



Considering Eco-Toilets for Nutrient Management on Cape Cod

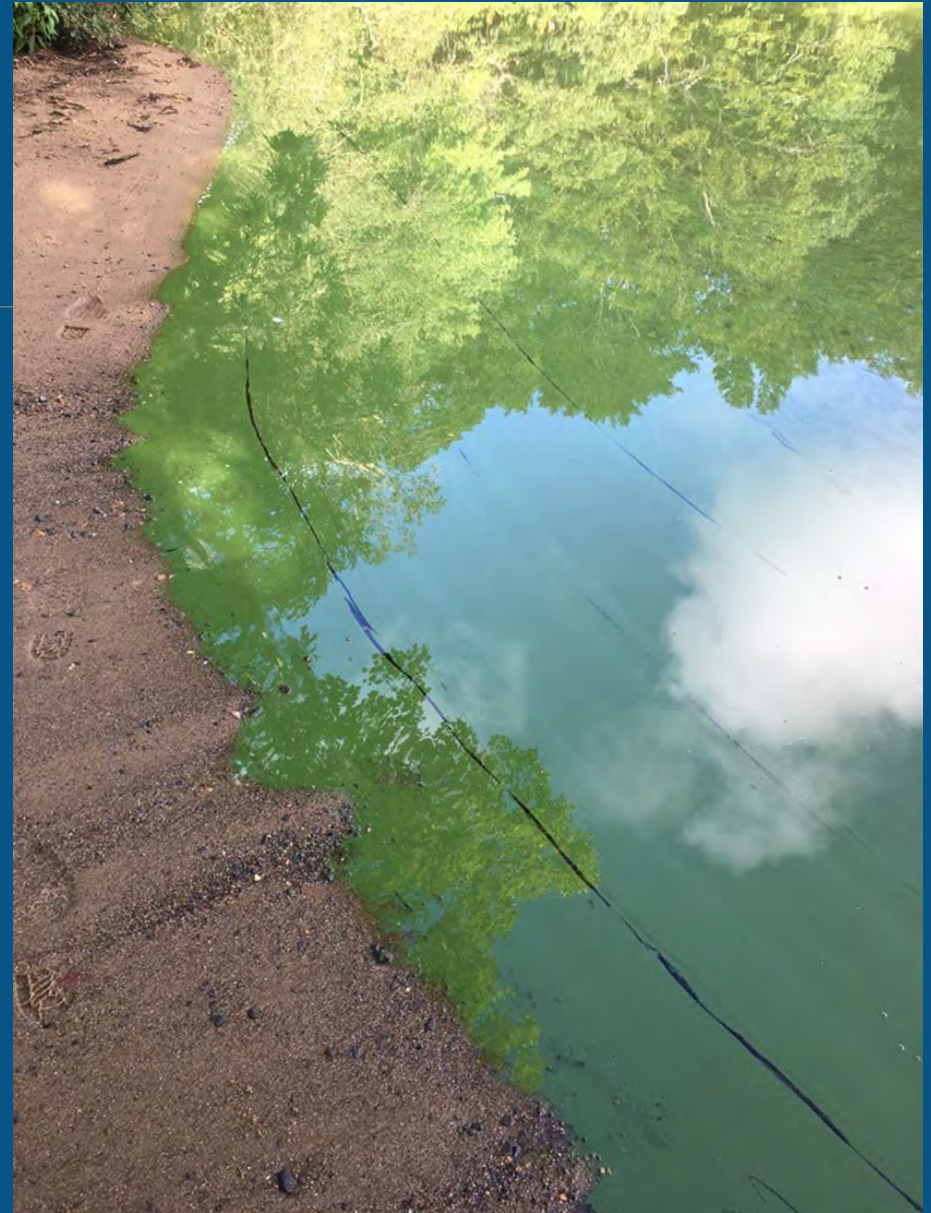
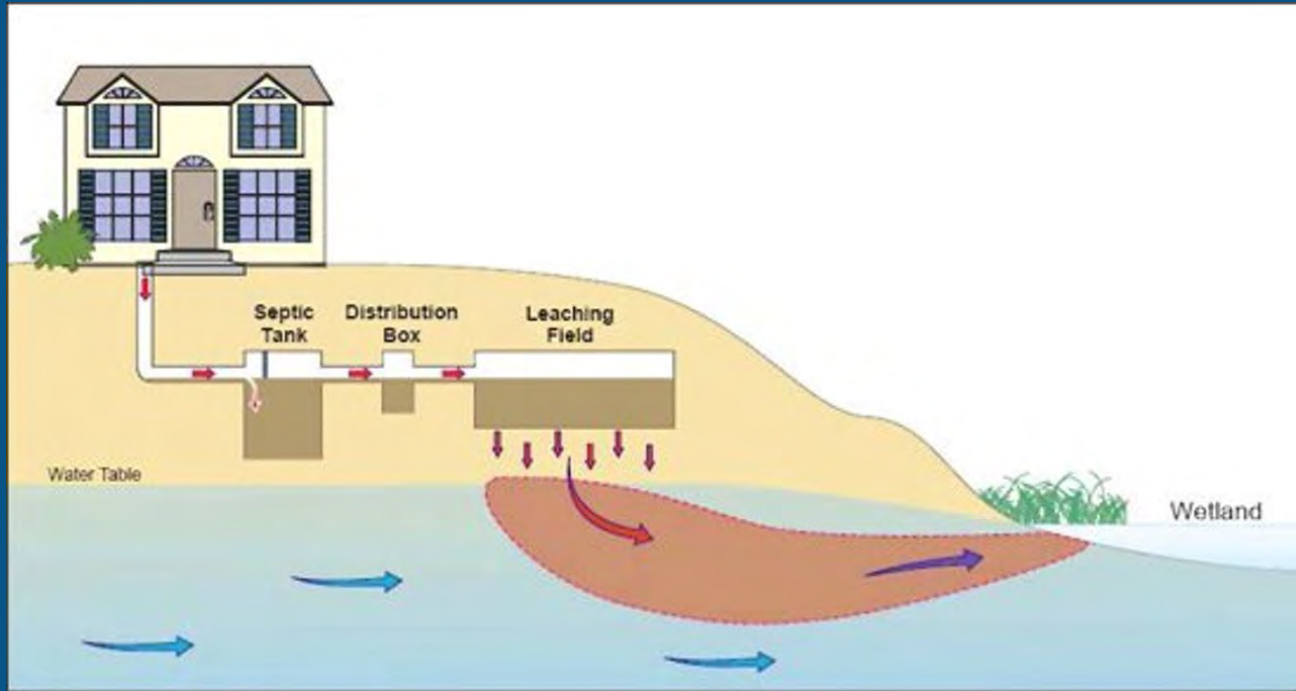
BRYAN HORSLEY

