

Soil Facts

Septic Systems and Their Maintenance

The septic tank, soil-treatment system (also called a septic system) is an effective, long-standing method for collecting, treating, and disposing of sewage from rural and suburban homes and businesses. Septic systems are used in every county in North Carolina. Nearly 50 percent of the state's homes have them, and new systems are being installed at a rate of more than 40,000 per year. This fact sheet will answer some typical questions about septic systems and their maintenance.

Why Use a Septic System?

Septic systems are used when centralized sewage treatment plants are not accessible in a community. They safely treat and dispose of wastewaters produced in the bathroom, kitchen, and laundry. These wastewaters may contain disease-causing germs and pollutants that must be treated to protect human health and the environment. Septic systems are usually a permanent solution to wastewater treatment and disposal. Therefore, they must be properly used, operated, and maintained by the homeowner to assure the long-term performance of these systems. Even when used as a temporary wastewater treatment solution until sewer lines are extended to a community, special care and maintenance are needed for septic systems so that they don't pose a risk to public health or the environment.

What Is a Septic System?

Several different types of septic systems are available, each with its own design. The traditional, conventional system is the one that has been most commonly used in North Carolina up until the past decade (Figure 1). It consists of three main parts: the septic tank, the drainfield, and the soil beneath the drainfield.

The septic tank is a watertight container about 9 feet long and 5 feet tall. It is buried in the ground just outside the home. The tank is usually precast from reinforced concrete, although tanks made from plastic or fiberglass may be seen on occasion. While a tank is typically designed with a 1,000-gallon liquid capacity, its size is legally determined by the number of bedrooms in the home. The tank temporarily holds household wastes and allows a small amount of pretreatment to take place (Figure 2).

What Takes Place in the Septic Tank?

All of the wastewaters from the home should flow into the septic tank. Even waters from the shower, bathtub, and washing machine can contain disease-causing germs or environmen-

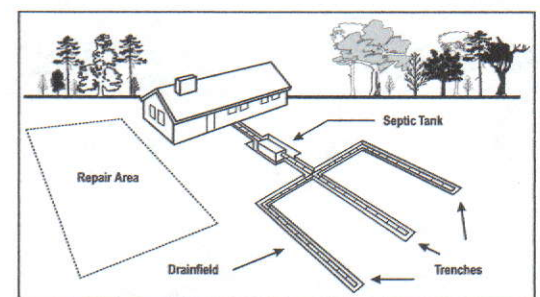


Figure 1. A conventional septic system.

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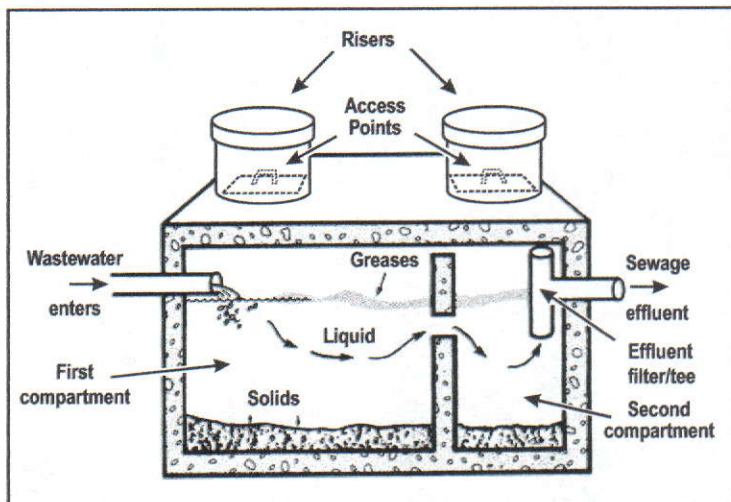


Figure 2. A two-compartment septic tank.

tal pollutants. As wastewater flows into the tank, the heavier solid materials settle to the bottom (forming a sludge layer), and the lighter greases and fats float to the top (forming a scum layer). The tank's primary purpose is to retain the solids. After a retention time of about two days, the liquid portion (the sewage effluent) flows out of the tank through the outlet pipe. The retention time is necessary for separation of the solids from the liquid and for anaerobic digestion of the solids to begin in the septic tank.

