Septic System Installation Slide Show

In 1994, The Buzzards Bay NEP modified a computer slide show developed by Purdue University for the US EPA so that the information presented better reflects to conditions and permitting in Massachusetts. The Project distributed this slide show to area Boards of Health and other interested parties. We have placed this slide show on our web site so more people can appreciate and better understand septic system siting requirements in Massachusetts.

Septic System Installation Slide Show

Buzzards Bay Project

Version 1.0 8/94

Principles and Design of

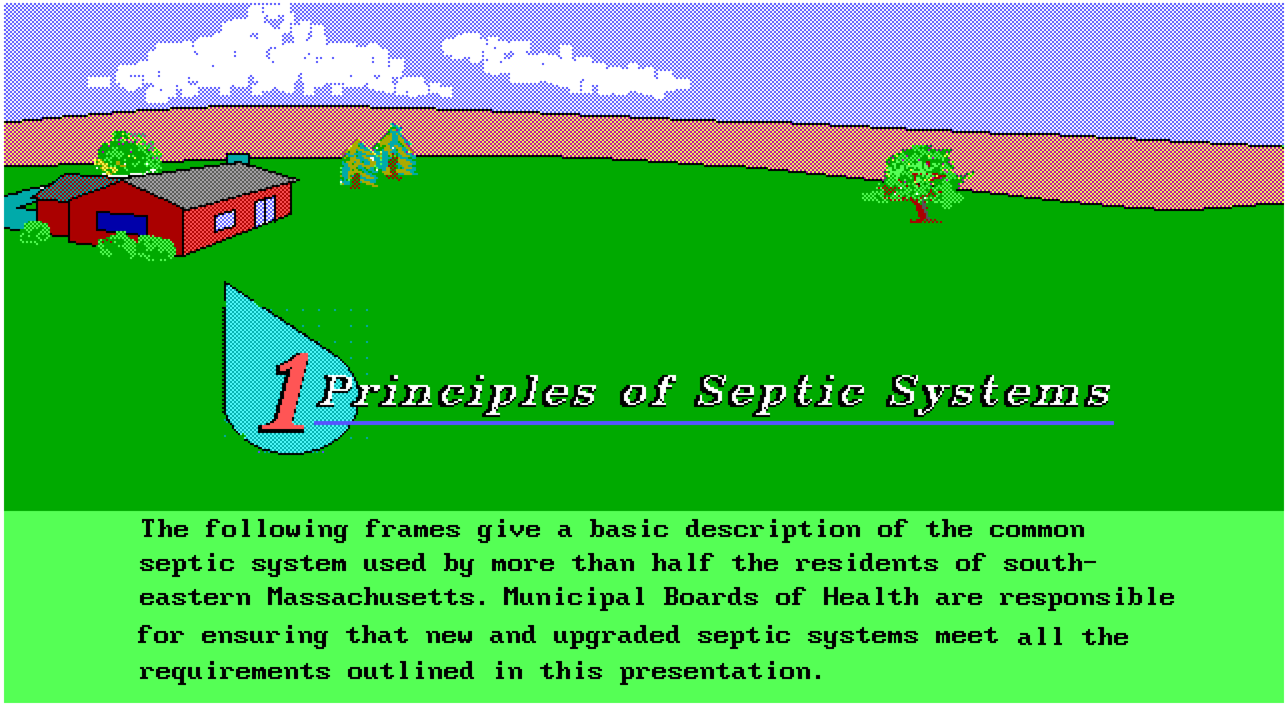
ON-SITE WASTE-WATER DISPOSAL

with Septic Systems

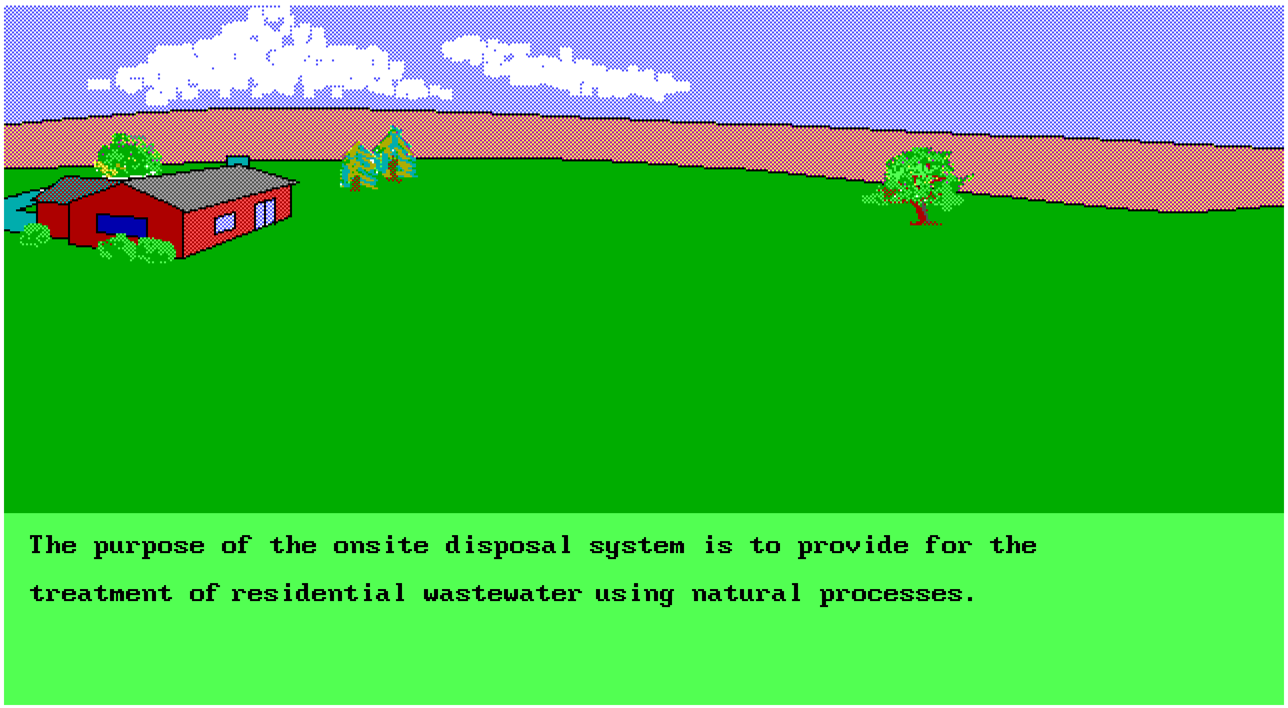
A computer-aided instruction program developed by Purdue University in conjunction with the Environmental Protection Agency.

Adapted by the Buzzards Bay Project to reflect conditions and regulations in Massachusetts.

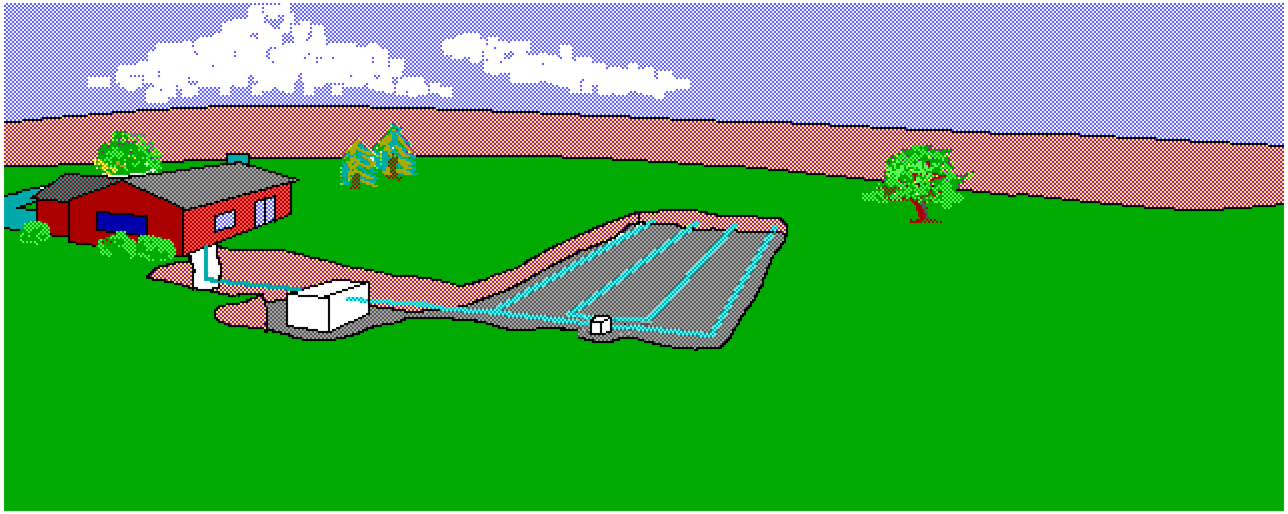
Septic System Installation Slide Show



Septic System Installation Slide Show

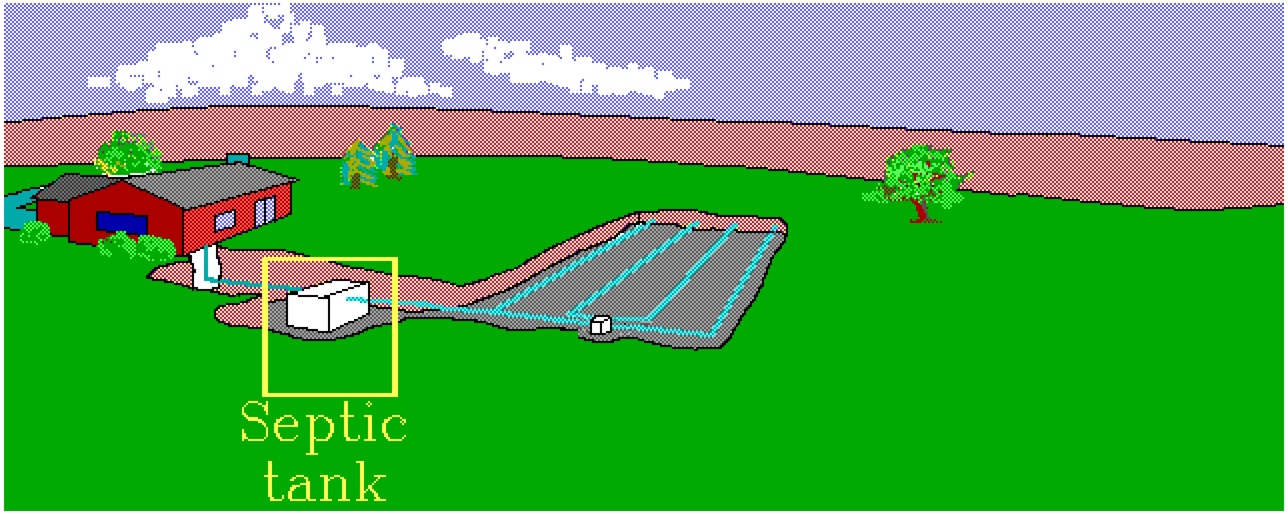


Septic System Installation Slide Show



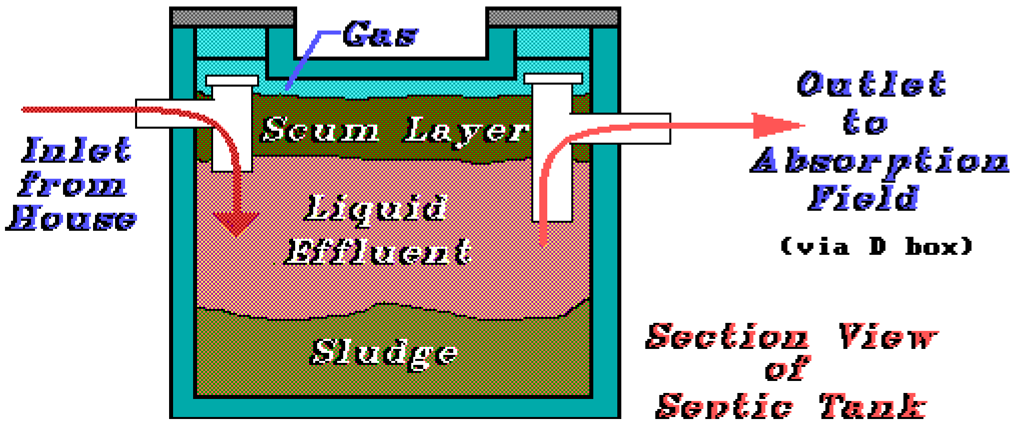
A typical septic system has three main components.

Septic System Installation Slide Show



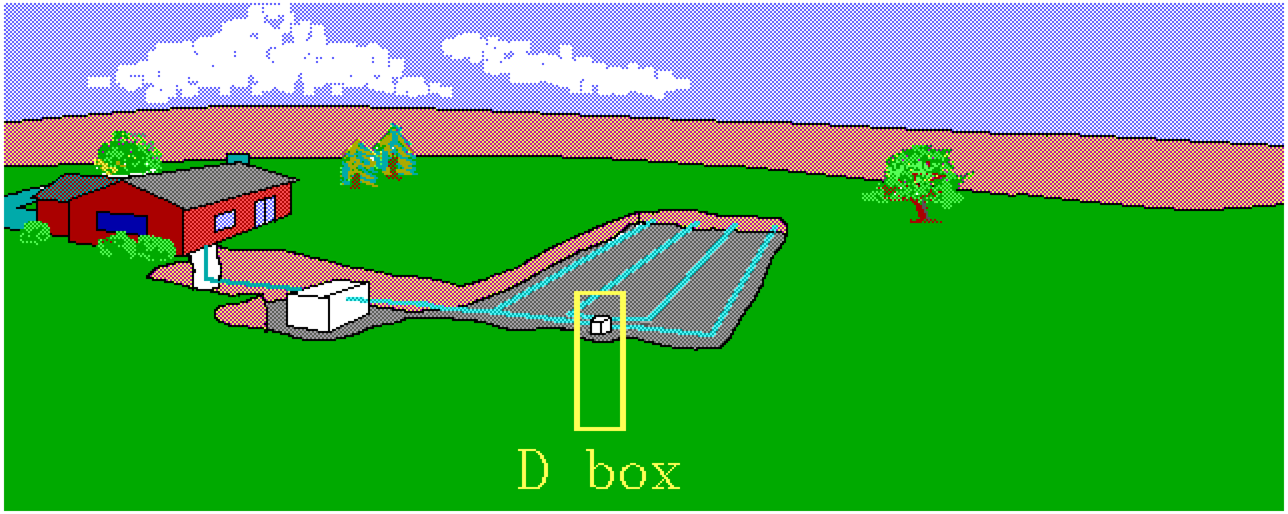
First, wastewater exits the house and enters the septic tank where solids settle out and grease and scum float to the top. This is the first stage of treatment.

Septic System Installation Slide Show



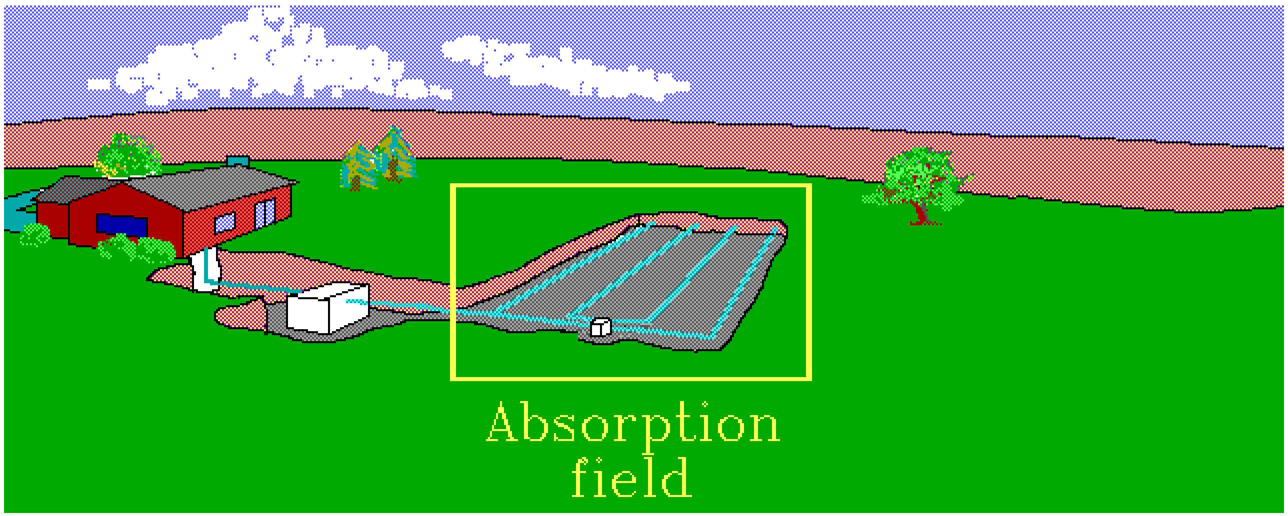
The solids that settle to the bottom of the septic tank slowly decompose. Gas bubbles given off during this process rise, carrying with them, fats, oils, and greases. The tank outlet is located between these two layers where the clearest liquid is found. Tanks typically should be pumped every 3 years to prevent sludge and scum from clogging the leaching field. Actual pumpout schedules should be based on frequent tank inspections.