ENVIRONMENTAL PROJECT ASSISTANT

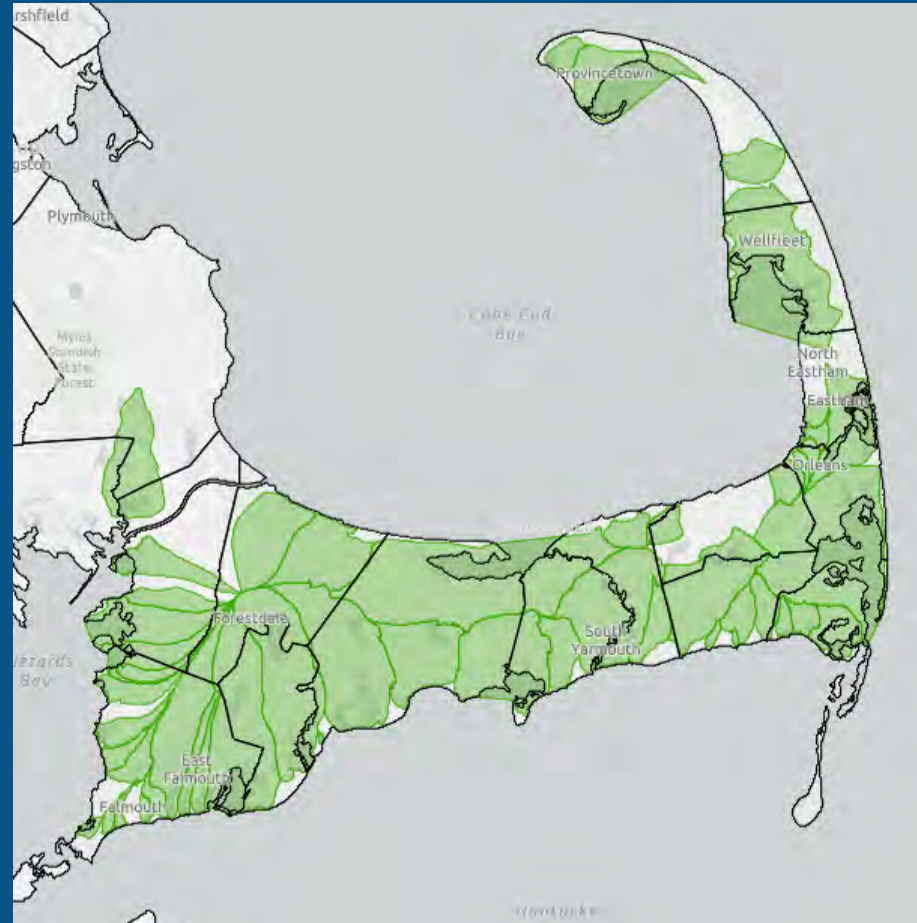
MASSACHUSETTS ALTERNATIVE SEPTIC
SYSTEM TECHNOLOGY CENTER

