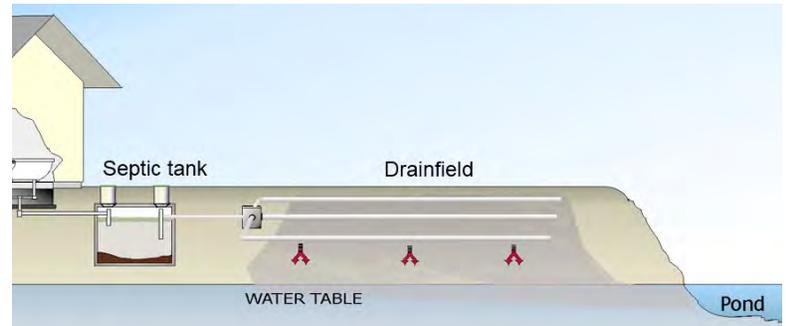


# Design & Management of Septic Systems

NE-1045 (2010-2015)

## *Conventional Septic Systems Useful, But at times Inadequate*

A conventional septic system is a small-scale, on-site sewage treatment system that typically consists of a storage tank for waste solids and a field that absorbs the wastewater. Septic systems serve rural residences, small farmsteads and businesses, and other areas without sewers—about 25 percent of the US population. As federal funding for connecting rural areas to city sewers has ended, existing septic systems are being used for longer periods of time, and new development in rural areas is dependent upon septic systems. Because septic systems were considered a temporary fix until city sewer extensions were installed, maintenance and management were often ignored. Outdated, poorly located, or improperly designed or installed septic systems can degrade environmental and public health through release of pathogens and nutrients. Furthermore, septic systems located in at-risk areas are vulnerable to changes associated with climate change and variability, such as wetter soils, warmer temperatures, rising water tables, or severe drought. Around the nation, older septic systems must be replaced with advanced technologies, however, public misconceptions about septic systems, lack of management programs, and financial barriers make doing so difficult.



In conventional septic systems, waste solids are captured and stored in a septic tank, and a drainfield absorbs and treats the wastewater. Photo by University of Rhode Island Cooperative Extension NEOWT Program.

## *Multistate Project Studies Septic System Design & Management*

In 2010, scientists, along with industry, regulatory agency, and private sector partners, formed multistate research project NE-1045 to research septic system design and management and educate septic system users, developers, practitioners, regulators, and land use planners. The multistate approach has been key to improving septic systems for the diverse soils, topography, and climates of the US.

## *Research & Outreach Improve Septic Systems, Employment Opportunities & Communities*

NE-1045's research and outreach efforts have:

### **Improved Septic Systems**

- NE-1045 scientists evaluated new wastewater treatment technologies that will make the US more resilient to climate change.
- Newly developed septic systems limit nitrogen and phosphorus contamination of groundwater and surface water. These systems better protect human and environmental health.
- With advanced septic systems, treated wastewater could be reused for toilet flushing and irrigation. This would conserve potable water supplies in rural communities.

### **Increased Adoption of Advanced Septic Systems**

- Between 2010 and 2015, the percentage of septic systems in Minnesota that comply with standards rose from 65% to 79%. The estimated percentage of systems that fail to protect groundwater has dropped from 25% to 16%.
- Over the last five years, 30% to 40% of new septic system applications in Rhode Island were for advanced systems—many of which are located in coastal zones at risk from climate change.

### **Influenced Policy**

- Based on NE-1045 research, specially-designed septic systems are now required in watersheds that are sensitive to nitrogen levels. This has helped protect these watersheds from further degradation.
- University of Minnesota researchers recommended appropriate septic system designs for adult care facilities.
- Regulators in Rhode Island, Massachusetts, and Vermont accepted NE-1045's new design guidelines for bottomless sand filters. These filters make septic systems resilient to rising sea levels and groundwater tables, mitigating the impacts of climate change.

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Installing septic systems on steep slopes and in certain soil types can be challenging. NE-1045 investigated new technology to better suit these challenging environments. Photo by Soil Science @ NC State/Flickr. CC License 2.0.



NE-1045 scientists developed and promoted the use of bottomless sand filters with advanced septic systems in areas at-risk for climate change impacts. These sand filters mitigate the impacts of sea level rise.

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### **Improved Training & Knowledge**

- NE-1045 provided training opportunities and materials that have led to better use and management of septic systems. Better management means that rural areas can continue to rely on septic systems to safely disperse wastewater. Properly managed septic systems also disperse treated wastewater back into groundwater sources, replenishing aquifers, wetlands, rivers, and lakes.
- After Extension workshops, homeowners reported knowing more about how to manage their septic systems.
- Through University of Tennessee and North Carolina State University outreach efforts, 14 wastewater professionals received intensive training on how to deliver effective education and training programs in their home communities.
- Over 300 professionals in Rhode Island, Massachusetts, and Vermont learned to design or install bottomless sand filters, a septic system component that is more resilient to climate change.

### **Expanded Employment Opportunities**

- Several land-grant institutions developed training centers to provide continuing education credit classes. These classes enable septic system professionals to expand into new professions, or renew their existing licenses and retain their current employment. For example,
  - University of Rhode Island trained over 2,000 professionals seeking license renewal in the New England region.
  - University of Minnesota trained nearly 2,000 professionals, helping them maintain or acquire licenses.
  - Through Michigan State University Extension, approximately 33% of the participants used continuing education credits to maintain a license.
  - 125 professionals took University of Rhode Island's inspector training classes, passed their exams, and received inspector registrations, which are required in Rhode Island communities.
  - Due to University of Arizona training classes, over 200 professionals now know how to design, install, and/or inspect septic systems using Arizona state regulations, and 14 professionals became eligible to conduct septic system site evaluations.
  - Oklahoma State University lectures provided continuing education credits to over 150 septic system installers for the Oklahoma Department of Environmental Quality, nearly 80 Oklahoma Health Department sanitarians, and over 20 septic system soil profilers.

## *Want to know more?*

NE-1045 was supported, in part, through USDA's National Institute of Food and Agriculture by the Multistate Research Fund established in 1998 by the Agricultural Research, Extension, and Education Reform Act (an amendment to the Hatch Act of 1887) to encourage and enhance multistate, multidisciplinary research on critical issues that have a national or regional priority. Additional funds were provided by contracts and grants to participating scientists. NE-1045 has been renewed through 2020 as project NE-1545.

For more information on the project, visit <http://nera.rutgers.edu>. For more information on the Multistate Research Program or the Impact Writing Initiative, visit <http://www.multistateresearchimpacts.org>.

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University of Minnesota  
University of Missouri  
North Carolina Cooperative Extension  
North Carolina State University  
Oklahoma Cooperative Extension  
University of Rhode Island  
Rutgers University  
University of Tennessee



Above: At one of the Onsite Wastewater Training Centers participating in the project, practitioners take classes and exams to become licensed septic system inspectors, expanding their employment opportunities and the services they offer their clients. Left: Project scientists expanded their septic system outreach to assist US territories that are at risk for climate change.