Septic System Installation Slide Show



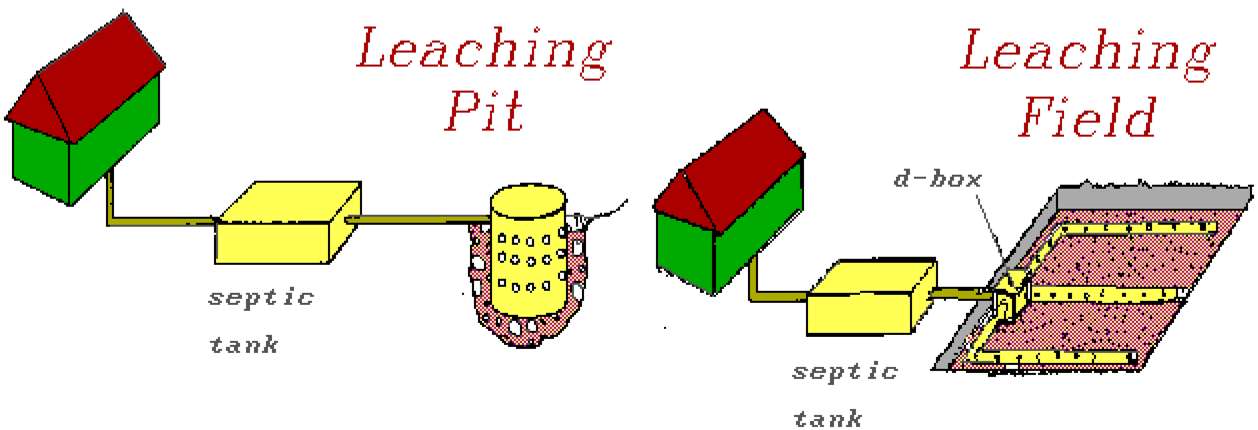
The "clarified" effluent leaves the septic tank and enters a distribution box ("D box") which distributes the flow to the soil absorption field, or leaching facility.

Septic System Installation Slide Show



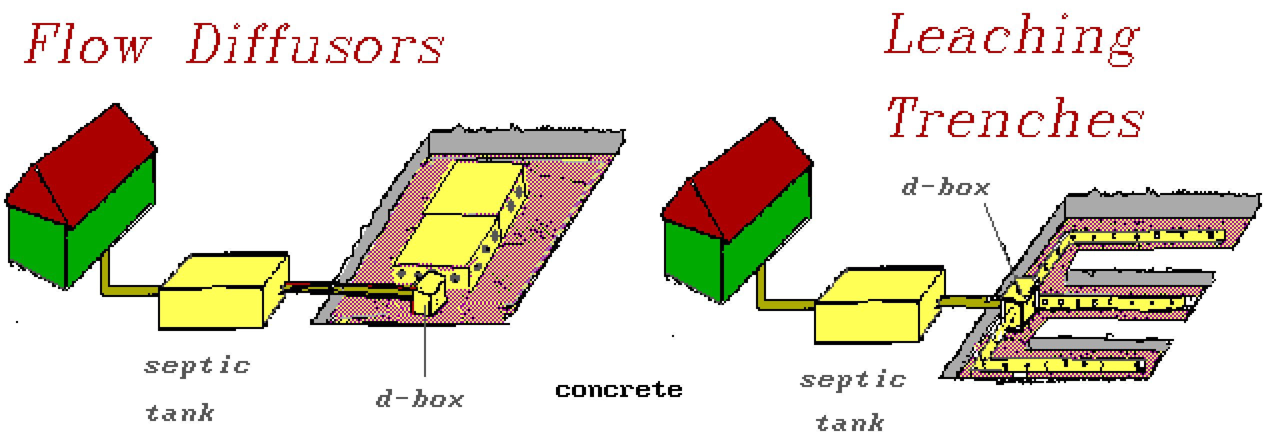
Finally, the effluent arrives at the absorption field where it is evenly distributed to the soil for treatment. In and below the absorption field is where most wastewater treatment occurs through a variety of physical, chemical, and biological processes.

Septic System Installation Slide Show



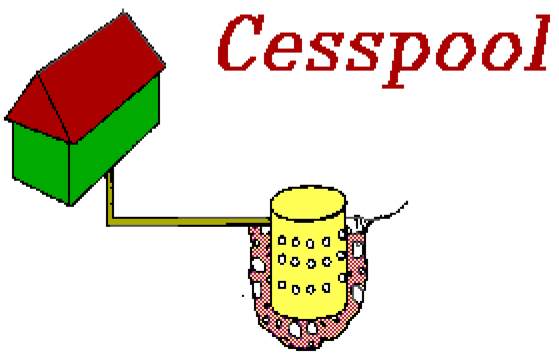
Leaching pits and leaching fields are the most common absorption fields installed in Massachusetts. Standard 6' leaching pits are typically installed when groundwater levels are more than 12 feet below the surface. Leaching fields are used when groundwater levels are closer to the surface.

Septic System Installation Slide Show



Flow diffusors are a design intermediate between a leaching pit and leaching fields. Flow diffusors are rectangular leaching structures, usually made of concrete, that are used where the watertable is very high. Leaching trenches are similar to leaching fields except that only trenches are excavated, instead of the whole field.

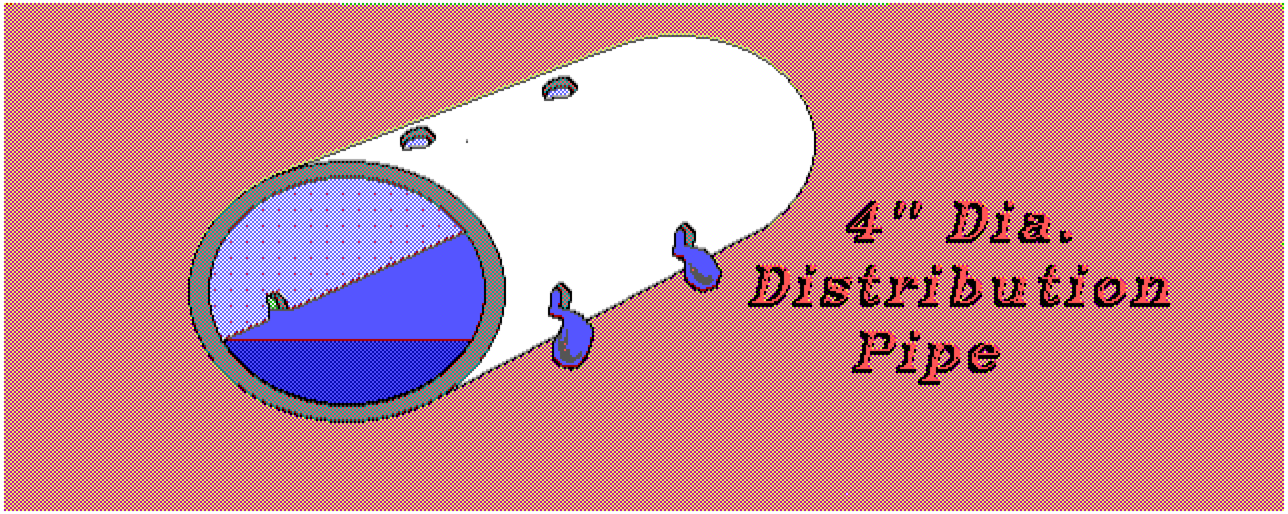
Septic System Installation Slide Show



Most homes built before 1978 have what are generally called "cesspools". Most frequently, a cesspool consists of a leaching "honeycomb" pit. These systems are prone to failure and represent a potential threat to public health and the environment. Even when a cesspool is not overflowing, it may still be contaminating groundwater.

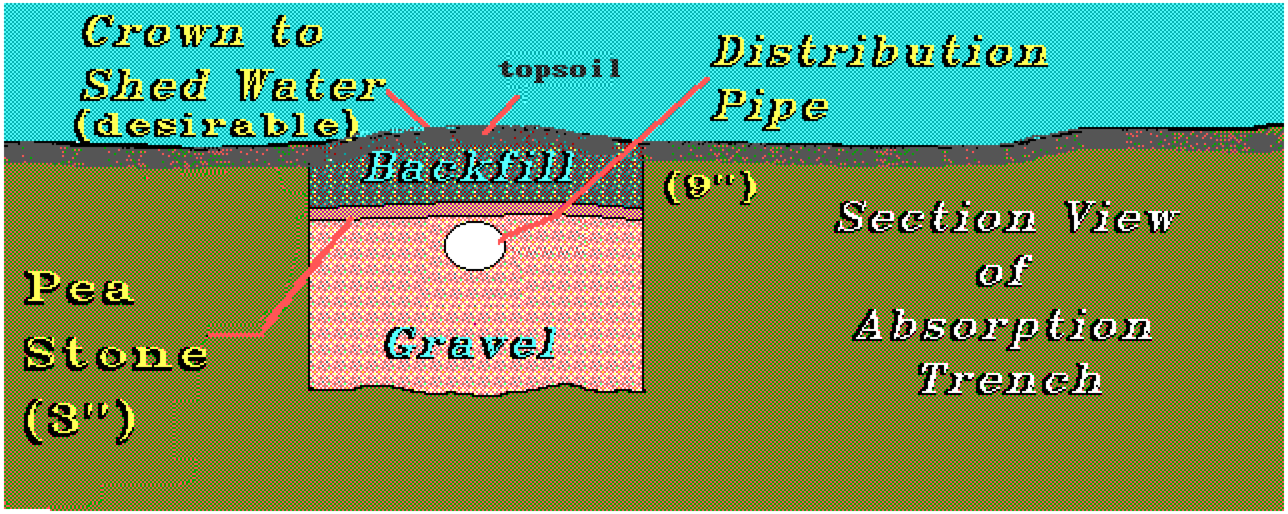
Boards of Health generally require that cesspools be upgraded to Title 5 systems if they have been deemed to have "failed". Some towns have adopted more stringent regulations requiring upgrades for any expansion, change of use, or change in ownership of the property. A Health Board permit is required for upgrades.

Septic System Installation Slide Show



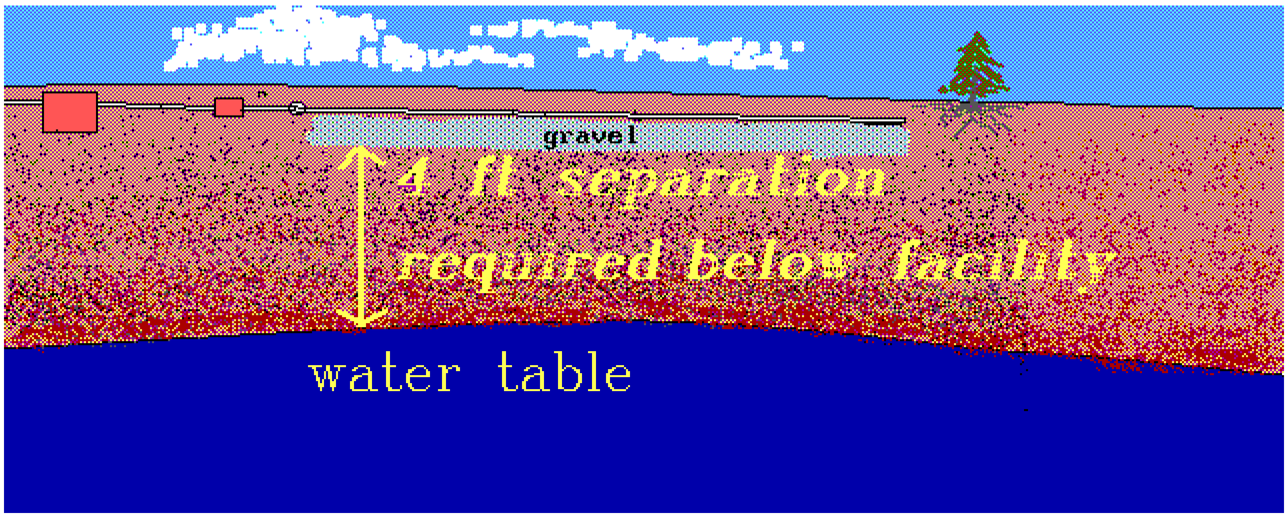
Distribution pipe laterals are used when the aborption field is a leaching field or leaching trench. Trenches provide maximum contact with the soil, and future septic systems will increasingly be of this design in Massachusetts.

Septic System Installation Slide Show



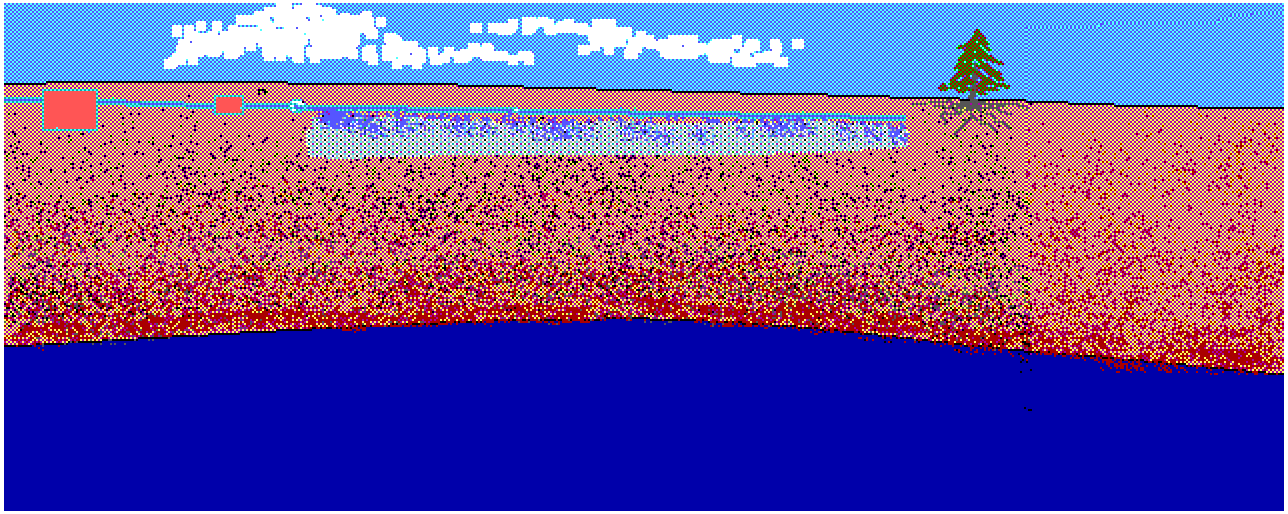
In leaching trenches, lateral pipes are surrounded and supported by gravel, and the soil between the trenches is left undisturbed. In a leaching field, the entire site is excavated and filled with gravel.

Septic System Installation Slide Show



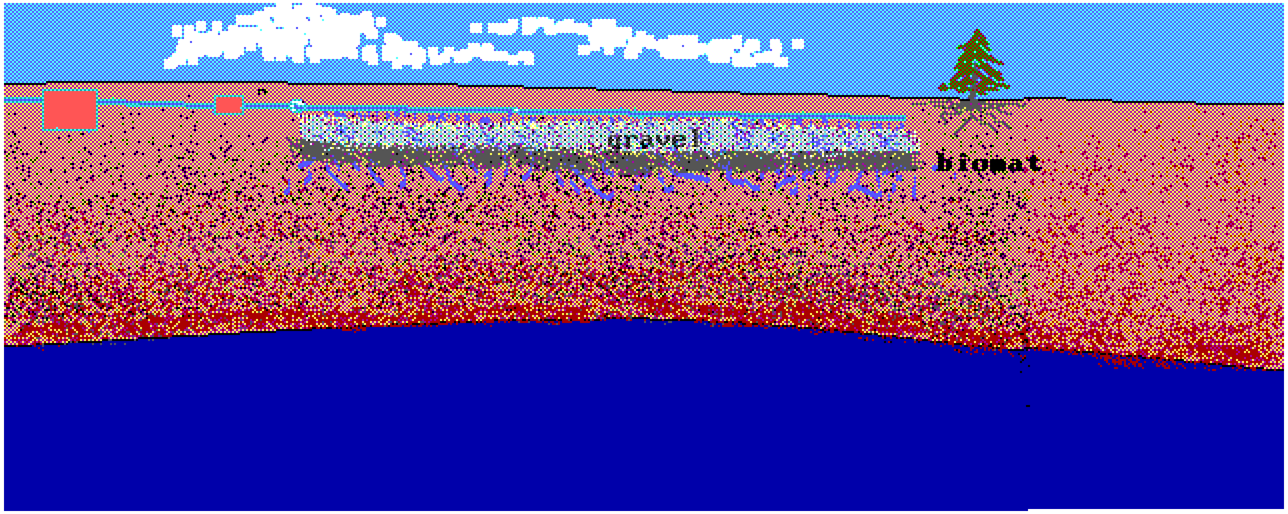
In Massachusetts, a 4-foot separation is required between the maximum water table elevation and the bottom of the leaching facility. This separation maximizes the amount of pollutants removed by the field. A 5-foot separation will be required in fast perking sandy soils, under new state regulations.