BARNSTABLE COUNTY DEPARTMENT OF
HEALTH AND ENVIRONMENT

Nutrient pollution

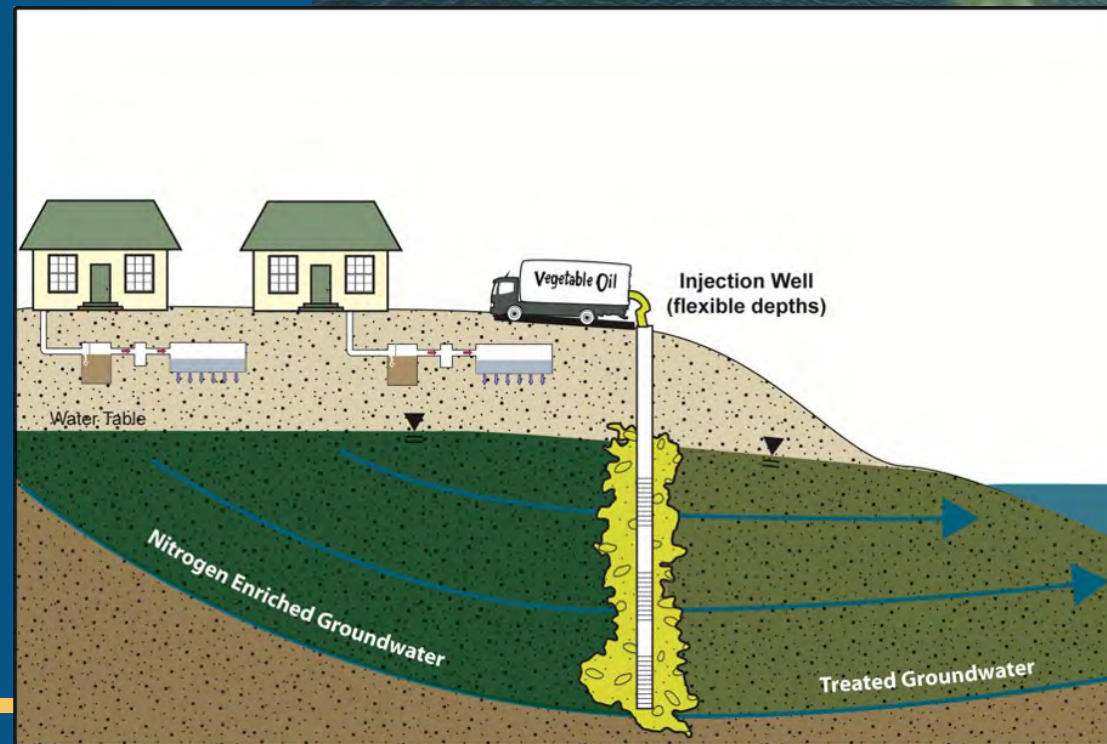
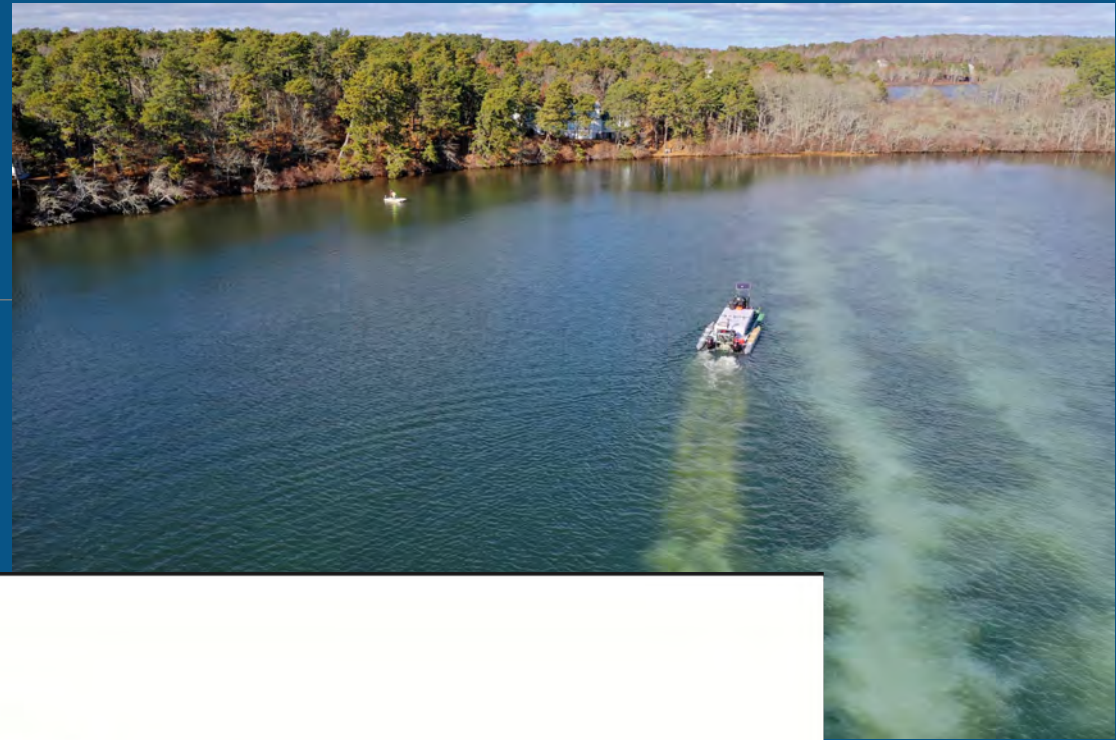