An outlet baffle (or a sanitary tee at the outlet end) prevents solids from flowing out with the liquids. Newer septic systems installed since 1999, however, include an effluent filter in the septic tank. These are installed in place of the sanitary tee at the outlet end of the septic tank (in the second compartment shown in Figure 2).

What Happens in the Drainfield and the Soil?

The purpose of the drainfield is to deliver the liquid sewage effluent to the soil. The real treatment of the wastewater occurs in the soil beneath the drainfield. Sewage effluent flows out of the tank as a cloudy liquid that still contains many disease-causing germs and environmental pollutants. Effluent flows into the perforated pipe in the trenches, passes through the holes in the pipe, and then trickles

down through the gravel to the soil (Figure 3). There are also "gravel-less" trenches used where plastic louvered chambers, polystyrene aggregate, tire chip aggregate, large diameter pipes, or multiple small pipes are used in place of the gravel aggregate. These materials provide a void space in the trench to allow distribution of the effluent to the trench bottom. As sewage effluent enters and flows through the ground, soil particles filter out many of the bacteria that can cause diseases. The soil

adsorbs some of the smaller germs, such as viruses, until they are destroyed. The soil can also retain certain chemicals, including phosphorus and some forms of nitrogen.

A special zone, called a biomat, forms in the upper 1 to 6 inches of the soil at the soil/trench interface just below the trench bottom. This biomat zone is useful. It helps remove many of the germs and chemical pollutants. If the solids accumulating in the septic tank are never pumped out, however, they can flow into the trenches and accumulate into an intensive biomat that becomes too thick. When that happens, the biomat completely clogs the soil and does not allow the sewage effluent to flow out of the trench. An improperly maintained system will fail and cause untreated sewage to completely fill the trenches and come out on top of the ground or back up into the home in its plumbing system.

Where Can a Septic System Be Used?

A centralized sewer system with a large sewage treatment plant usually

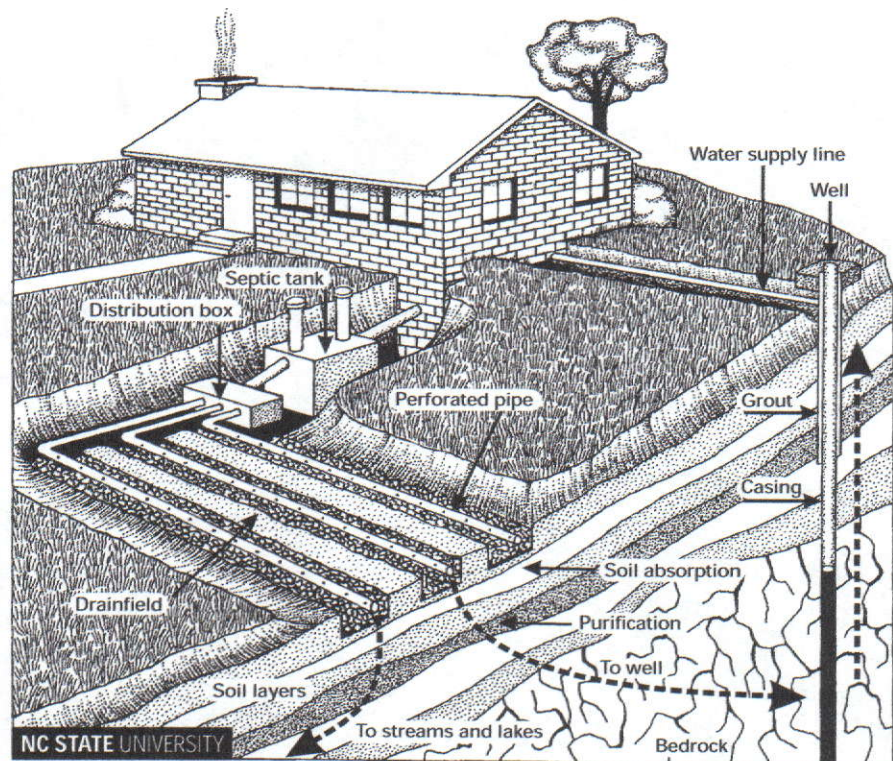


Figure 3. Wastewater treatment and disposal in the soil.