



## Breath of Fresh Air

*Ecofriendly, practical technology uses air to remove nitrogen from wastewater*

### Challenge

More than 25 million homes in the United States use septic systems to treat and dispose of household wastewater. However, traditional septic systems remove only a small percentage of the harmful nutrients, such as nitrogen, that this wastewater contains. The rest flows into groundwater, streams, and coastal waters, where it can threaten human health, harm ecosystems, and impact water quality. In Rhode Island's Narragansett Bay alone, on-site wastewater treatment systems contribute an estimated 51 percent of the nitrogen pollution that loads into the bay. Homeowners need access to practical technologies that can remove nitrogen from wastewater—without breaking the bank or violating local laws.

### Response

With a grant from CICEET, researchers from the University of Rhode Island are developing a low-cost, ecofriendly approach to removing nitrogen from on-site septic systems by using a technique called periodic aeration.



Developed to extend the life of leachfields, the commercially available SoilAir is now being tested for its ability to foster nitrogen removal as well.

As wastewater moves through a conventional septic system, little nitrogen removal takes place. Low oxygen levels in the leachfield prevent the oxidation of ammonia into nitrate, the first required step toward its release as harmless nitrogen gas. The second step is denitrification, a process that requires low oxygen conditions. As a result, leachfields have to alternate between being oxygen poor and oxygen rich to effectively remove nitrogen from wastewater—something they are not designed to do on their own.

Researchers seek to address this problem by enhancing the application of the commercially available device SoilAir. The device was developed to restore a failed leachfield's infiltration capacity by pumping air into it. Researchers have found that when SoilAir is used to pump air into a leachfield at regular intervals, it can produce the alternating aerobic and anaerobic conditions that foster the processes of oxidation and denitrification required to remove nitrogen from wastewater.



Septic systems are a common approach to managing household wastewater, and a pervasive source of nitrogen pollution. This CICEET project is building on a commercial technology to develop a practical, affordable approach to removing nitrogen from on-site wastewater systems.

### Impact

Through lab tests and extensive field trials, researchers have demonstrated that the process of periodic aeration using SoilAir technology can remove up to 75 percent of the nitrogen in wastewater from on-site treatment systems. They conducted eight months of pre-monitoring at six Rhode Island sites, monitoring the quality of septic tank effluent, as well as the water quality below the leachfield trenches. Then they conducted periodic aeration at three of the six sites. After eight months, they found significant reductions in nitrogen levels at the treated sites.

Researchers are working closely with their industry partner Geomatrix, whose patented SoilAir device is already being used to restore failing leachfields in more than a dozen states, in settings that include single-family houses, group homes, restaurants, apartment complexes, and community septic systems. Given the results demonstrated by CICEET researchers, Geomatrix plans to also market SoilAir for its ability to remove nitrogen. In a recent deployment in Connecticut, the device remediated a failing leachfield, and monitoring indicated that the site met state standards for nitrogen levels for the first time in more than a decade.

### Learn more

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