Watershed Nutrient TMDLs



Restoration actions

- Alum treatments
- Permeable Reactive Barriers
- Floating wetlands
- Aquaculture
- Wetland restoration
- Fertigation
- Inlet widening
- Biochar socks



Wastewater management

- Municipal sewer systems connected to central treatment plants
- Advanced treatment “IA” on-site septic systems



Ecological (circular) Sanitation

“Pollution is nothing but the resources we are not harvesting. We allow them to disperse because we’ve been ignorant of their value.”

– R. Buckminster Fuller



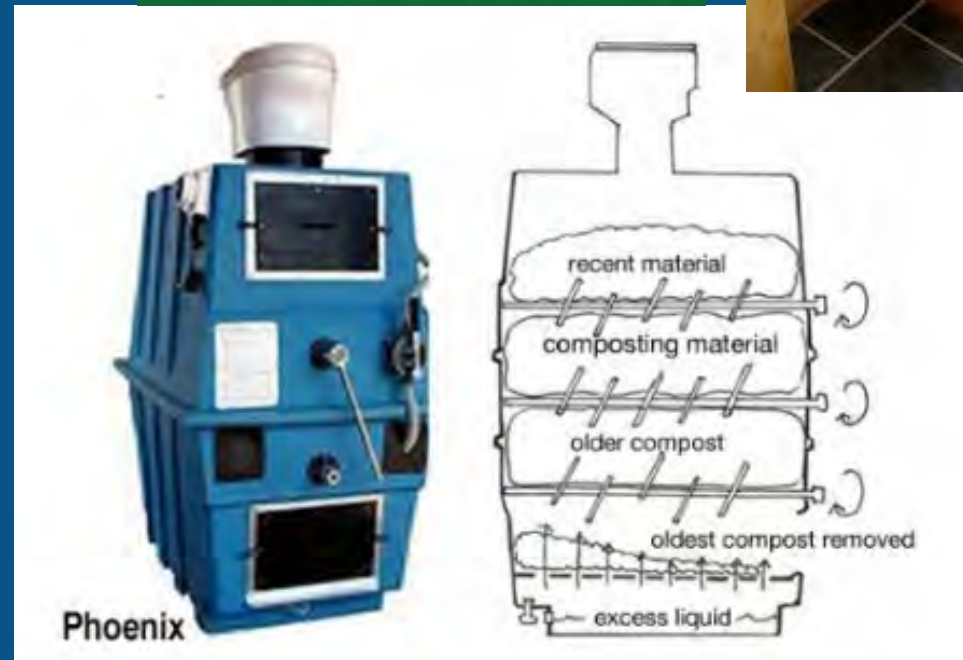
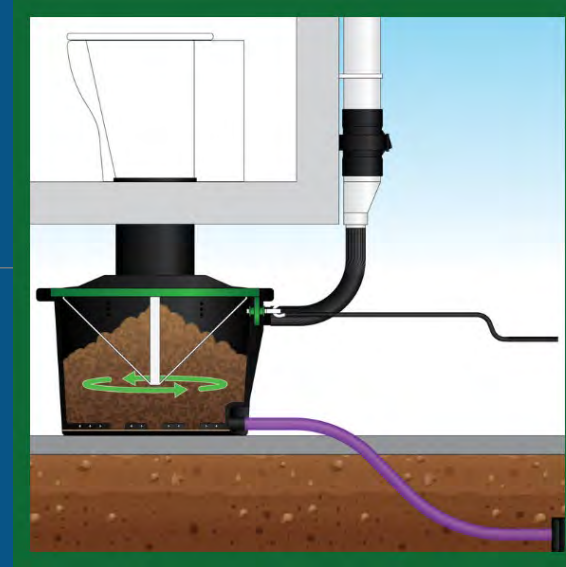
Eco-toilets offer a true source control

- Composting, urine diverting and incinerating toilets
- Often more hygienic than water flushed toilets!
- Divert main source of nutrients in wastewater
- Save water
- Conserve energy
- Recycle nutrients



Composting toilets

- Collect all urine and feces with little or no water
- Many toilet fixture and composting chamber options
- Produce compost for use in garden/landscape
- Approved in Massachusetts
- Film: “How Composting Toilets Could Save Cape Cod” by Undercurrent Productions