Septic System Installation Slide Show



Leaching facilities are designed to evenly distribute effluent. In practical terms, this does not always occur, or occurs only after the system has been operating for several months. Even distribution is less likely in seasonal residences.

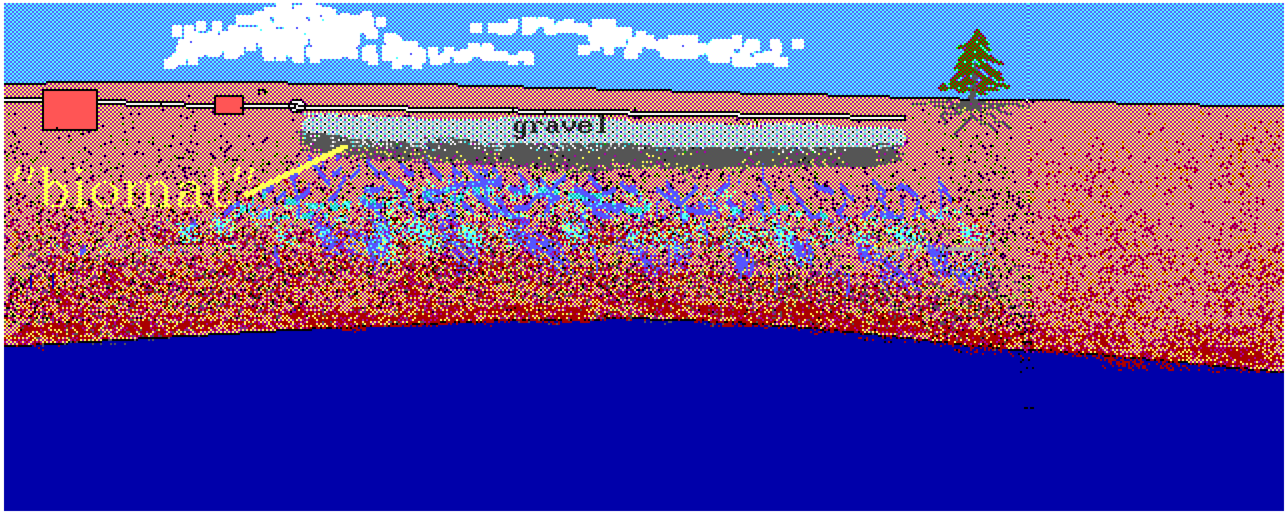
Septic System Installation Slide Show



As the effluent passes through the soil, minute solids, bacteria, and some nutrients are removed from the effluent.

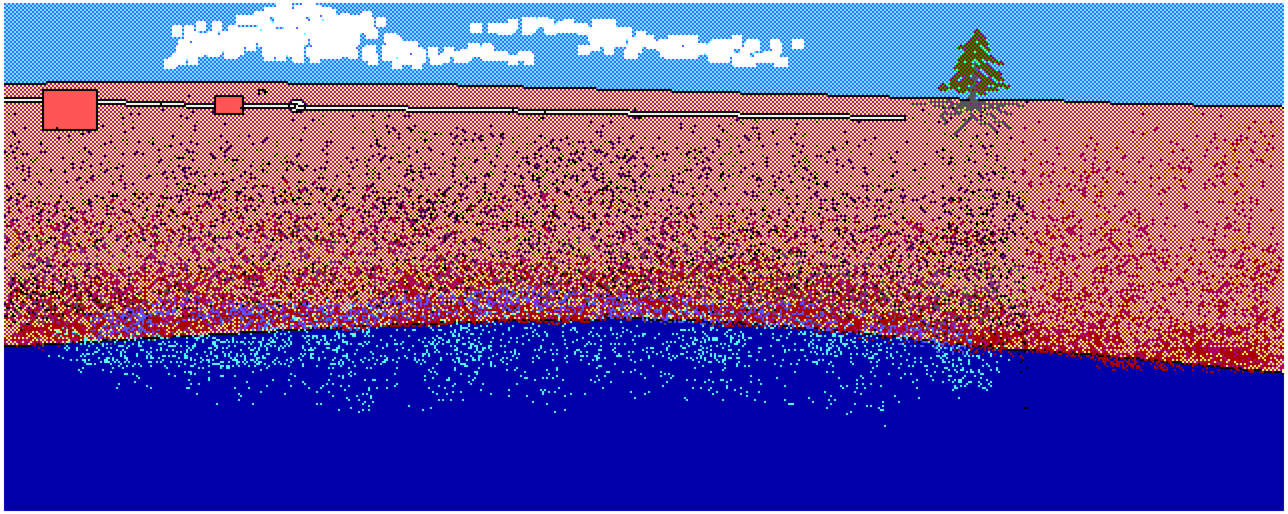
Septic systems are designed to remove pathogens. They remove only about 30% of household nitrogen discharges.

Septic System Installation Slide Show



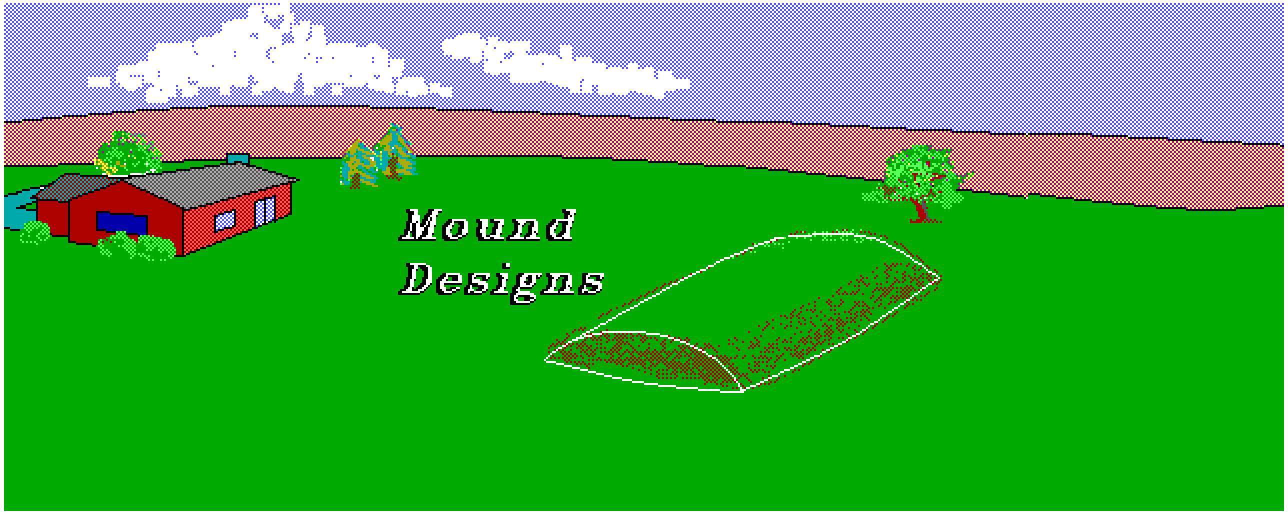
Usually a biological mat forms under a leaching facility. This "biomat", which appears as a black layer, is important in the removal of pollutants. A biomat may not function well if the soil below the facility is saturated with water.

Septic System Installation Slide Show



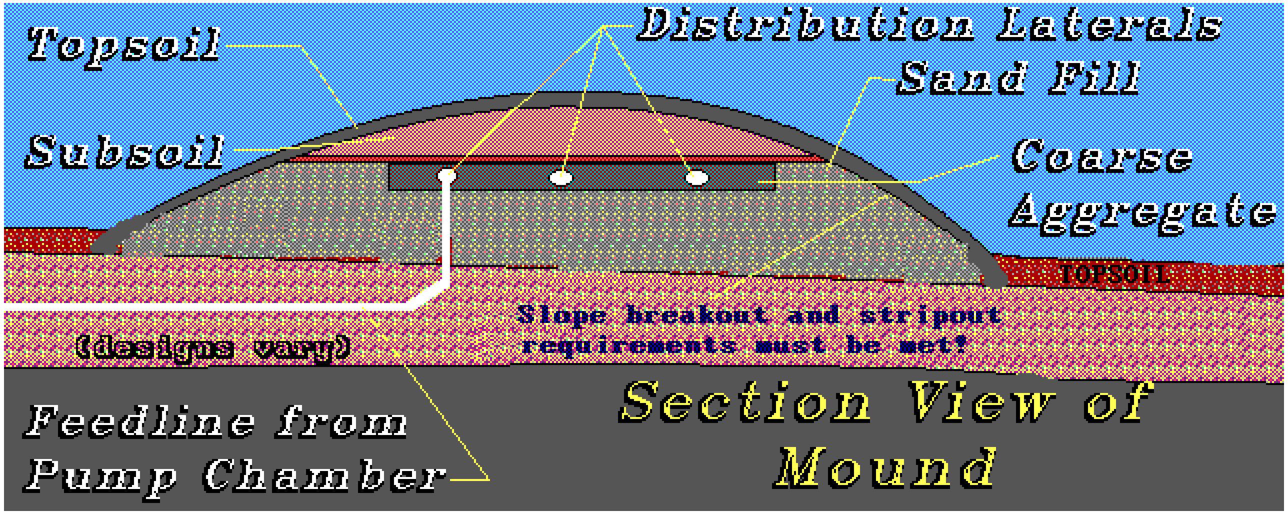
By the time the effluent reaches groundwater, most bacterial pathogens are removed, but the effluent is still high in nitrates and may also have a high concentration of viruses.

Septic System Installation Slide Show



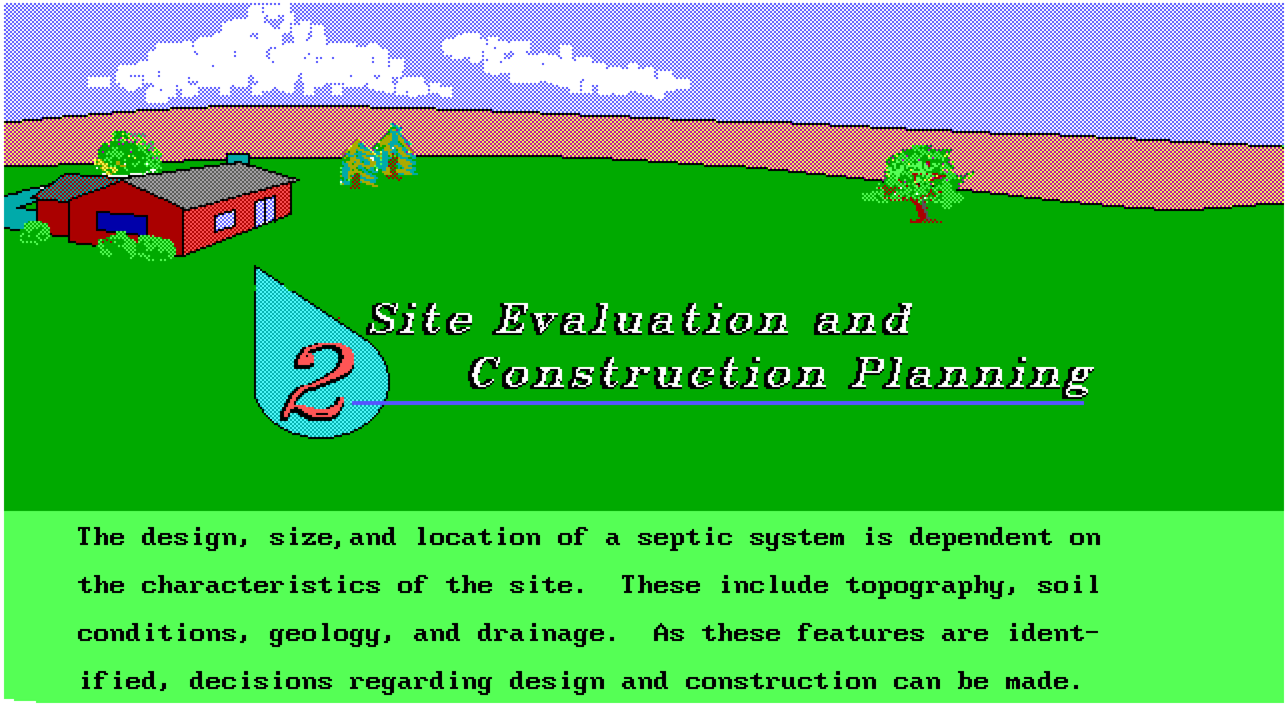
If the watertable is very high, sometimes a mounded septic system is installed. The use of mounded septic systems should not be allowed in velocity zones along the coast for new construction because of the risk of damage from storms and deflection of wave energy.

Septic System Installation Slide Show

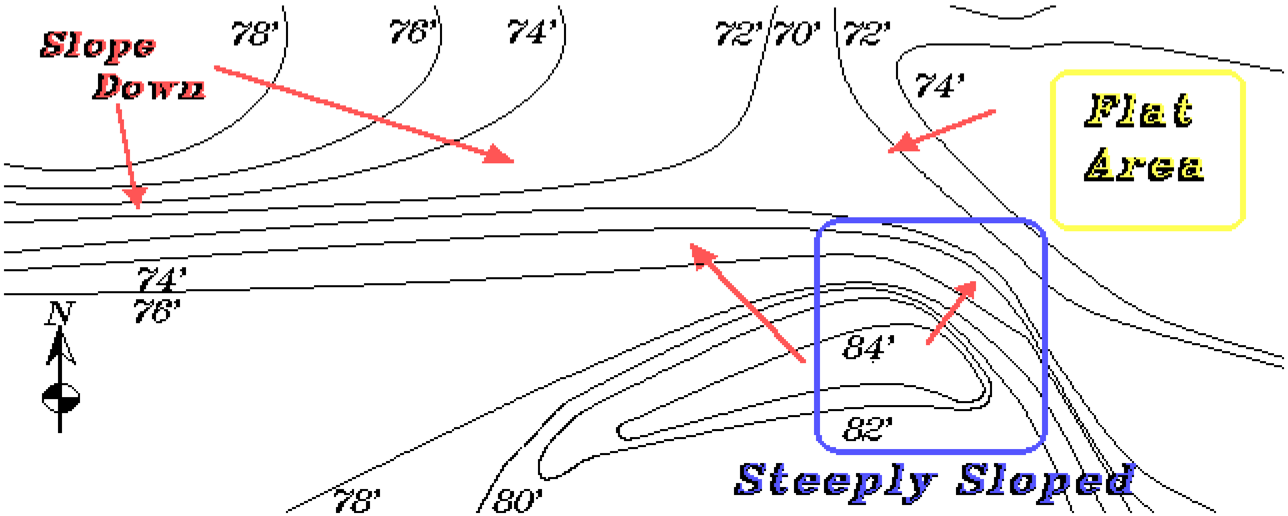


Mounded systems have a design similar to that of a conventional septic system. This mounded system shows the effluent zone completely above the original ground surface. No septic system or mound can be installed in a wetland. If a tall mound is proposed, review the site plan carefully to determine whether wetland boundaries are correct.

Septic System Installation Slide Show

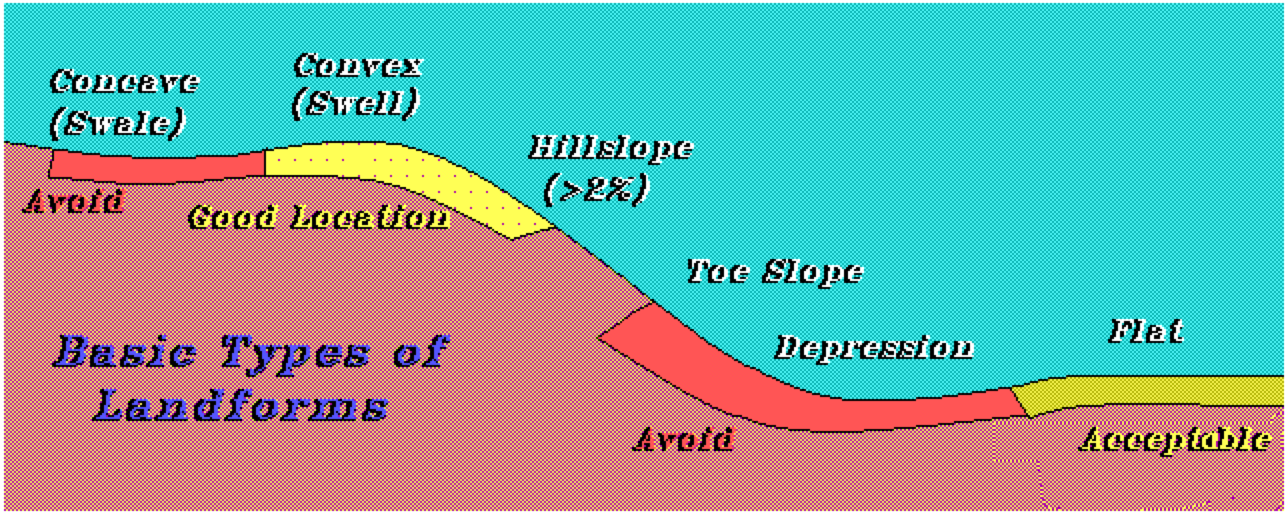


Septic System Installation Slide Show



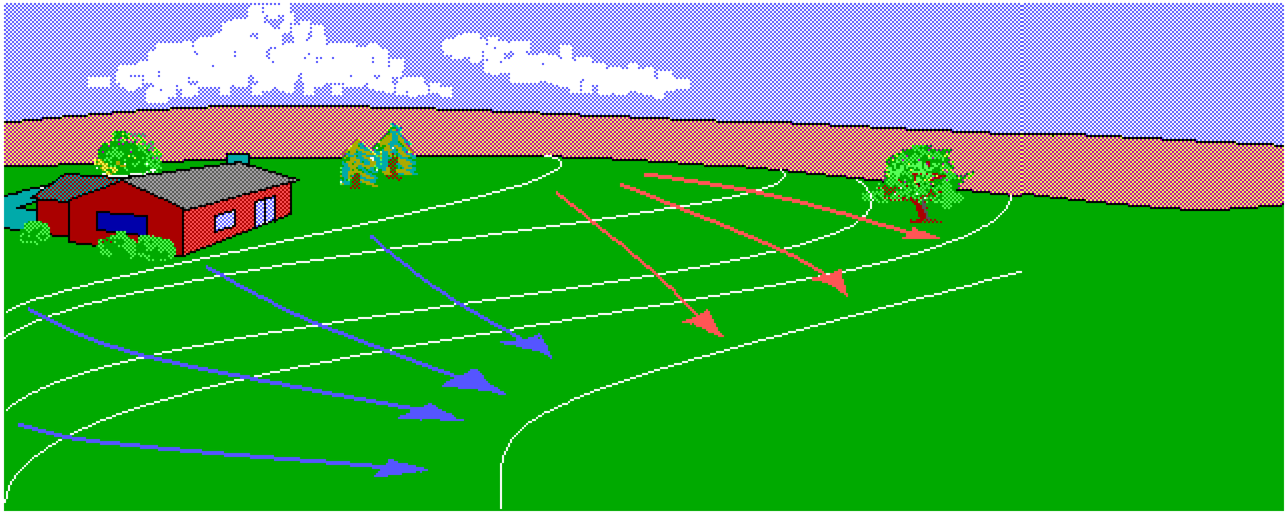
The topography of a site is a critical factor in the siting of septic systems. A contour map shows varying elevations in which each line represents a set elevation change. By interpreting these maps, flow of stormwater and sometimes groundwater can be predicted.

