USGS Science to Inform Nutrient-Management Activities in Southeast New England

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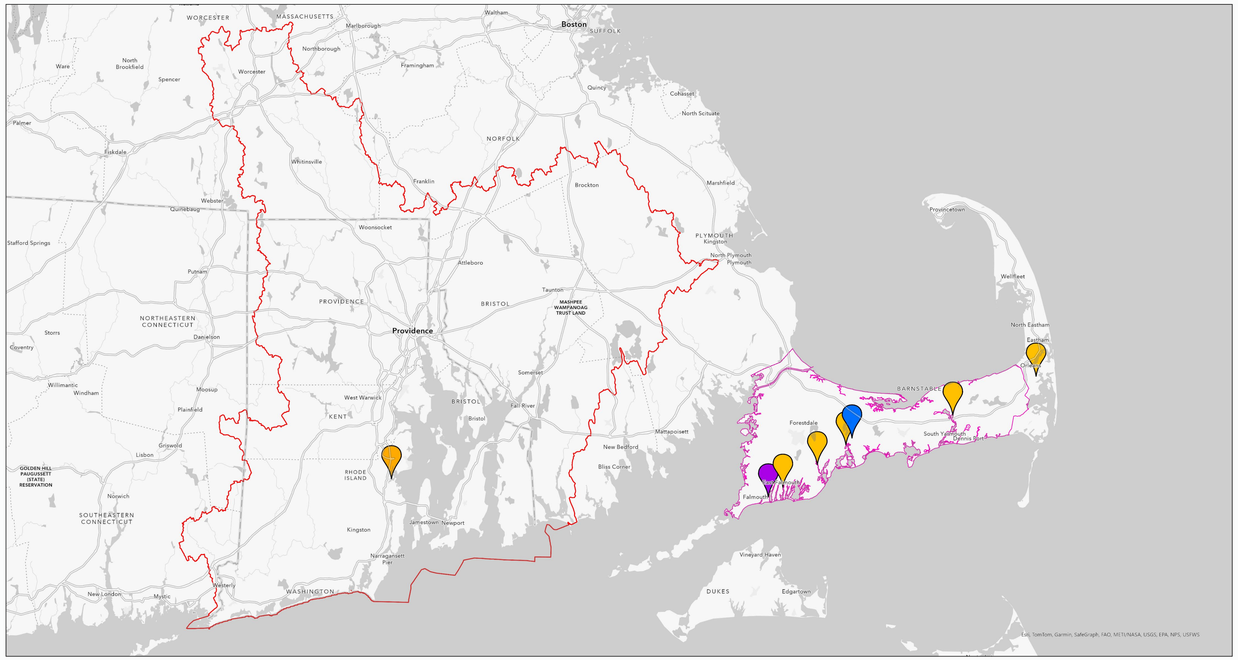
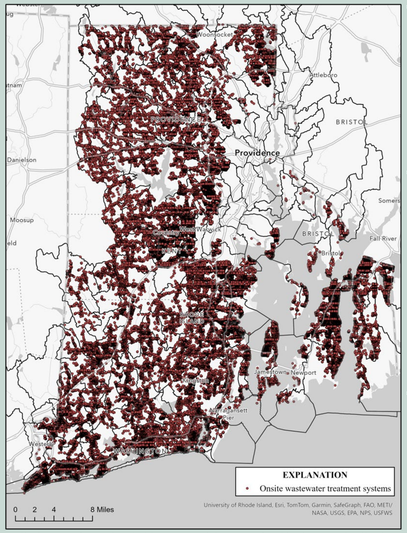
Nutrient pollution is a pervasive issue in southeast New England, contributing to water quality impairments, nuisance vegetation, and harmful algal blooms. The U.S. Geological Survey and the U.S. Environmental Protection Agency Southeast New England Program are collaborating on multiple studies with state and local governments and agencies to better understand how nutrient-management activities, such as sewering, permeable reactive barriers, and innovative/alternative septic systems, can reduce nutrient pollution in the area.



Narragansett Bay watersheds, RI

Investigating the contribution of onsite wastewater treatment systems to nitrogen pollution in watersheds of the Narragansett Bay



- Onsite wastewater treatment systems (septic systems) are a major source of excess nitrogen in Rhode Island.
- The USGS is characterizing the relative susceptibility of coastal waters to water-quality impacts from septic-system nitrogen.
- This analysis can be used by decision-makers to inform future management actions regarding septic systems.