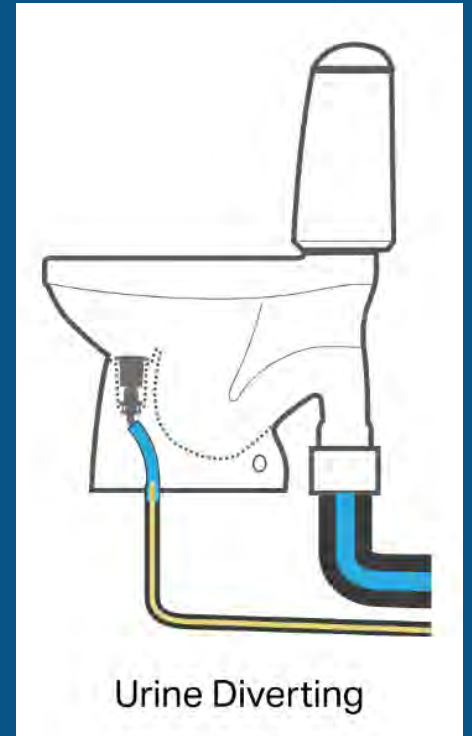
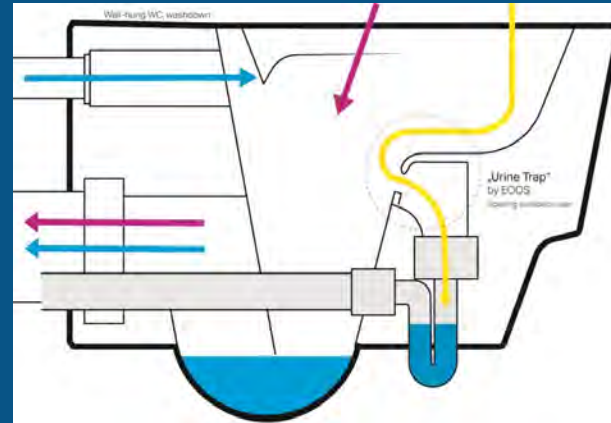
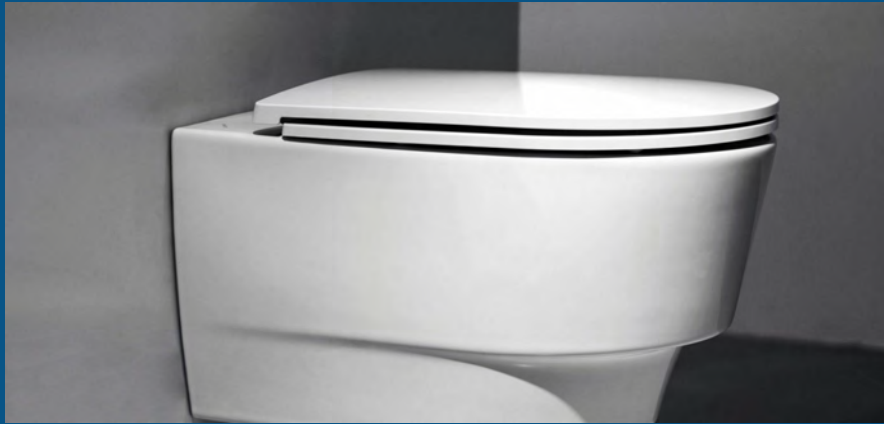


Incinerating toilets

- Cinderella
- Propane or electric powered
- Incinerates all materials into sterile ash



Urine diverting toilets: microflush



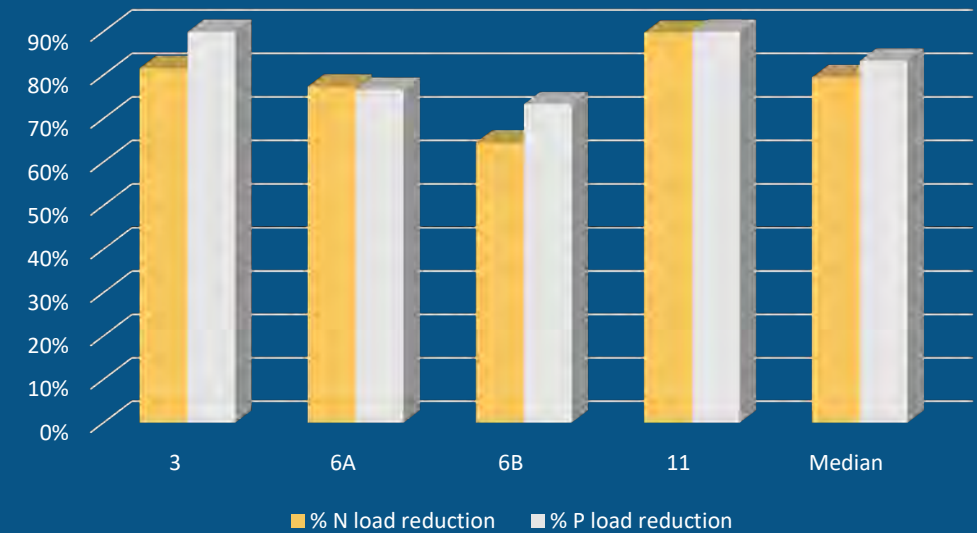
Urine diverting toilets: waterless



2012 Falmouth Eco-Toilet Project

- Installed variety of composting and urine diverting eco-toilets in Falmouth homes.
- Sampled septic tank effluent to measure nutrient levels.
- Found nutrient reductions of 80% to 90%!

