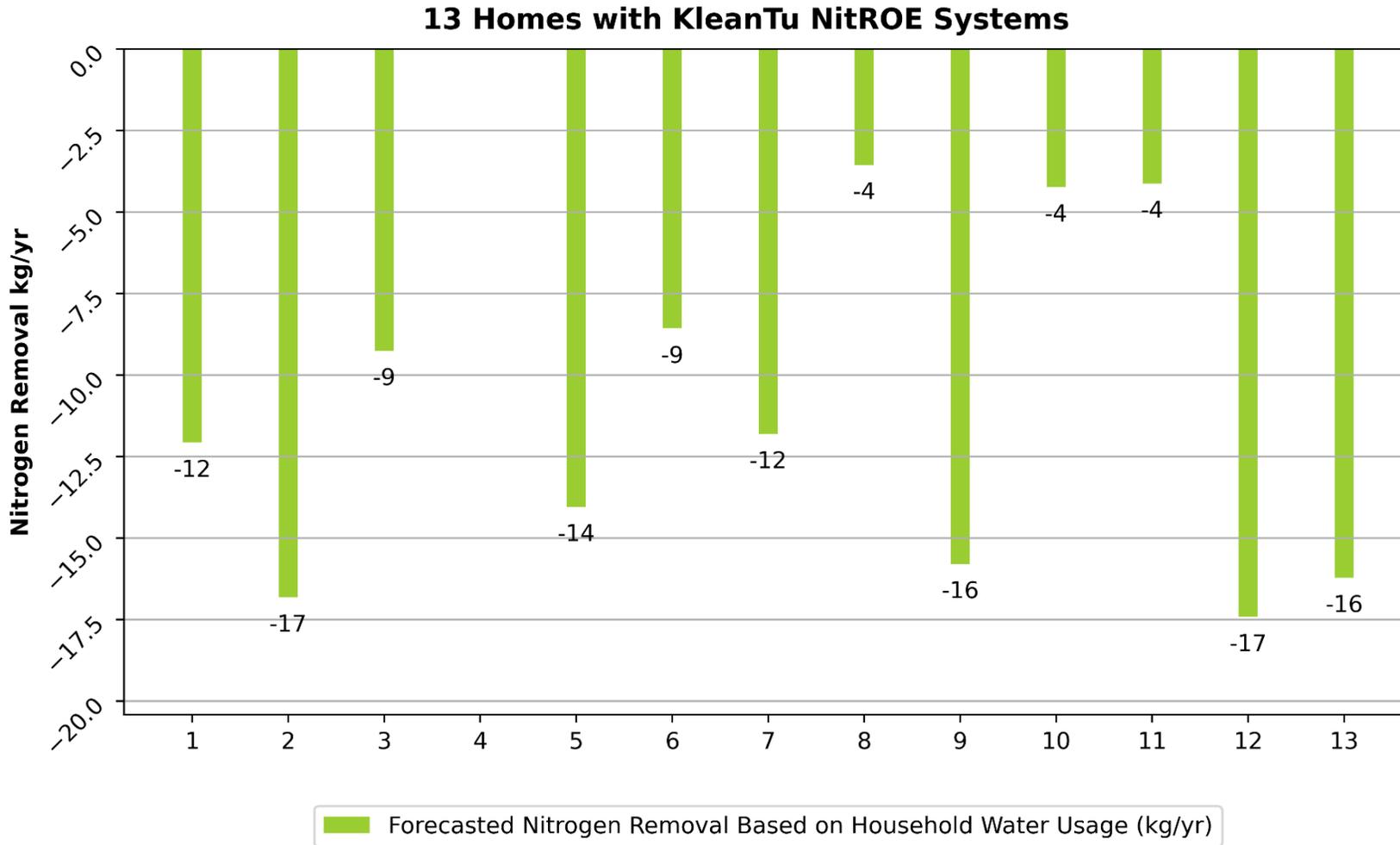
QUESTIONS?

**SHUBAEL POND I/A SEPTIC SYSTEM PROJECT
PERFORMANCE DATA 12/10/21 - 03/24/25 (MEDIAN)**

13 Homes with KleanTu NitROE Systems



SHUBAEL POND I/A SEPTIC SYSTEM PROJECT NITROGEN REMOVAL KG/YEAR



Based on median