Septic System Installation Slide Show



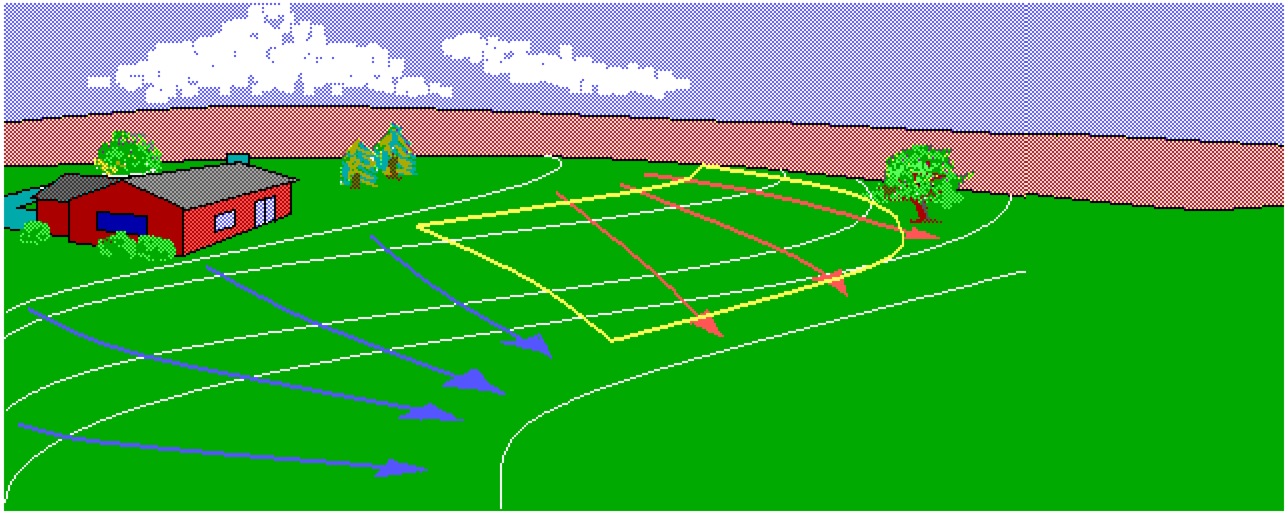
This topographic profile shows the basic types of landforms. Depressional areas and floodplains should be avoided since these may become saturated and be unable to adequately treat the effluent flow.

Septic System Installation Slide Show



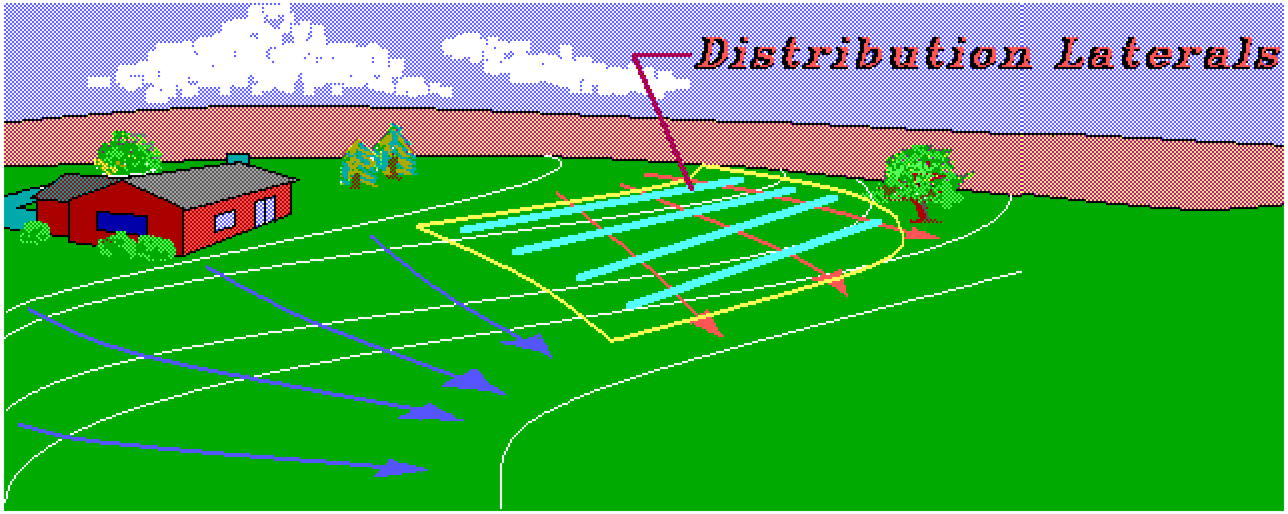
When locating the absorption field on the site, areas where water naturally converges (blue flow lines) should be avoided. Areas where flow diverge (red flow lines) are preferable.

Septic System Installation Slide Show



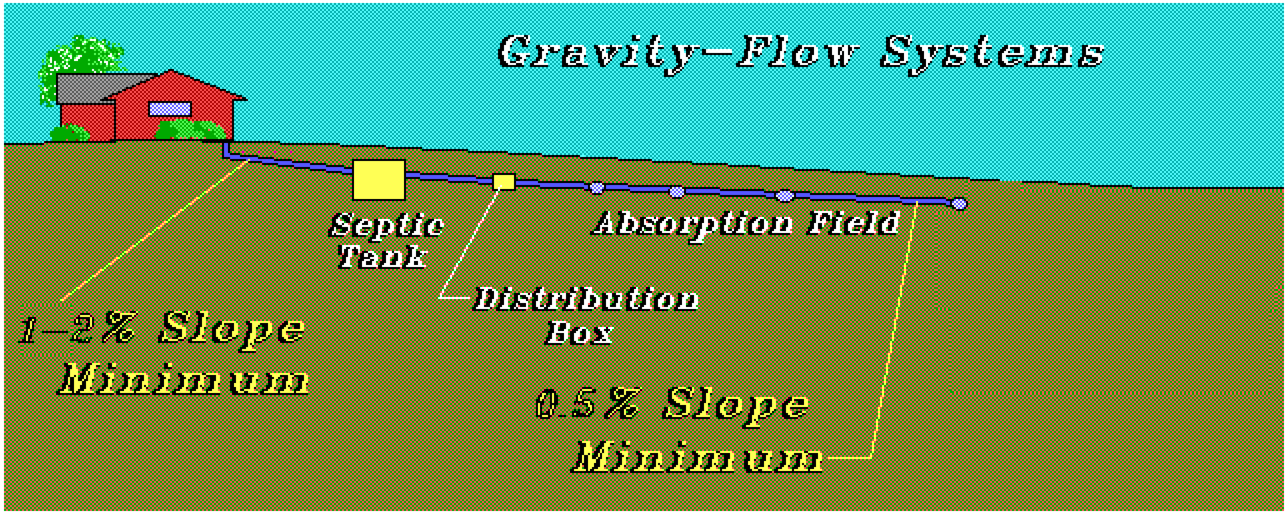
A "usable area" of soil absorption should be located in an area of diverging flow. This area can be trapezoidal in shape, but is most commonly rectangular. The larger the area chosen, the easier the system layout will be.

Septic System Installation Slide Show



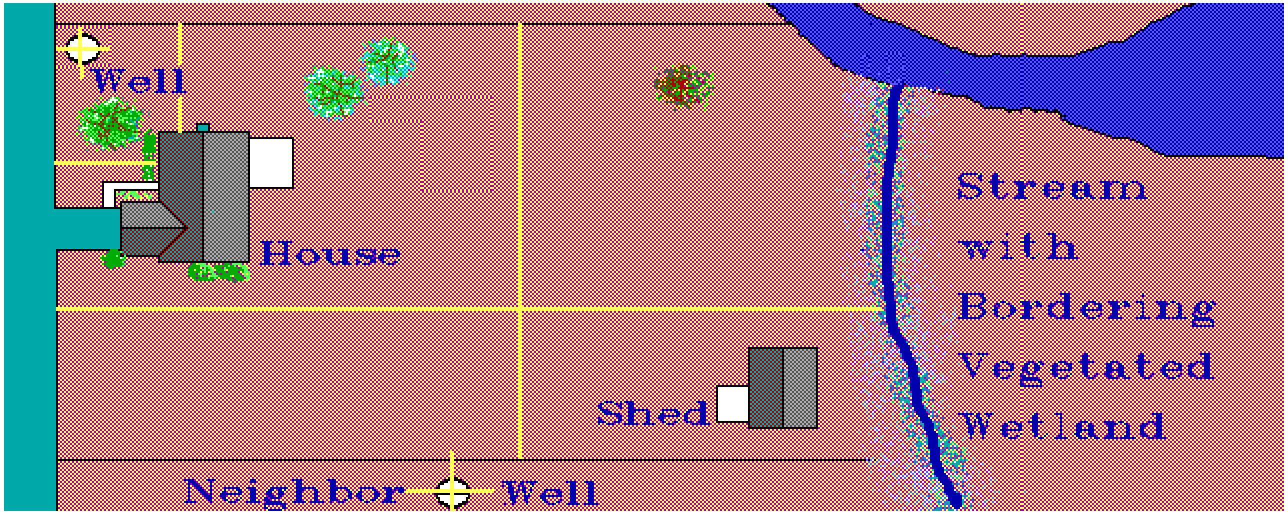
The absorption trenches should be placed perpendicular to the slope. Another way of saying this is that the trenches will be parallel to the contour lines.

Septic System Installation Slide Show



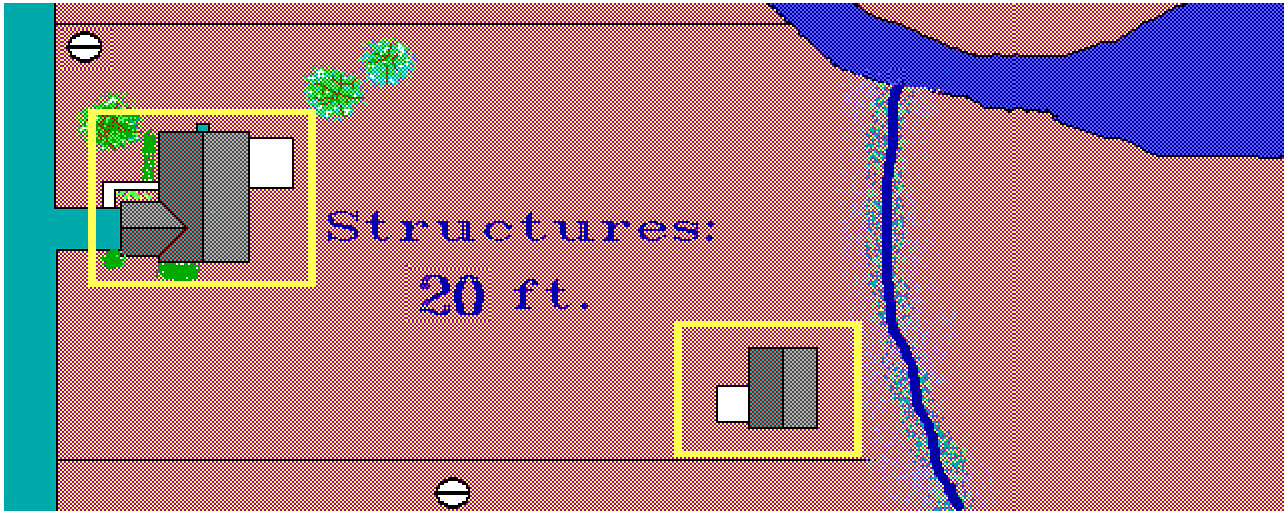
The slope of the system components must comply with Title 5 for proper system operation. Some sites may require the use of pumps.

Septic System Installation Slide Show



A complete layout of the site, including dimensions, structures, wells, and wetlands is needed before siting and designing a onsite septic system.

Septic System Installation Slide Show



Massachusetts code requires that the drain field of a septic system be located a minimum of 20 FEET from any building with a basement. The septic tank need only be 10 FEET from any building.

Septic System Installation Slide Show

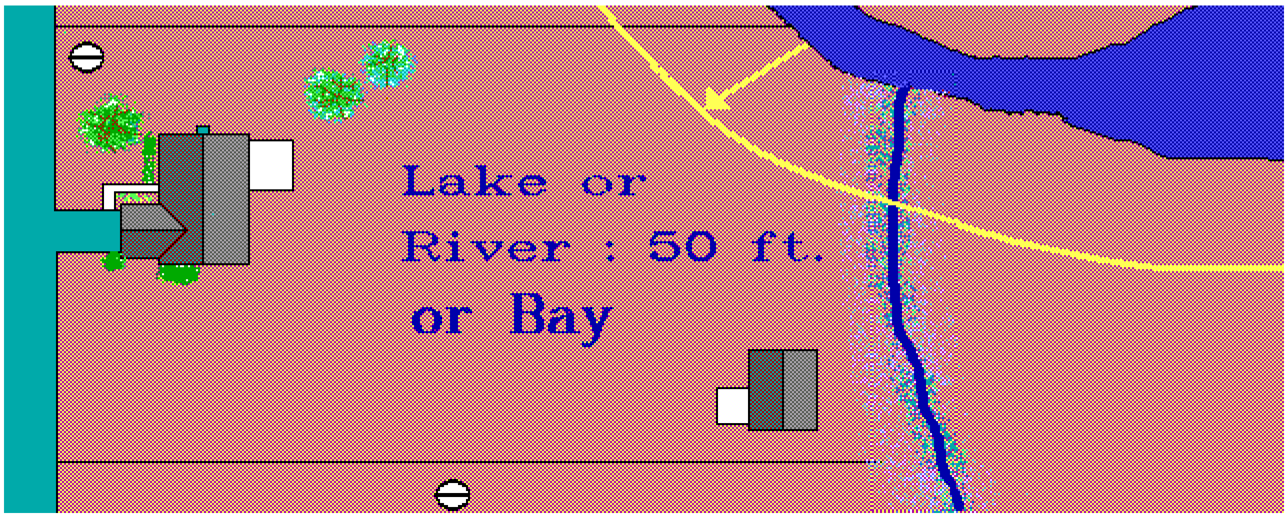
Massachusetts code requires that the absorption field be located 100 feet from any private wells.

(Don't forget the neighbor's well!)

Septic System Installation Slide Show

The leaching facility and tank may not be placed closer than 10 feet to property lines.