Percent load reduction for homes utilizing multiple toilet technologies in this study

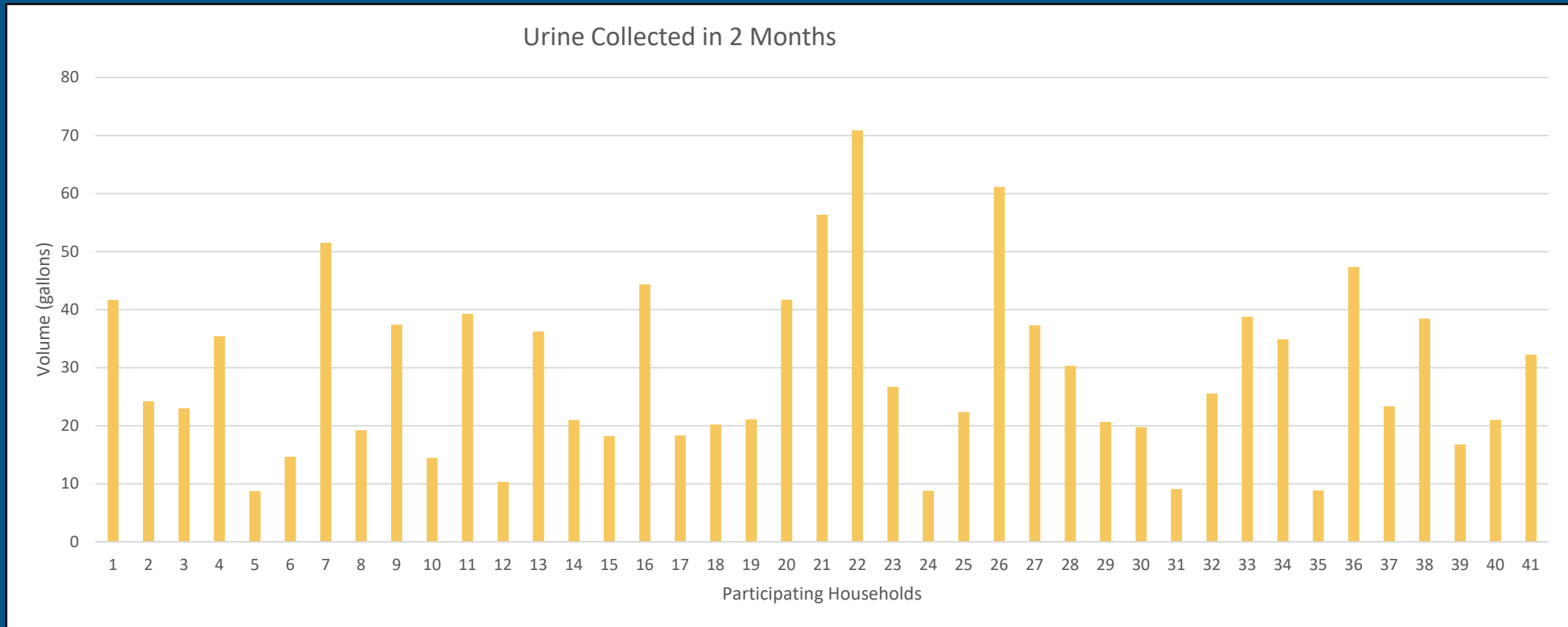


Green Center UD pilot project

- Completed in 2023
- 41 households (~60 people)
- 2-month collection period
- Used portable collection containers “cubies”
- Measured volume and analyzed nutrients collected
- Collected total of 1,003 gallons (avg. 29 gallons per household)

