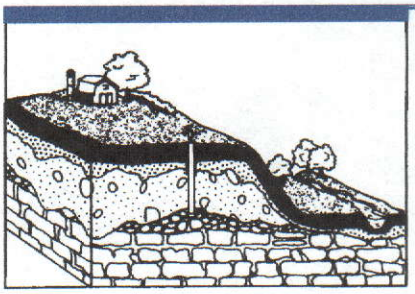

# SoilFacts

## *Why Do Septic Systems Fail?*

*A properly designed, constructed, and maintained septic system should treat and disperse wastewater effectively for many years. Unfortunately, septic systems sometimes fail.*

### Is My Septic System Failing?

How do you know if your septic system is failing? First, answer the following questions:

1. Do your drains empty slowly for reasons other than old, clogged pipes?
2. Does sewage back up into your house?
3. Have you noticed a wet, smelly spot in your yard?
4. Is your septic tank piped to a ditch or stream?
5. Is your washing machine or sink piped to a road or stream?
6. When it rains or the ground is wet, do you experience problems with your drains?
7. When you do laundry, does a wet spot appear in your yard?
8. Do you frequently have to pump your septic tank (more than once a year)?
9. Is the grass over or around your septic tank greener than the rest of your lawn?
10. Is the area around your septic tank or drainfield wet or spongy even when it has not rained for a week or more?

If you answered **"yes"** to any of these questions, your septic system has failed or is near failing. This means that it is not treating and disposing of sewage in a safe, environmentally sound fashion. You may also be able to tell your system is in trouble if noxious bacteria (fecal coliform) or large amounts of nutrients (particularly ammonia) are found in both nearby wells and surface water.

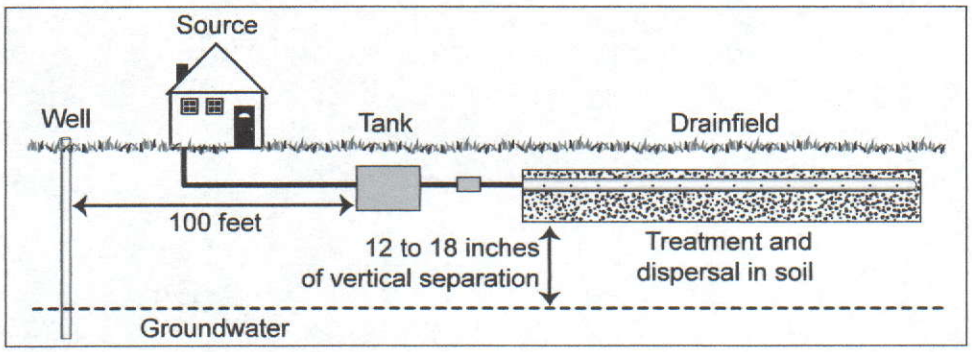


**Figure 1. Wastewater treatment and dispersal in the environment (not to scale).**



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## What Is a Septic System?

A septic system consists of four basic components: the source (home), the septic tank, the drainfield or leach field, and the soil beneath the drainfield (Hoover, 2004; Figure 1). Several different septic system designs are used in North Carolina. The type of system used is based on the lot's soil and site conditions; however, the conventional system (as illustrated in Figure 1) is the most commonly used in the state.

## Excessive Water Use

A common reason for septic system failure is overloading the system with more water than it can absorb. A septic system is designed for a specific wastewater flow rate based on the number of bedrooms (120 gallons per bedroom per day) in the house served by the system. When this flow rate is exceeded, the excess water backs up into the house or surfaces in the yard. This problem is often the result of a leaky fixture: either a toilet that has a slow leak or a dripping faucet. A change in water use, such as more people in the house or the addition of a water-using appliance, such as a dishwasher or washing machine, may add additional water to your septic system. Further problems can arise if a sump pump, icemaker, or dehumidifier drains into the septic tank. Each of these devices can add excess water and should not be connected into your septic system.

Along with excess water from inside the house, drainage or runoff water outside also may overload the septic system. In particular, water from roofs, roads, or paved areas may be diverted onto the system drainfield. This surface water will saturate the soil to the point that it can no longer absorb additional water. The result is sewage backing up into the house or on top of the ground. Finally, if the groundwater or surface water is allowed to enter the septic tank, it, too, can overload the system. For this reason, septic tanks are designed to be watertight, and surface water should be diverted from the access covers of the septic tank.