Septic System Installation Slide Show

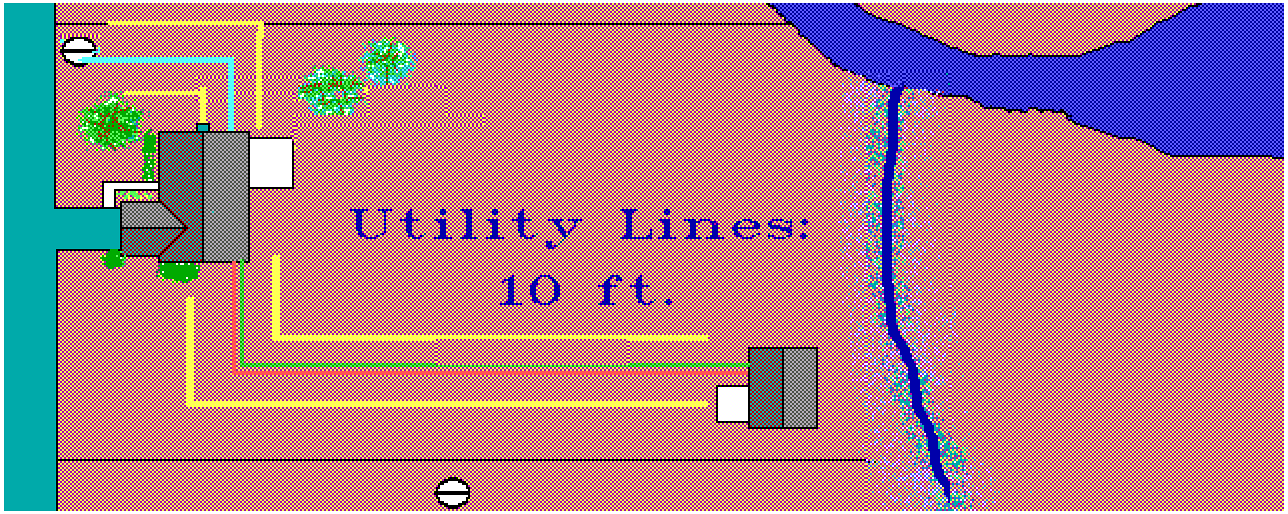


State regulations require that absorption fields must be at least 50 feet from any lake, river, bay, or other surface water. Some towns have adopted more stringent regulations to protect public health and the environment.

Septic System Installation Slide Show

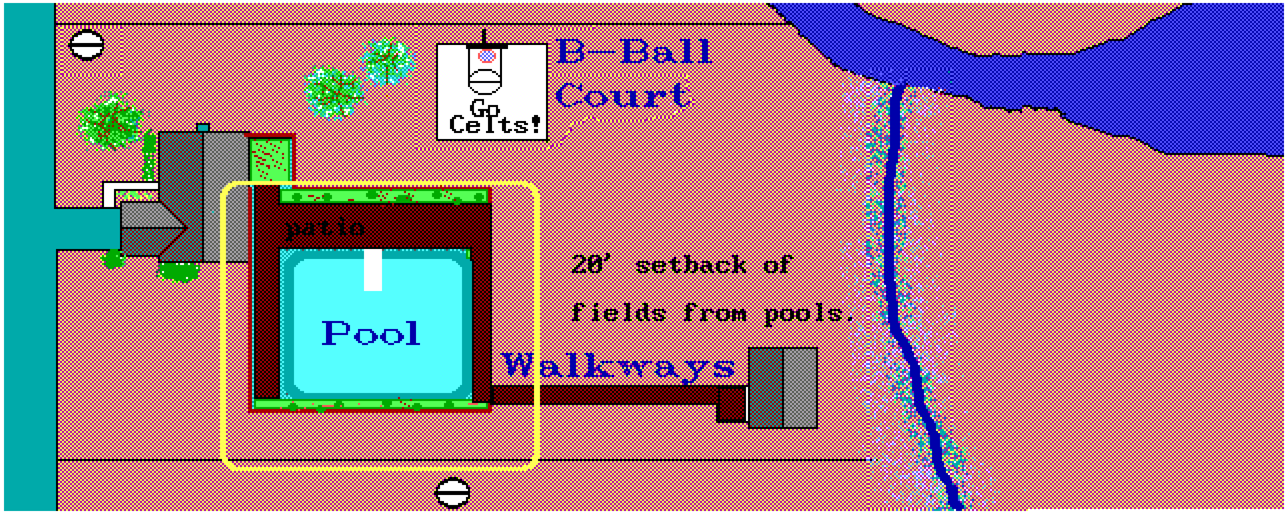
State regulations require that a leaching field must be at least 50 feet from any Bordering Vegetated Wetland (BVW). Some towns have adopted more stringent regulations.

Septic System Installation Slide Show



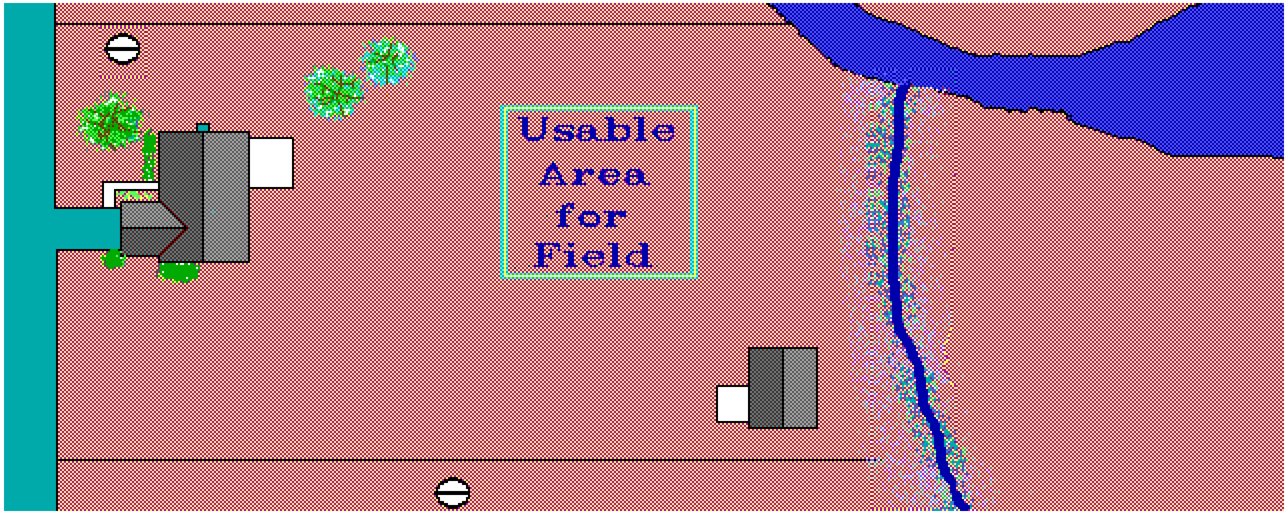
Finally, although not a requirement, it is a good idea to site the septic system at least 10 feet from buried utility lines.

Septic System Installation Slide Show



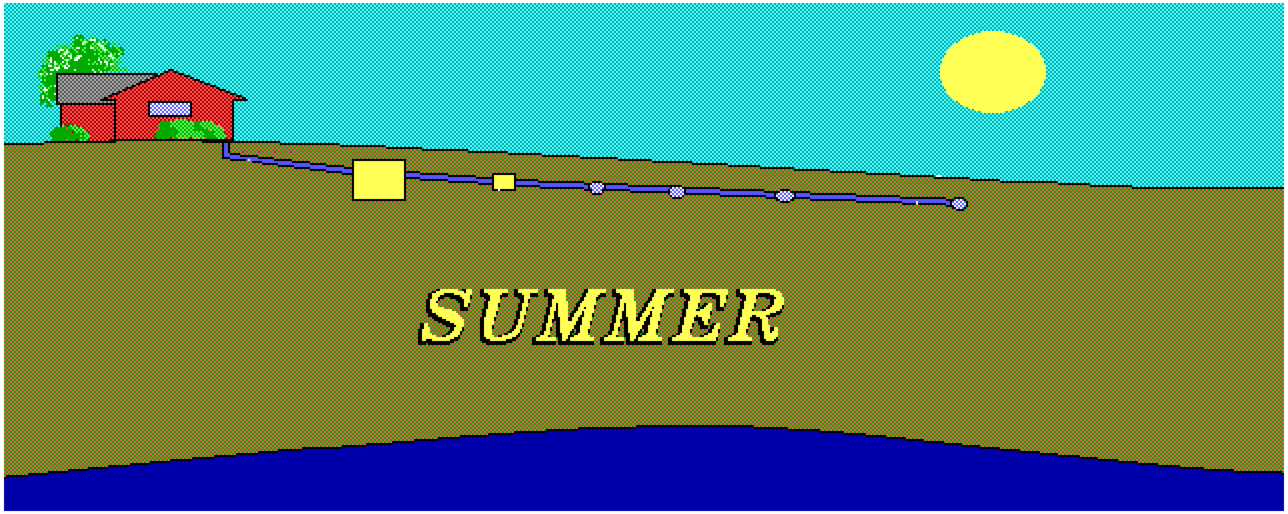
The homeowner should allow for any possible construction. Don't locate a leaching field where a pool, deck, basketball court, or some other addition is planned.

Septic System Installation Slide Show



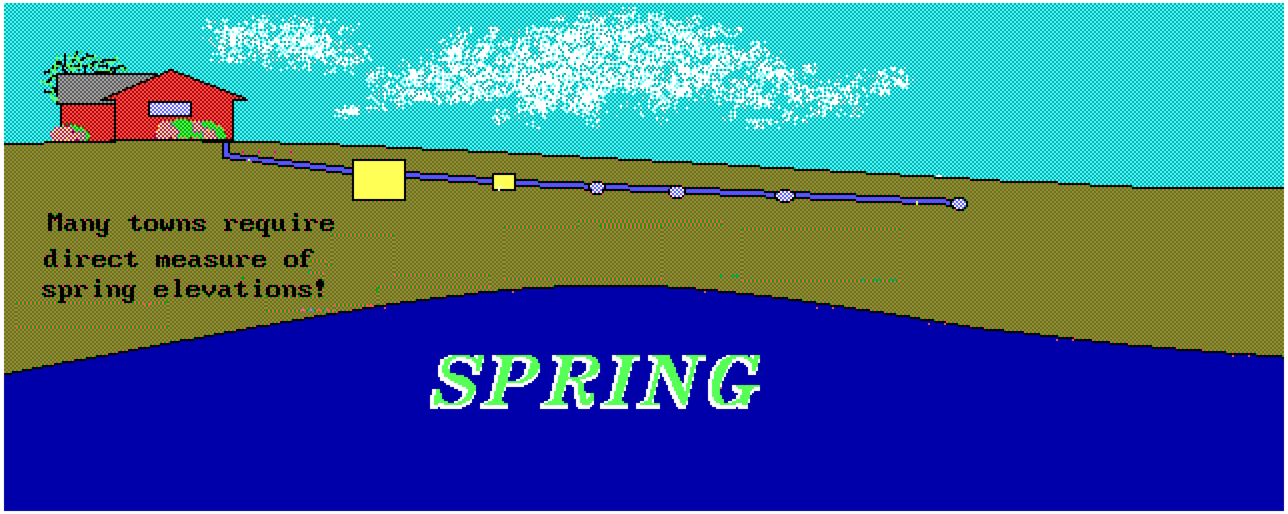
After accounting for all of these separation distances, you can determine the usable area remaining. When a proposed system upgrade cannot meet all Title 5 setbacks, a Board of Health may issue a "variance". Variances must be submitted to DEP for approval.

Septic System Installation Slide Show



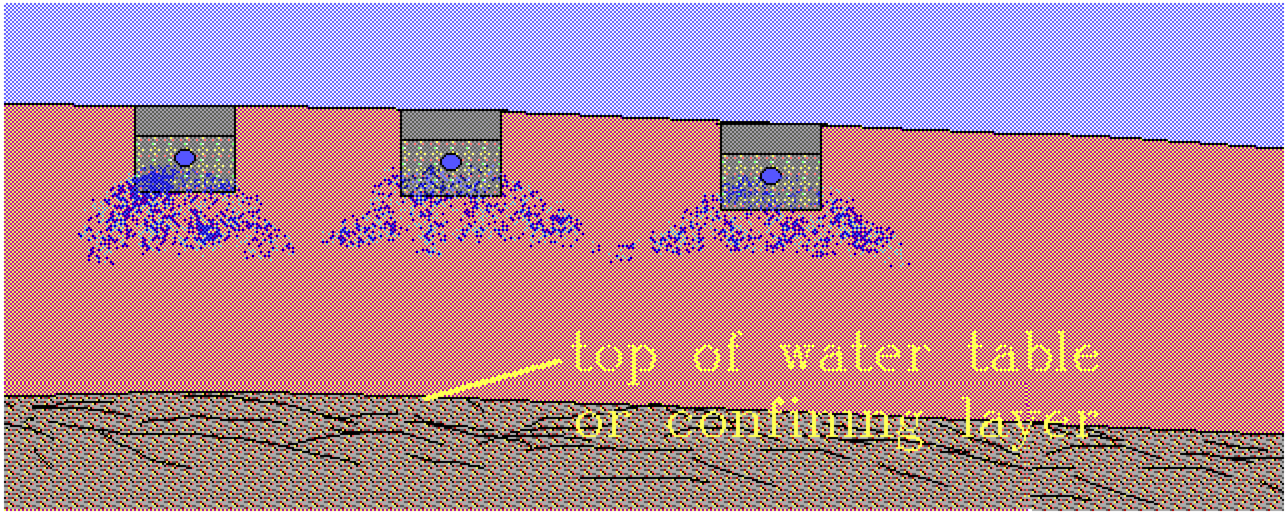
When determing the depth of the water table, summer water levels should be adjusted to estimate maximum water table levels which generally occur in the spring....

Septic System Installation Slide Show



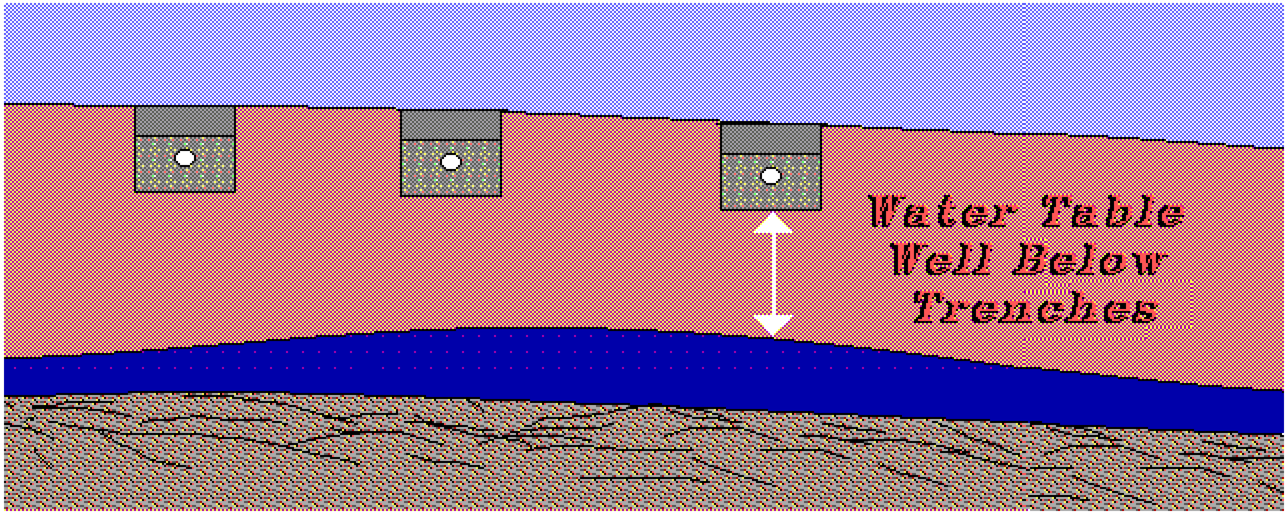
when the water table is usually very high because of
spring rains and thawing snow. In 1995, the Buzzards Bay Project
will have a program in place to help establish correction factors
suitable for estimating maximum groundwater elevations.

Septic System Installation Slide Show



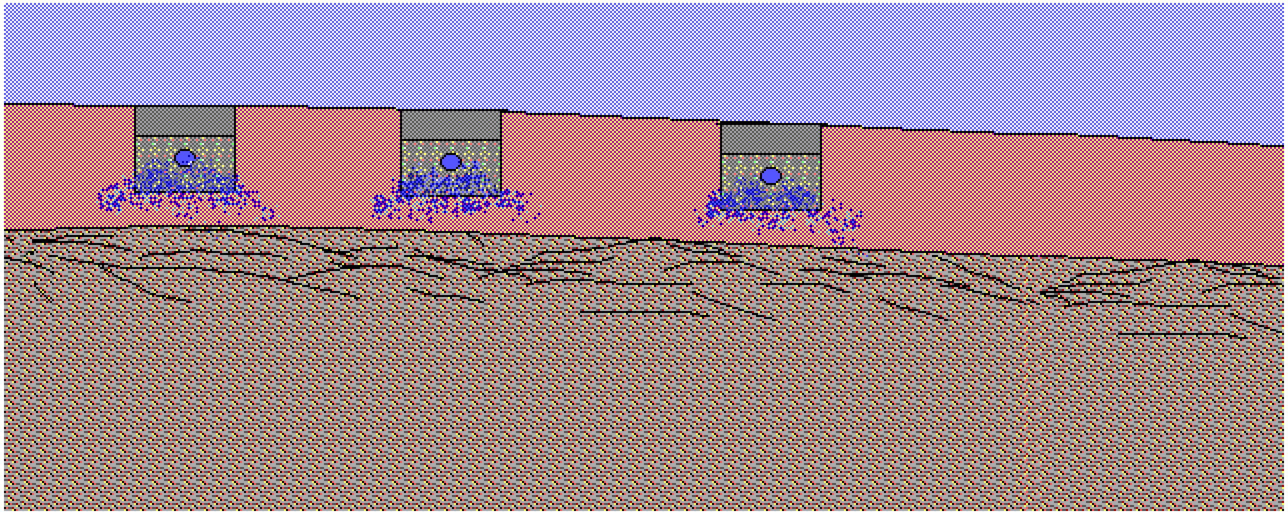
It is critical that the base of the system is four feet above the water table or confining layer.