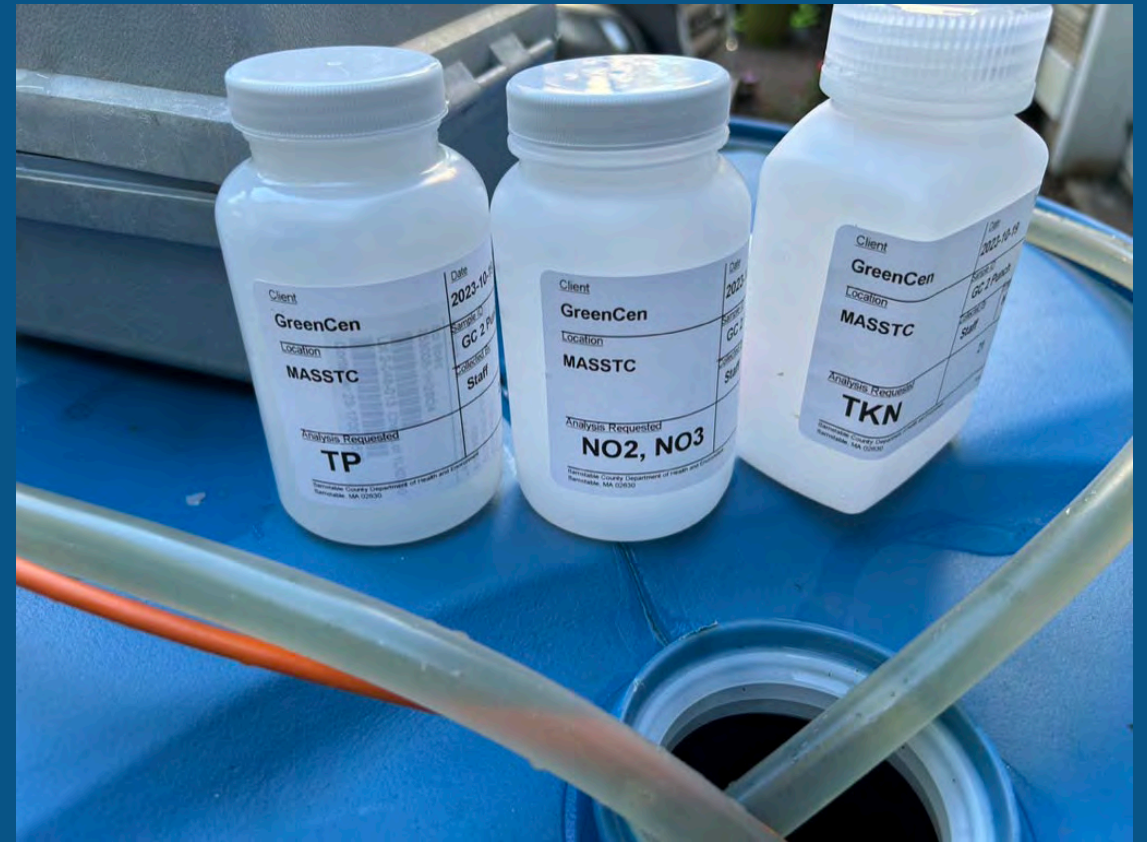


UD pilot project: volume

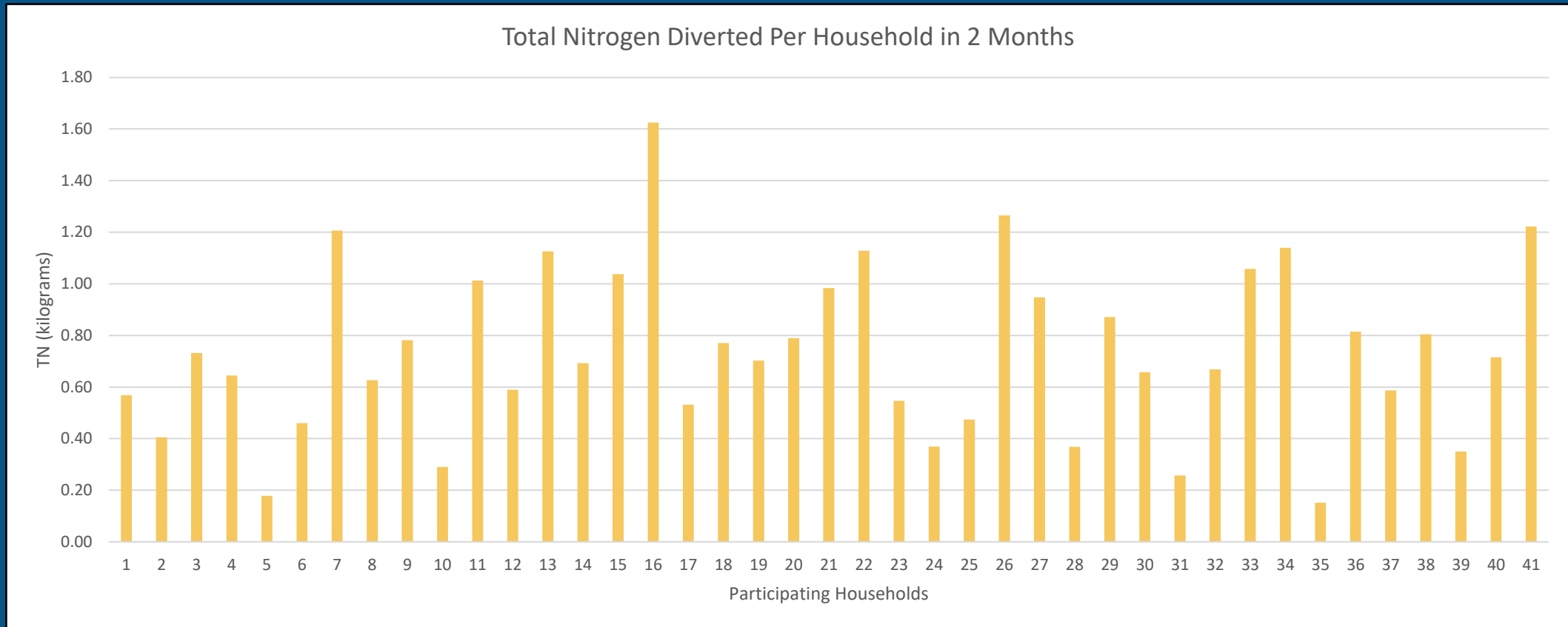


UD pilot project: nutrients

- Average nitrogen concentration 7,267 mg/L
- Average phosphorus concentration 469 mg/L
- Load (kg) = concentration (kg/L) x volume (L)
- Total nitrogen collected 30.2 kg (0.74 kg/household)
- Total phosphorus collected 2.0 kg (0.05 kg/household)

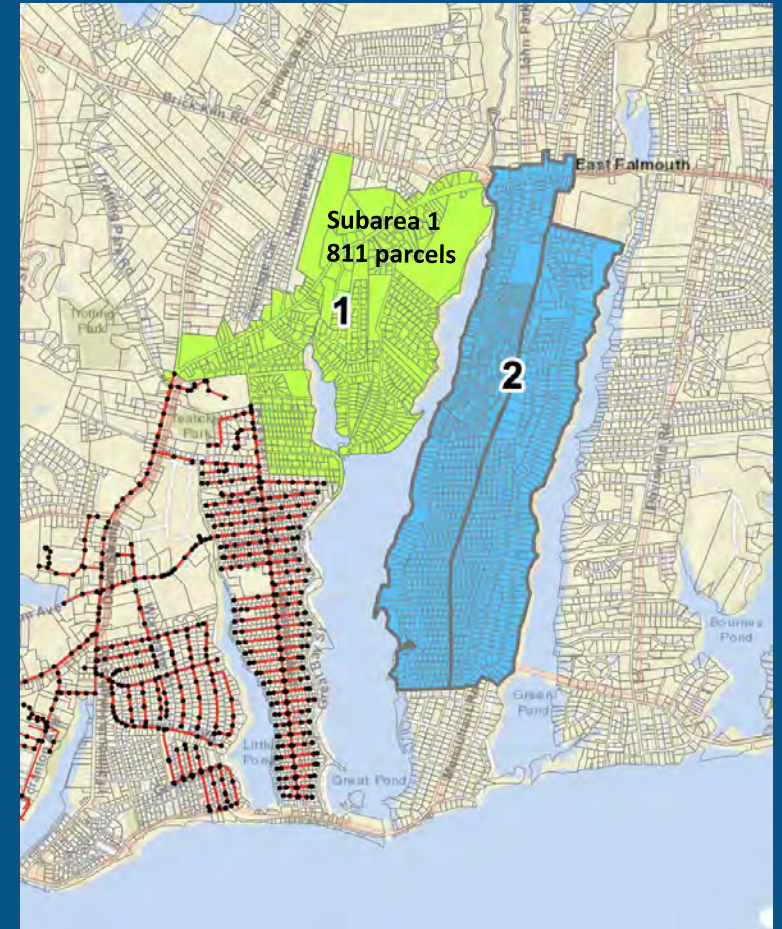


UD pilot project: nitrogen load



UD pilot project: comparative performance

- Great Pond Targeted Watershed Management Plan
- Subarea 1 sewer expansion proposes to connect 811 parcels to remove 2,890 kg-N/year from watershed (3.56kg/parcel)
- UD pilot project found N removal rate at 4.41 kg-N/year per home x 811 homes = 3,578 kg-N/year



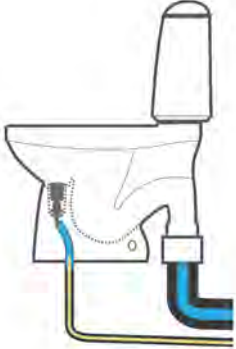
Upcoming Falmouth UD Project

- MASSTC/Town
- Goal: DEP approval of UD as IA system with nutrient credit toward TMDLs
- Need: 50+ UD system installations
- 3 years of performance monitoring
- Sample collected urine and septic tanks
- Currently in planning/preparation phase
- Need participants!




MASSTC eco-toilet installations coming soon

- 3 buildings (2 existing, 1 planned)
- Three composting toilets
- 4 waterless urinals
- 1 split bowl UD toilet
- Greywater gardens
- Leachate and urine recycling
- Urine application pilots



Urine Diverting




Eco-Toilet Options Assessment

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Thank you!

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