## Poor Maintenance or None at All

As with all major appliances, septic systems require routine maintenance. The N.C. Cooperative Extension publications *Septic Systems and Their Maintenance,* AG-439-13, and *Septic System Owner's Guide,* AG-439-22, describe the proper maintenance of a septic system. The main purpose of the septic tank is to stop solids from entering into the drainfield. If solids do reach the drainfield, they will clog the small spaces or pores in the gravel and soil below, resulting in sewage backing up into the house or surfacing in the yard. The lack of septic tank maintenance is a key cause of premature septic system failure. You should have your tank pumped every 3 to 5 years depending on use (see *Septic Systems and Their Maintenance* (AG-439-13) for specific guidance on pumping frequency). Also, you should have the septic tank pumper inspect the sanitary tee outlet or effluent filter to ensure proper function. Houses with septic systems should not have a garbage disposal. But if your home has a garbage disposal or grinder pump, the tank should be pumped more frequently. Additives, whether biological or chemical, have not been shown to have any beneficial effect on the solids in the tanks or system in general. For this reason, they are not recommended.

If your system received its permit from your county health department after January 1, 1999, it must have an effluent filter. These filters are designed to prevent finer solids from reaching the drainfield. The filters require some additional maintenance. As the filters clog with solids, your drains may work more slowly. When this occurs, a septic tank pumper or the homeowner can clean the filter with a garden hose, making sure the waste on the filter is washed off into the inlet side of the tank, and replace the filter in the tank. If the filter is clogged, it is often a sign that the tank needs to be pumped.

## Poor Design and Installation

An improperly designed septic system is a failure waiting to happen. It is critical that the system be designed with adequate space and has suitable soil. The space requirements are determined by the amount of sewage flowing into the system and by the soil and site conditions of the drainfield. In designing a septic system, it is assumed that there are two people per bedroom in a house and that each resident produces about 60 gallons of wastewater a day. Therefore, a septic system is designed to handle a flow rate of 120 gallons per day per bedroom (two people per bedroom x 60 gallons per person per day). For nonresidential property, the flow rate is determined by the proposed use. Soil and site conditions dictate the amount of sewage that can be safely applied to the soil. In general, sandy soils can accept more wastewater than clayey soils, which results in smaller drainfields for sandier soils. Finally, the location of a seasonal high water table or a restrictive layer (such as hard pan or rock) determines the depth below the soil surface that the bottom of the drainfield trenches can be placed.

The soil is the most important part of the septic system in treating and ultimately dispersing the treated sewage. If the soil beneath the drainfield is too wet, the sewage may not be adequately treated before it reaches groundwater. Furthermore, if a restrictive layer is too close to the trench bottom, the soil may not be able to absorb all of the sewage, thus forcing it to the surface or back up into the house. In North Carolina, there must be 12 to 18 inches of unsaturated soil beneath the drainfield trench bottom. This distance is referred to as the vertical separation distance. Environmental health specialists employed by the county or district health departments are trained to evaluate the soil and site to ensure that it is suitable for sewage treatment

and dispersal. Additional information can be obtained in the N.C. Cooperative Extension publication *Investigate before You Invest* (AG-439-12).

Even when a system is designed properly given the flow rate and soil and site conditions, problems can result from the construction and installation of the system. When systems are installed in soil that is too wet, the soil is significantly compacted and the soil pore space is smeared in excavated areas. In extreme cases this can seal the soil in the trenches, not allowing any wastewater to flow into the underlying soil for treatment and dispersal. With the reduced capacity for wastewater to flow into the soil, it is likely that the wastewater will back up into the house or emerge on top of the ground.

Septic systems must be installed according to the design. This includes checking the elevation of each component. If the trench bottoms, drain lines, or distribution box are not level, wastewater may not flow properly or be distributed evenly across the drainfield. Step-downs or other devices used on sloping sites must be properly installed, or one trench may be overloaded with wastewater. Interceptor drains or other drainage systems must have an outlet that allows groundwater to drain away from the drainfield. Finally, the soil cover over the drainfield should be uniform and crowned to prevent surface water from ponding on or flowing into the trenches. If the area is landscaped, use small, lightweight equipment because heavy machinery may compact the soil and even crush the pipes or septic tank.

## Physical Damage

Driving, paving, or building on top of a septic system can damage or destroy it. The pipes and septic tank can shift position or be crushed from repeated or even occasional abuse. Furthermore, the soil can be compacted, or ruts may form, exposing system components and possibly untreated sewage to the ground surface. Paving over all or a portion of the drainfield may prevent air from getting into the soil, as well as limit access for repairs or maintenance. Building over the drainfield may cause compaction or even damage a line due to the weight of the structure or the location of building footings. Paving or building over the septic tank also will prevent required tank maintenance.