Septic System Installation Slide Show



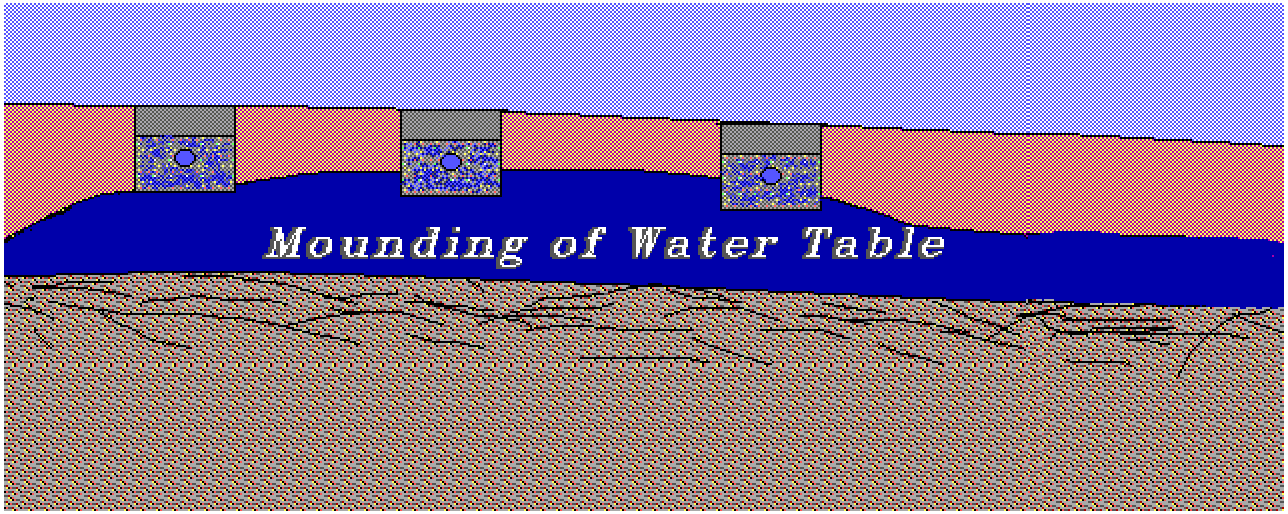
This separation is not only important for effluent treatment,
but can accomodate any mounding of effluent that may occur.

Septic System Installation Slide Show



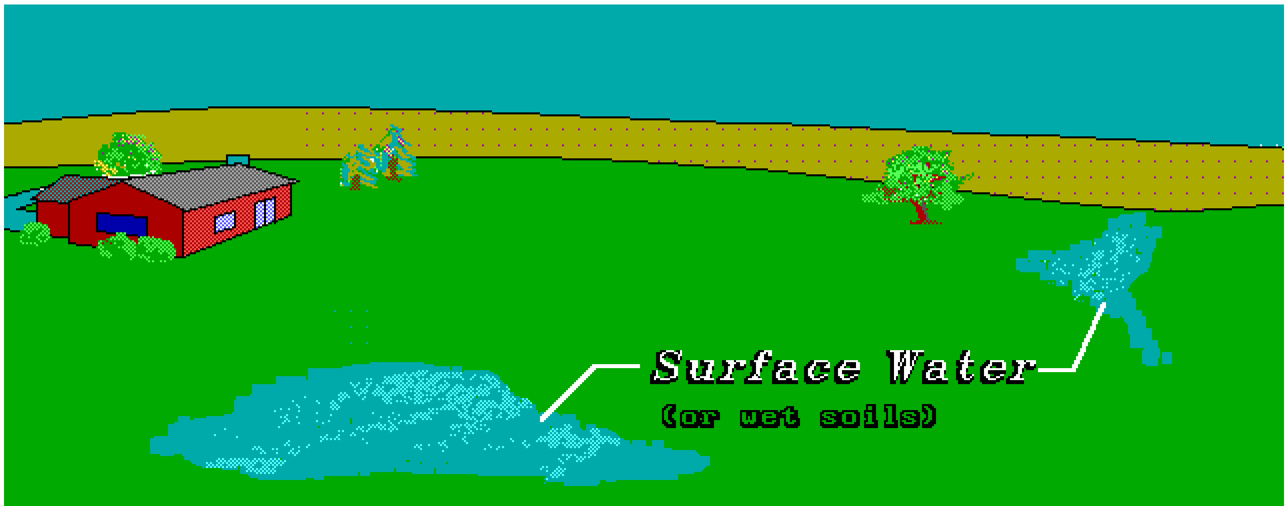
On the other hand, improperly siting a system can result...

Septic System Installation Slide Show



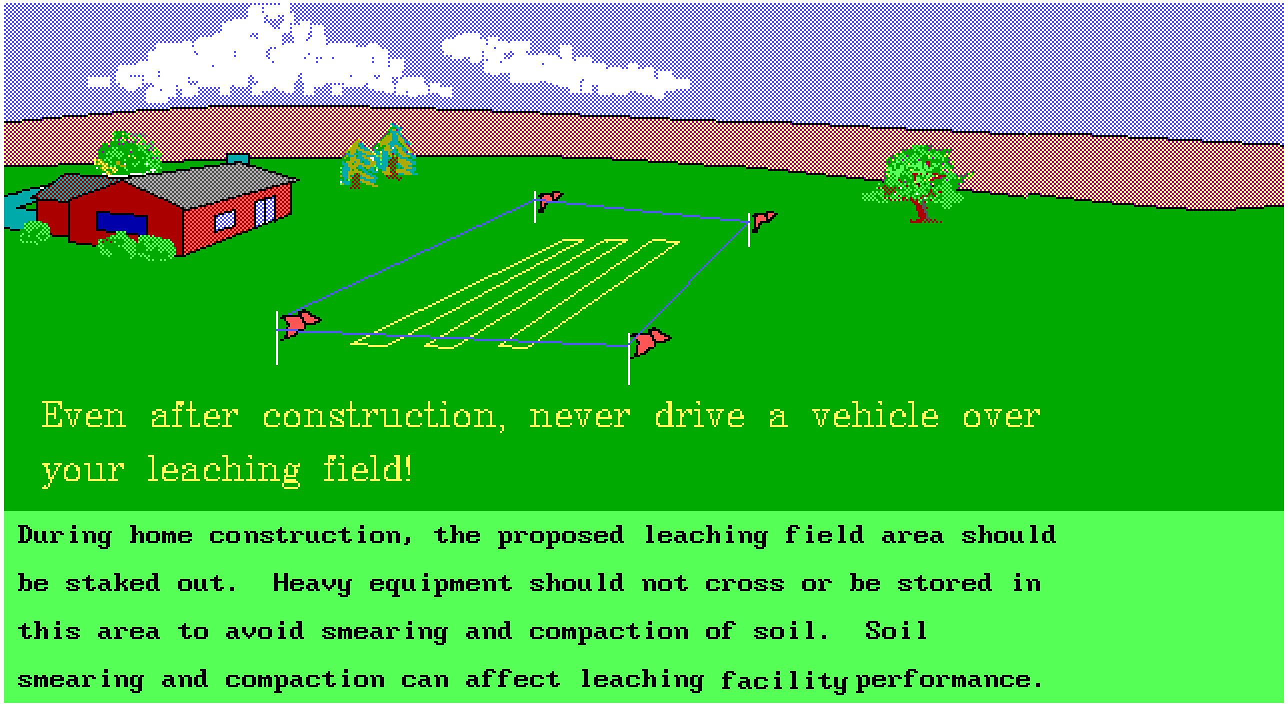
...in failure of the absorption field and backing up of toilets and breakout of effluent at the surface! Even without surface breakout, the lack of a four foot separation to groundwater is a potential health problem because of groundwater contamination.

Septic System Installation Slide Show

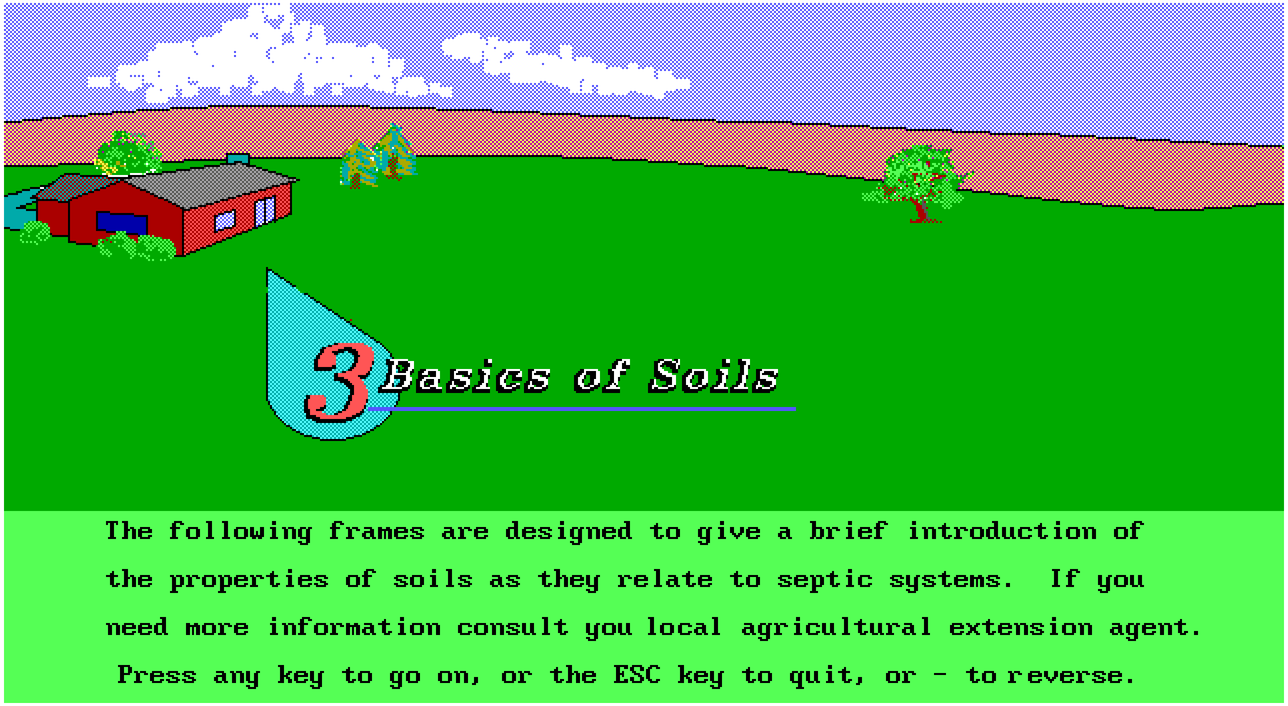


Before allowing construction to proceed, be sure the soil is relatively dry. If the soil is too wet, construction will damage soil structure, causing the septic system to not function properly. Good soil structure is most important when trenches are used.

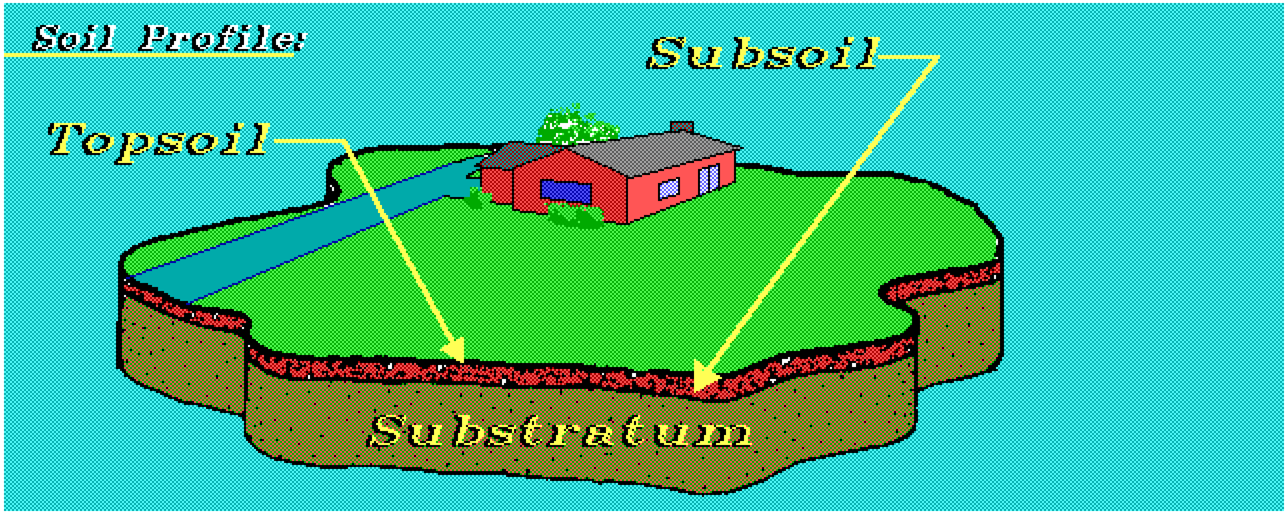
Septic System Installation Slide Show



Septic System Installation Slide Show

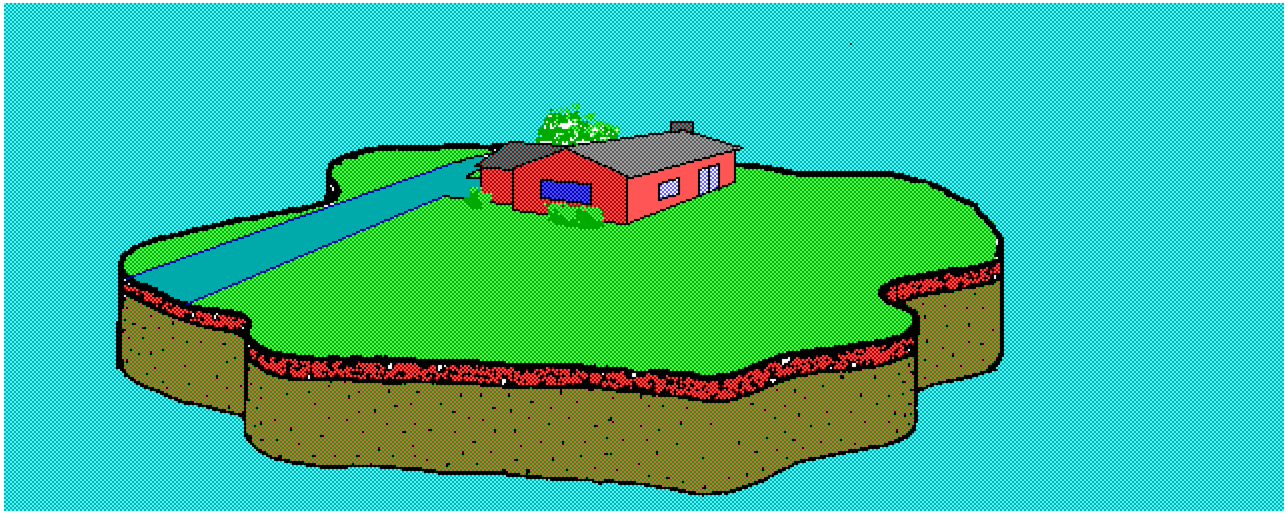


Septic System Installation Slide Show



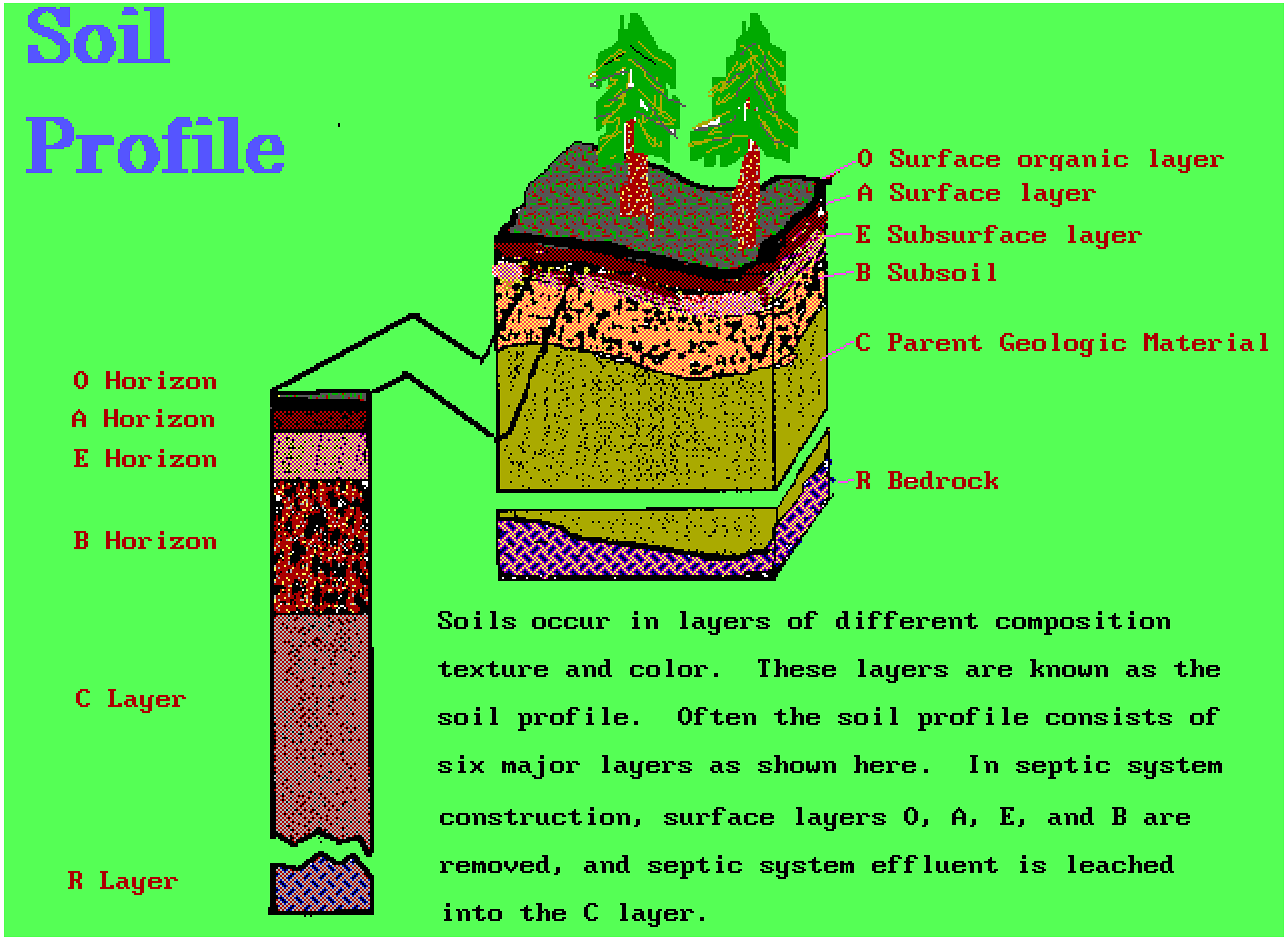
Underlying each site are several layers of soil composed of different minerals and amounts of organic matter. These layers make up what is called a "soil profile."