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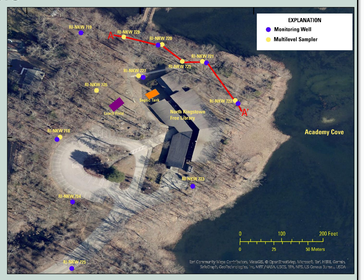
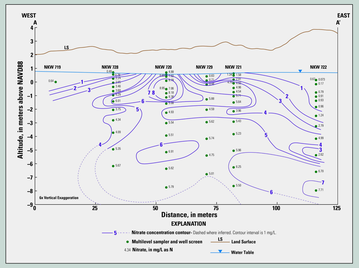
Academy Cove, Wickford, RI

Evaluating nitrogen loading to Academy Cove following the conversion to municipal sewers

- In 2018, Wickford, Rhode Island, began installing sewers to reduce nutrient inputs to coastal waters.
- The USGS is collecting groundwater samples and using regional models to evaluate water quality and nutrient load responses.





- Water quality samples collected from wells at the North Kingstown Free Library (above) provide information on groundwater quality conditions (left) near Academy Cove.

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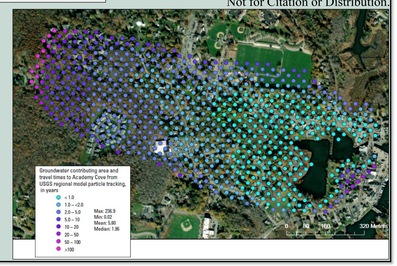
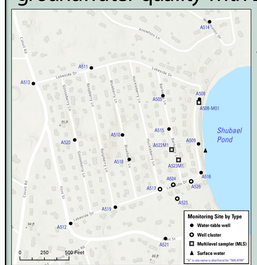
- An existing groundwater flow model is being used to simulate regional groundwater travel times (right) and nitrogen transport to coastal waters.

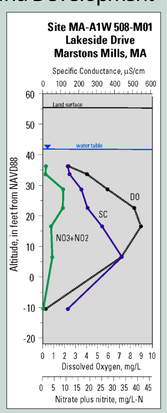


Three Bays watershed, MA

Evaluating the effect of innovative and alternative septic systems on groundwater quality with EPA Office of Research and Development



- The effect of newly installed innovative and alternative (I/A) septic systems on groundwater quality has been evaluated near Shubael Pond (left) since 2021.



- A network of multi-level samplers and monitoring wells are sampled quarterly to quantify changes in groundwater quality (vertical profile shown, right).
- Improved groundwater quality will be indicated by changes in specific conductance, nitrate, and dissolved oxygen.

Potential sites for permeable reactive barriers, Cape Cod, MA

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Characterizing hydrogeology at potential sites of permeable reactive barriers

- Permeable reactive barriers (PRBs) are reactive zones emplaced below the water table for passive treatment of groundwater contaminants such as nitrogen.
- The USGS developed a site-assessment approach for identifying potential sites that could see improved water quality by using PRBs.

- 5 onsite investigations were conducted on the Cape (above).

Maravista, Falmouth, MA

Evaluating groundwater quality improvements from converting onsite wastewater disposal to municipal sewering

- Sewering on the Maravista peninsula in Falmouth, MA, began in spring 2017.
- In spring 2016, USGS installed a network of multi-level samplers and monitoring wells to evaluate groundwater quality following the conversion to sewer (left).

- Temporal trends in water quality indicate that nitrate levels have decreased since sewering began in 2017 (right)

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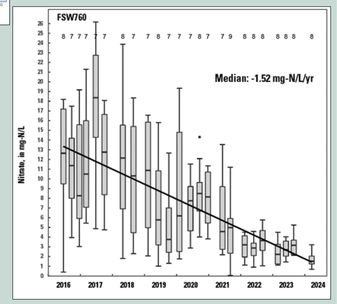
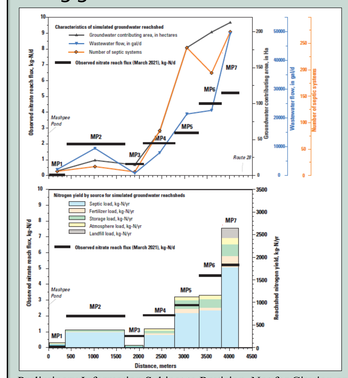


Rivers on Cape Cod, MA

Characterizing nitrogen loading at the stream-reach scale and using groundwater-flow models to delineate source recharge areas



- Many reach-scale nitrate loads are positively and moderately correlated to reachshed characteristics including contributing area size, wastewater return-flow rates and numbers of septic systems (left).
- This method provides direct measurement of nitrogen flux without needed assumptions about attenuation and transport.

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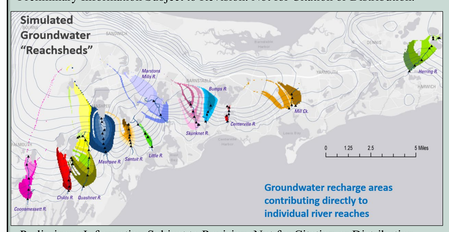

- Individual reach loads from groundwater represent a significant component of required nitrogen-load reductions in watersheds.

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For more information on USGS-SNEP projects:

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