Tree roots may clog the drain lines and gravel in the trenches. The best way to prevent this from occurring is to remove or simply not plant trees or shrubs within 25 feet of the drainfield. Roots may also get into the septic tank or distribution box, so do not plant trees and shrubs over these devices. You should plant grass over the drainfield and all other outdoor system components. The grass aids in removal of water and helps to prevent soil from eroding over the components.

Most septic systems require that an area be set aside for possible repairs. This area should be treated and protected just as if it were currently in use.

## Repairing a Failing Septic System

Septic systems may fail despite proper maintenance, design, and construction. If properly maintained, the life span of a septic system is similar to that of an asphalt shingled roof. If a failure does occur, the problem needs to be corrected swiftly and properly. Any failure, despite its cause, poses a nuisance, presents a public health hazard, and can degrade the environment.

If your system is failing or you suspect a failure, contact your local environmental health department. The department will send an environmental health specialist trained in assessing failing septic systems to determine the cause or causes of the failure and suggest how to repair the problem. Do not attempt to fix the failure without the approval of the local environmen-

### Dos and Don'ts for Septic System Repairs

1. **Do** report problems to your local environmental health department and ask for an evaluation.
2. **Do** conserve water until a repair is made.
3. **Do** rope or fence off the area where sewage is on the ground surface to keep people and animals away from untreated sewage.
4. **Don't** place more soil over a wet smelly spot, which is probably where raw sewage has leaked. This will not solve the problem and may cause sewage to back up into your house. Raw sewage contains harmful bacteria that may cause sickness or death.
5. **Don't** pipe or ditch the sewage to a ditch, storm sewer, stream, sinkhole, or drain tile. This will pollute surface water, groundwater, or both, and cause a health hazard. **It is illegal.**
6. **Don't** pipe, ditch, or run the sewage into an abandoned well or other hole in the ground. This will pollute groundwater and cause a health hazard. **It is illegal.**
7. **Don't** ignore the problem. It will not go away. The longer you wait to fix the problem, the worse the situation may become, possibly making a simple repair into a very costly one.

tal health department. In some cases, the corrective measures could be as simple as installing water conservation devices. In the case of a complete system failure, construction of a new septic system may be the only solution.

## Preventing Failures

Regular maintenance of your septic system is the best way to prevent a failure. As stated, the N.C. Cooperative Extension publications *Septic Systems and Their Maintenance* (AG-439-13) and *Septic System Owner's Guide* (AG-439-22) describe the proper maintenance of a septic system. Listed are some of the things you can do.

1. **Conserve water.** Use water-saving fixtures and conserve water in the kitchen, bath, and laundry to reduce the amount of wastewater the soil has to absorb. This is especially beneficial immediately after a heavy rain as well as during the winter and early spring.
2. **Repair or replace leaky fixtures.** Leaky fixtures add excess water to the drainfield, so fixing them promptly will reduce the amount of water the soil has to absorb.
3. **Maintain proper cover and landscape over the drainfield.** Make sure the drainfield is covered well with grass to prevent soil erosion. A crowned drainfield and surface swales will prevent excess surface water from entering the trench. Also, make certain that gutters, downspouts, patios, walkways, and driveways do not divert water over the drainfield or septic tank.
4. **Pump your tank regularly.** Regular pumping prevents solids from reaching the drainfield and causing it to clog. The tank should be pumped every 3 to 5 years depending on use. Additives have not been shown to significantly reduce the amount of solids in the tank. Do not use them in place of regular septic tank pumping.
5. **Limit what goes into the septic tank.** Do not dispose of chemicals, solvents, cleaning fluids, paint, motor oil, gasoline, and other such substances in the septic tank. They may kill all the beneficial bacteria in the tank and soil as well as pollute the environment. Dispose of these materials properly at your local recycling center or transfer station. Kitty litter, hygiene products, cooking oil, grease, and waste food may clog the system and should be disposed of in the trash. Waste from fruits and vegetables can be composted.
6. **Do not drive or build over any part of your septic system.**
7. **Inspect the system components routinely.** Check for signs of problems that can be corrected before a failure occurs.

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Prepared by

***David L. Lindbo**, Associate Professor and Soil Extension Specialist, Department of Soil Science*
***Diana Rashash**, Area Environmental Education Specialist. NC Cooperative Extension*
***Michael T. Hoover**, Professor and Soil Extension Specialist, Department of Soil Science*

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