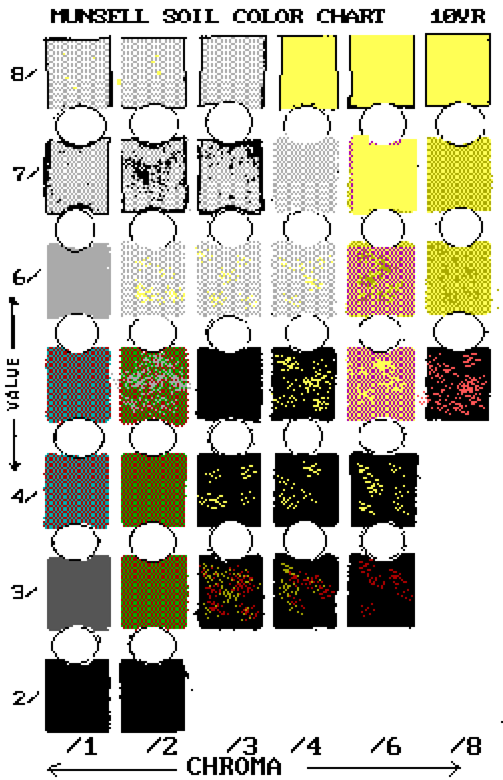
Septic System Installation Slide Show



Soil is not only the foundation of your dwelling, but the foundation of wastewater treatment as well. Every site has unique soil characteristics that are critical in determining the size and type of system required.

Septic System Installation Slide Show





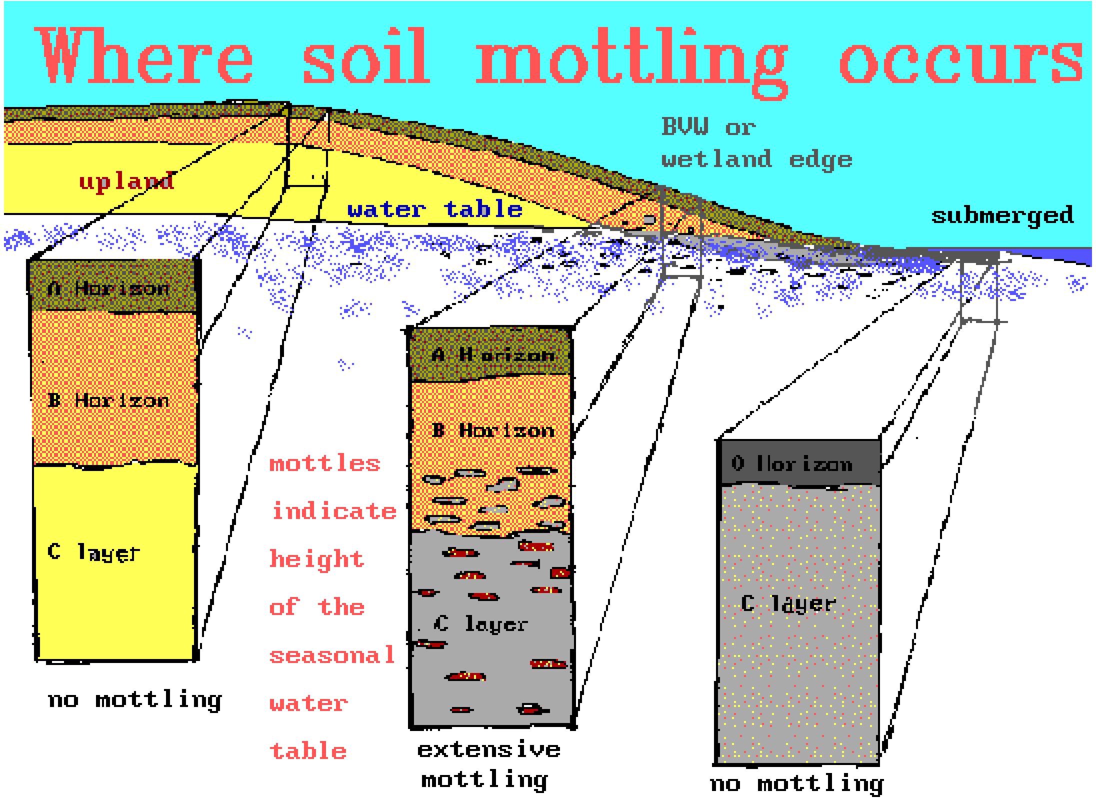
Munsell Color Chart

The Munsell color charts are a valuable tool for identifying soil types. By matching soil hue "value" and "chroma", wet (hydric) and dry soils can be easily distinguished.

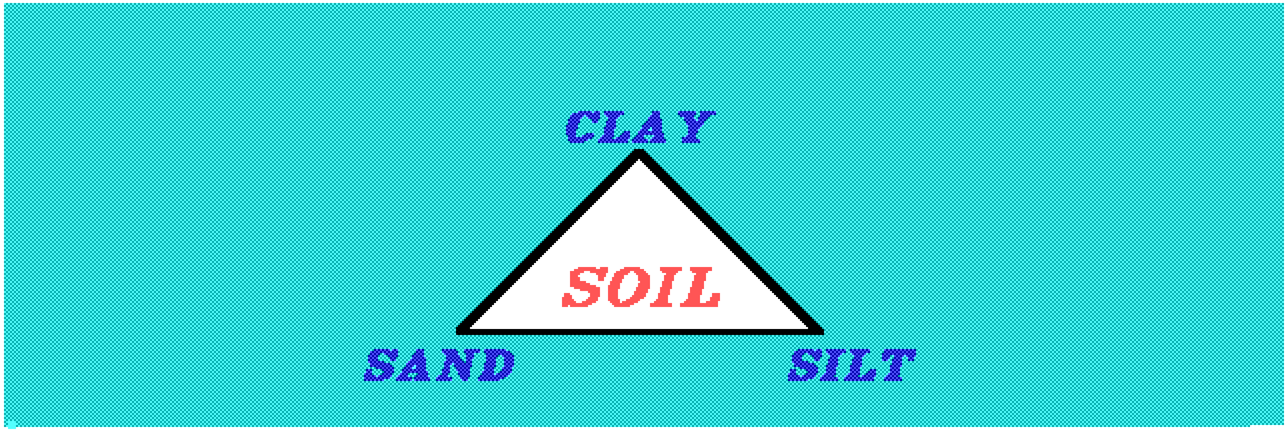
Mottling

Mottling of soil (formation of blotches of soil of different color) occurs when a layer of soil is alternately within or above the watertable repeatedly over a long period. Mottling is an excellent way to identify hydric (wet) soils.

Septic System Installation Slide Show

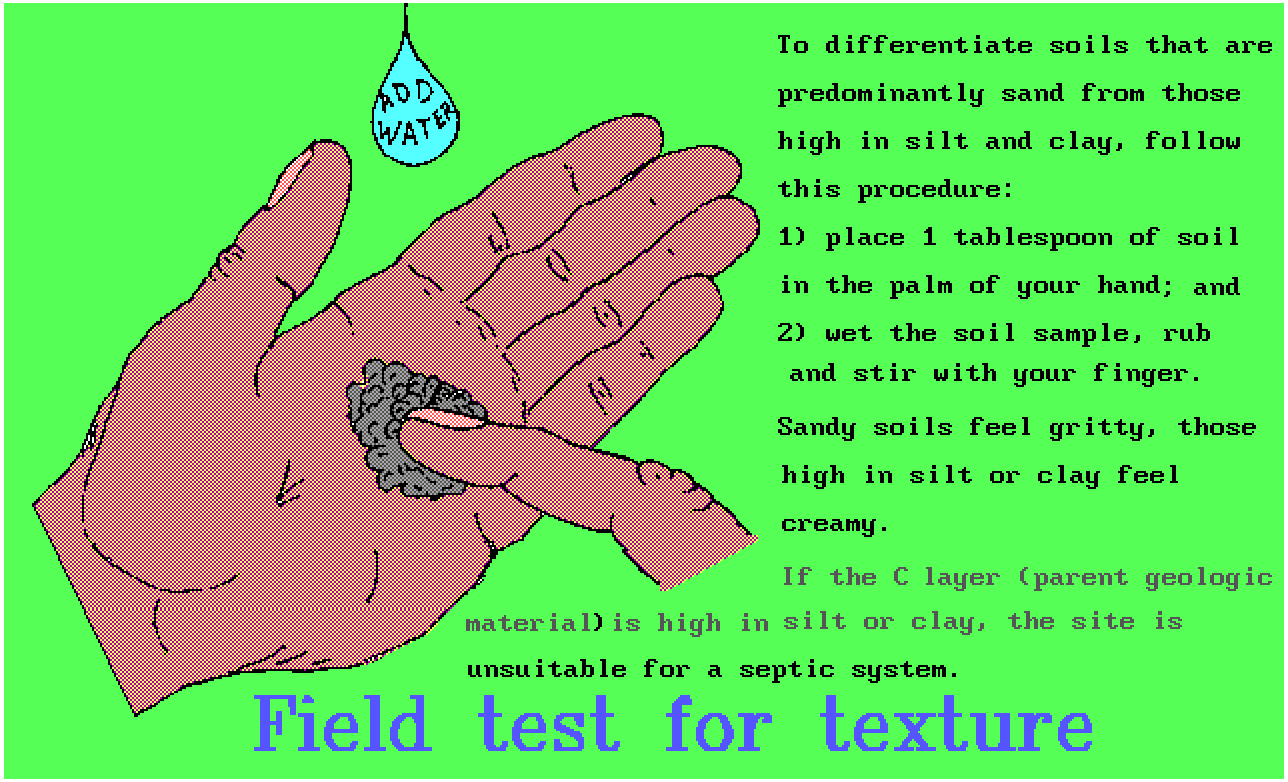


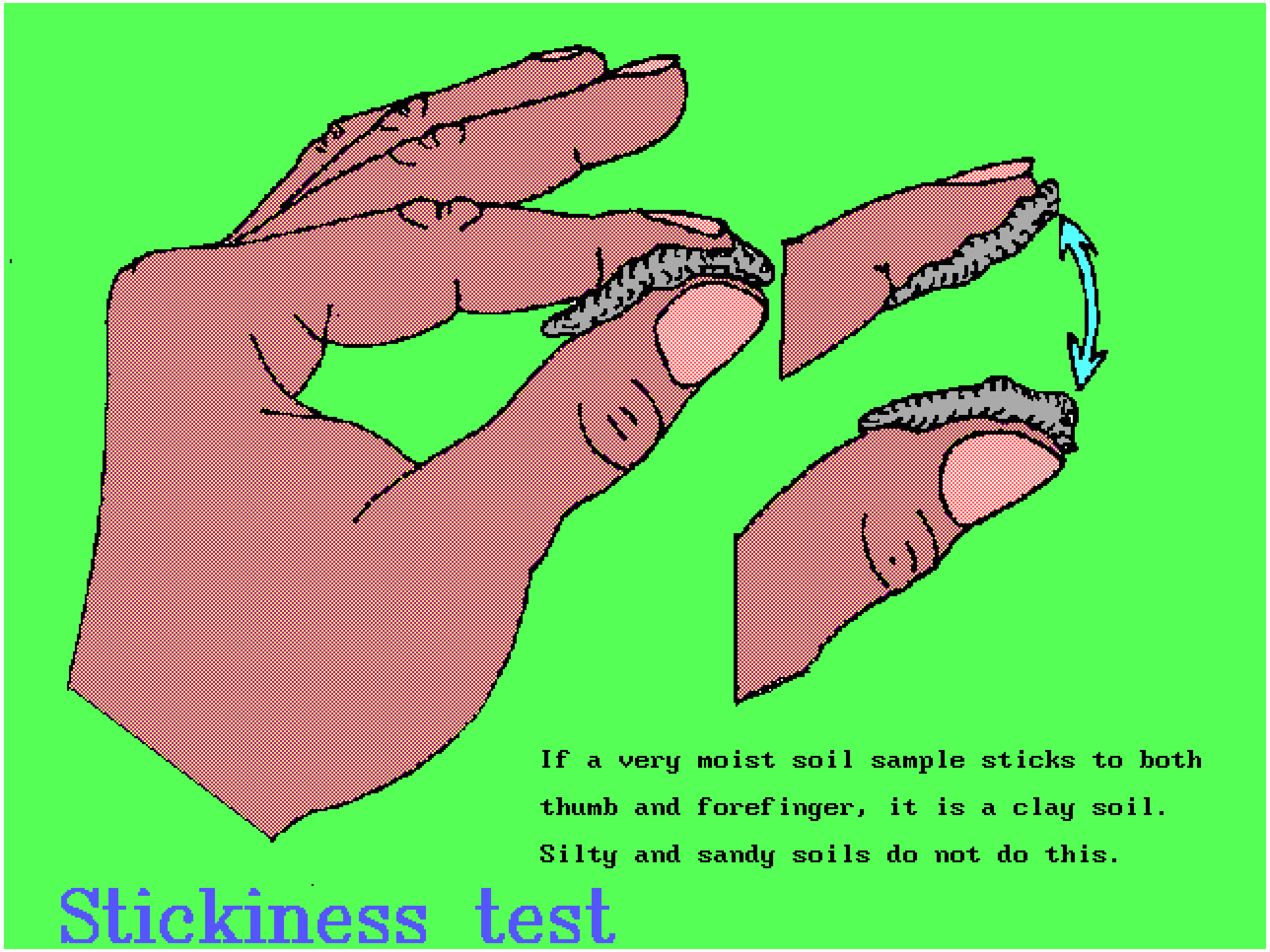
Septic System Installation Slide Show



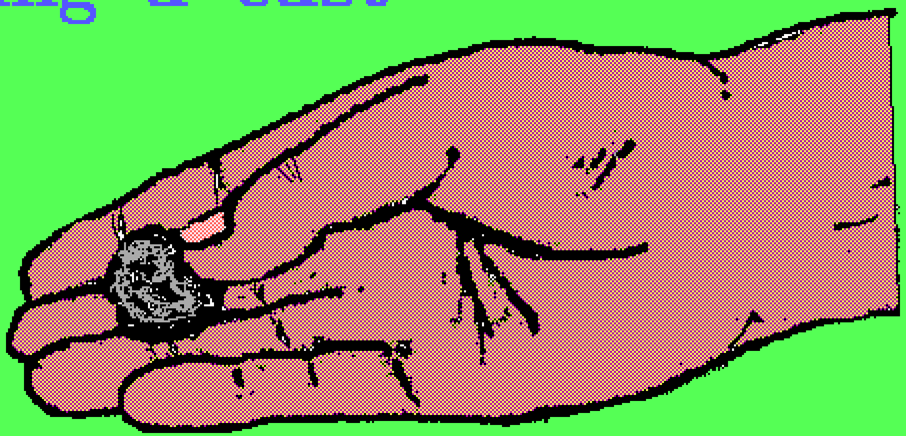
All soils are composed of sand, silt, and clay, and some organic matter. The relative amount of each determines the soil's texture. Around Buzzards Bay, sand, loamy sand, sandy loam, loam, silt loam, and silty clay are the most common textural classes. Soil texture is useful for predicting potential percolation rates and susceptability to compaction and smearing.

Septic System Installation Slide Show




If a very moist soil sample sticks to both
thumb and forefinger, it is a clay soil.
Silty and sandy soils do not do this.
Stickiness test

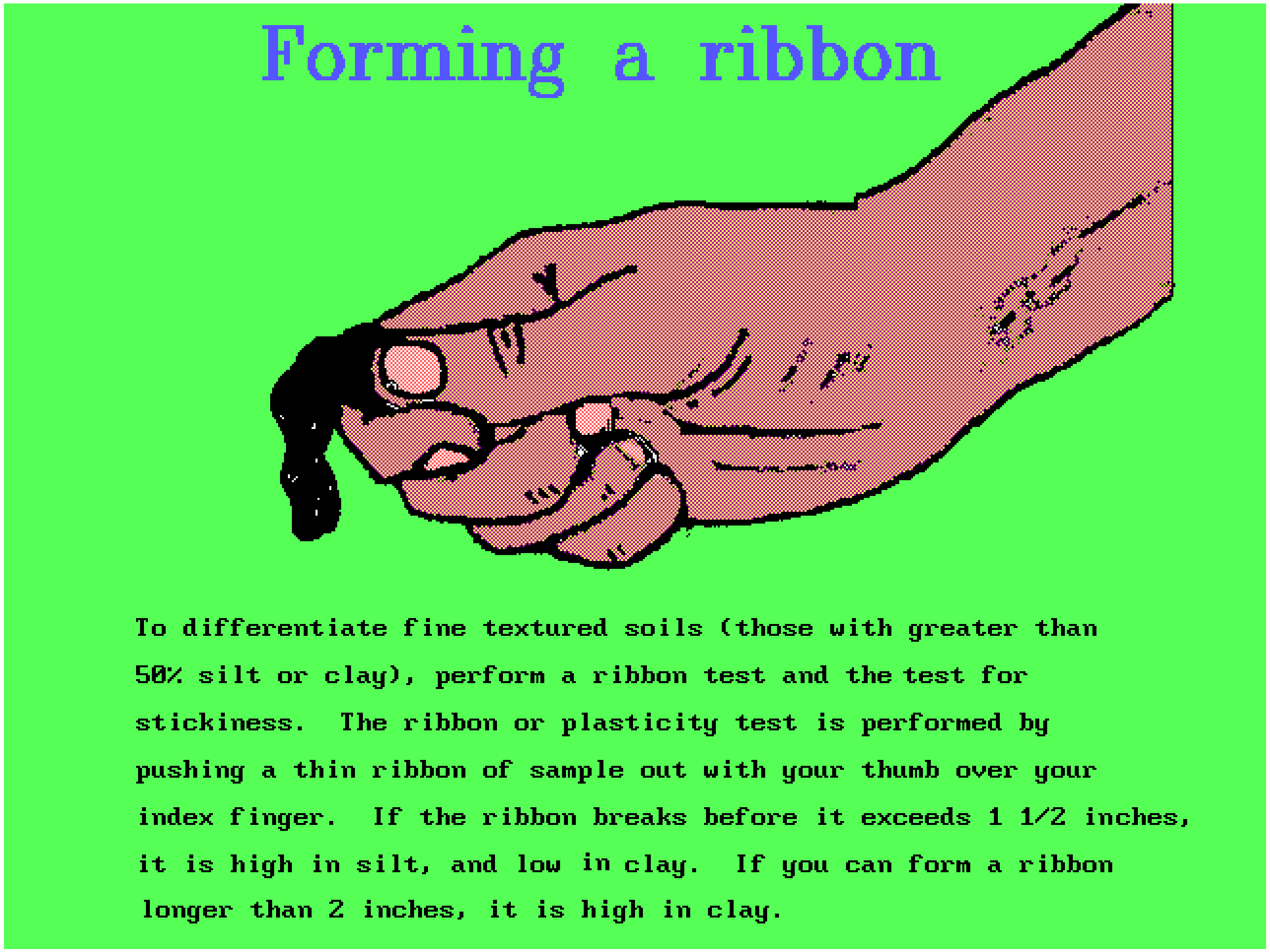
Forming a cast



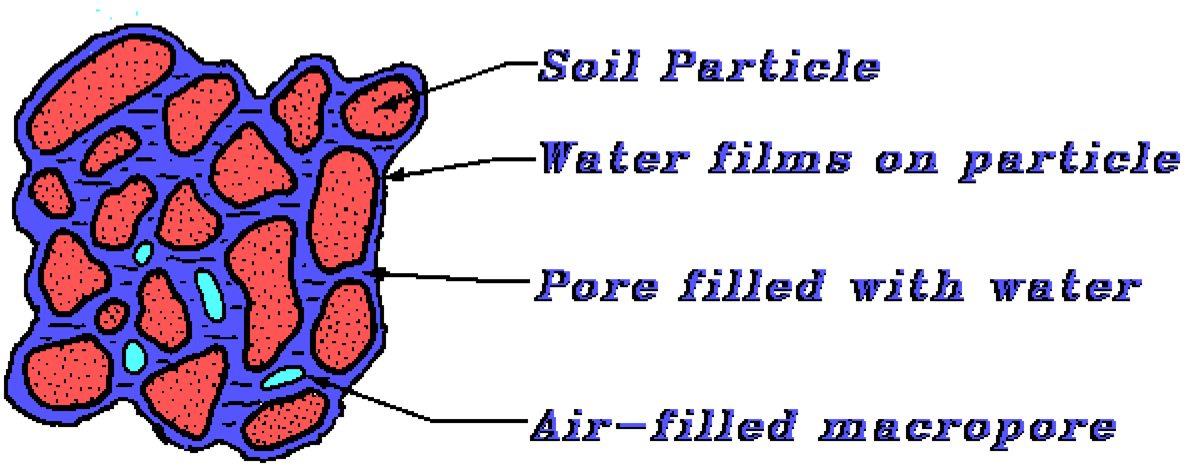
Sandy soils are frequently encountered around Buzzards Bay. To differentiate between sand (85% sand), loamy sand (70 - 85% sand) and sandy loams (50% to 70% sand), form a cast with a fresh moist sample. Sandy soils do not form a cast, or one that breaks easily.

Loamy sands will form a cast that will only bear gentle handling. Sandy loams form a cast that can withstand moderate handling.

Septic System Installation Slide Show

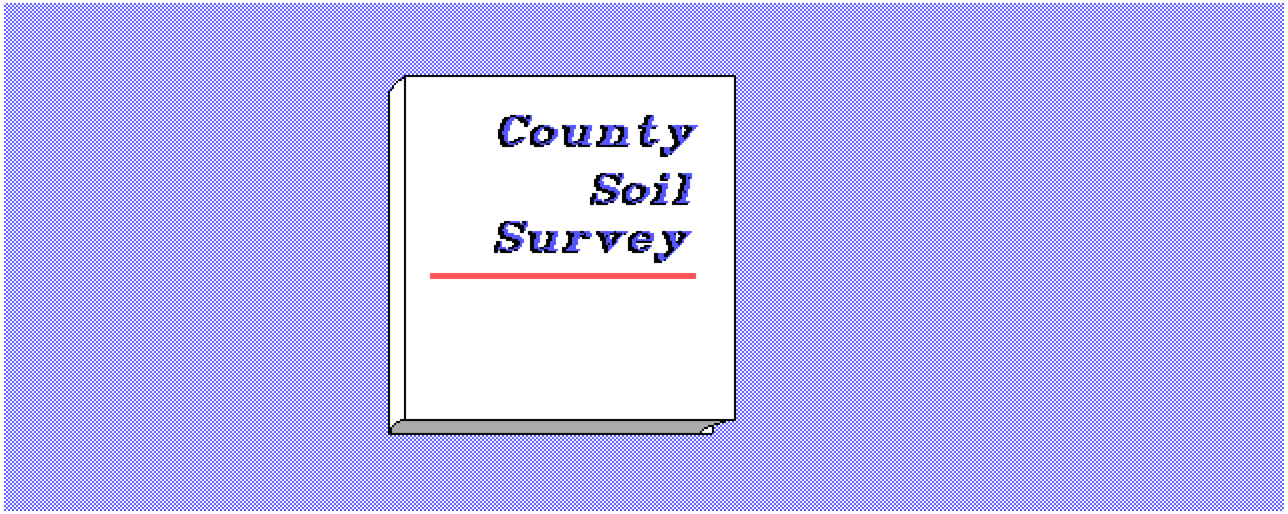


Septic System Installation Slide Show



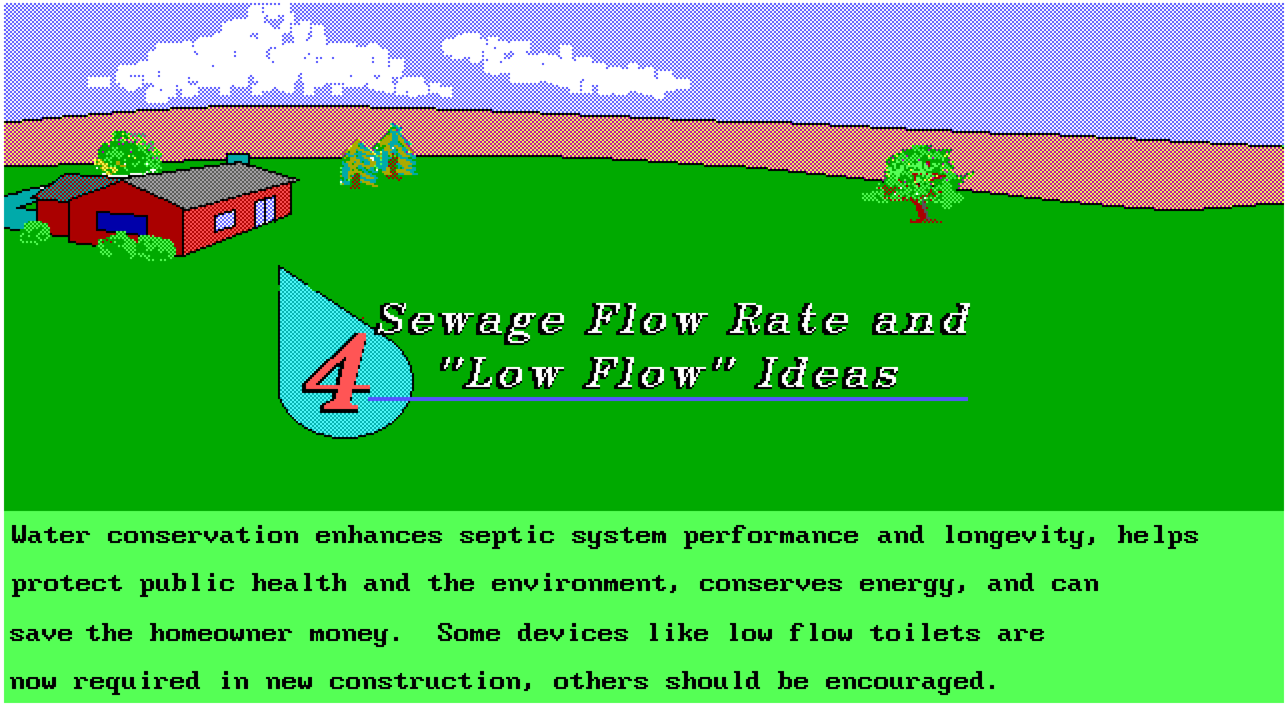
There is much more to soil than just the inorganic particles that compose it. Soil can be thought of as a miniature ecosystem teeming with animal life and microrganisms. Soil particles are surrounded by voids which can be filled with air or water.

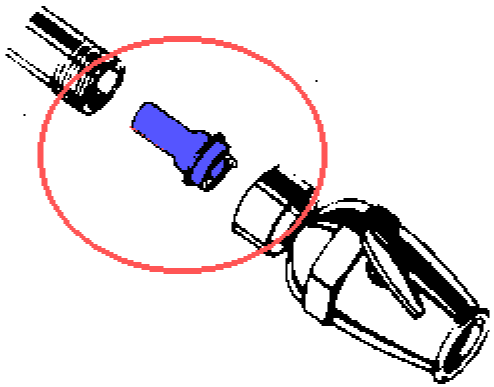
Septic System Installation Slide Show



Consult the soil survey for your county. This report is available from the USDA Soil Conservation Service or your local Cooperative Extension. These soil maps can give you a good idea of what kind of soils you might expect at a site.

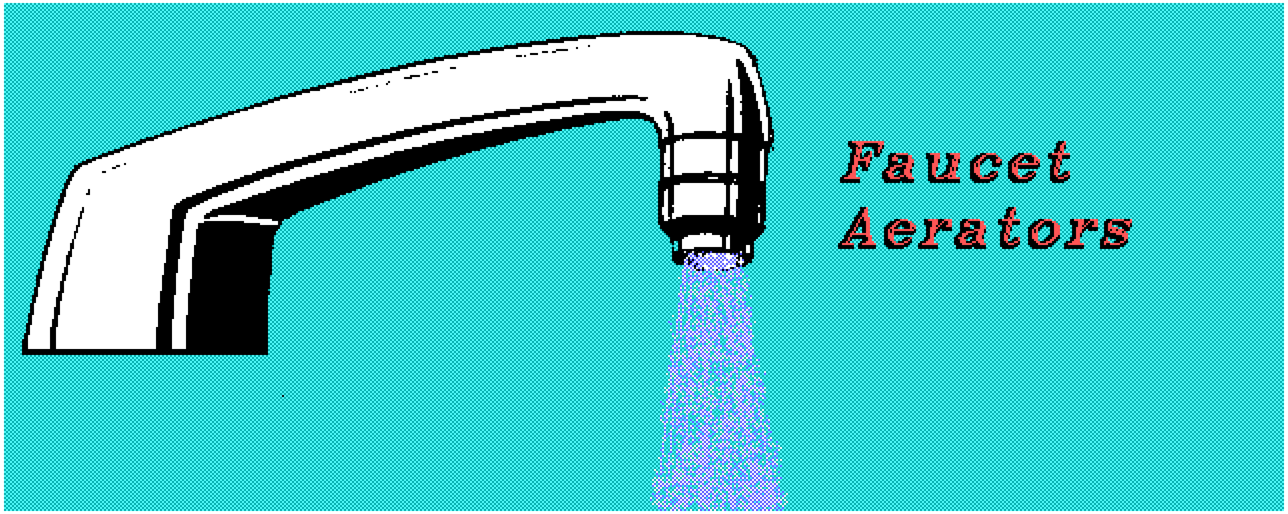
Septic System Installation Slide Show





Flow Restrictor

Flow control devices (orifice reducers) fit into supply lines of faucets or showers and limit the rate of water flow.



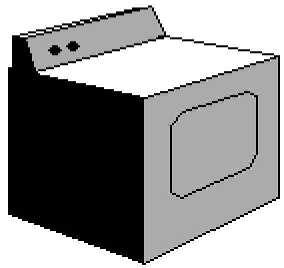
Faucet aerators or spray tips should be installed in all sinks.

They increase the washing area without increasing the water usage.

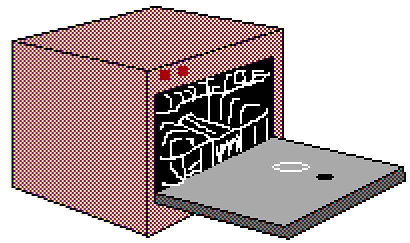
In addition, they are inexpensive and easy to install.

Septic System Installation Slide Show

Water Saving Appliances



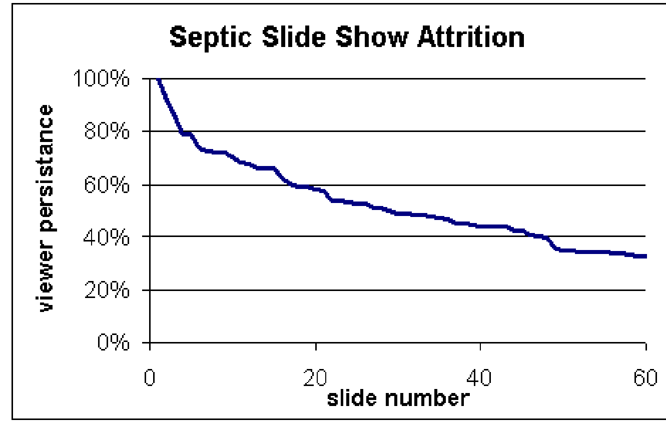
Front Loading Washers



Sudsaving Dishwashers

Homeowners should use water saving appliances. When using washing machines or dishwashers, do full loads instead of partial ones.

Septic System Installation Slide Show



Buzzards Bay Project

The End.

For more information or technical assistance, call the Buzzards Bay Project at (508) 291-3625

Congratulations! You are among the top 1/3 of slide show viewers that stuck it out to the end.