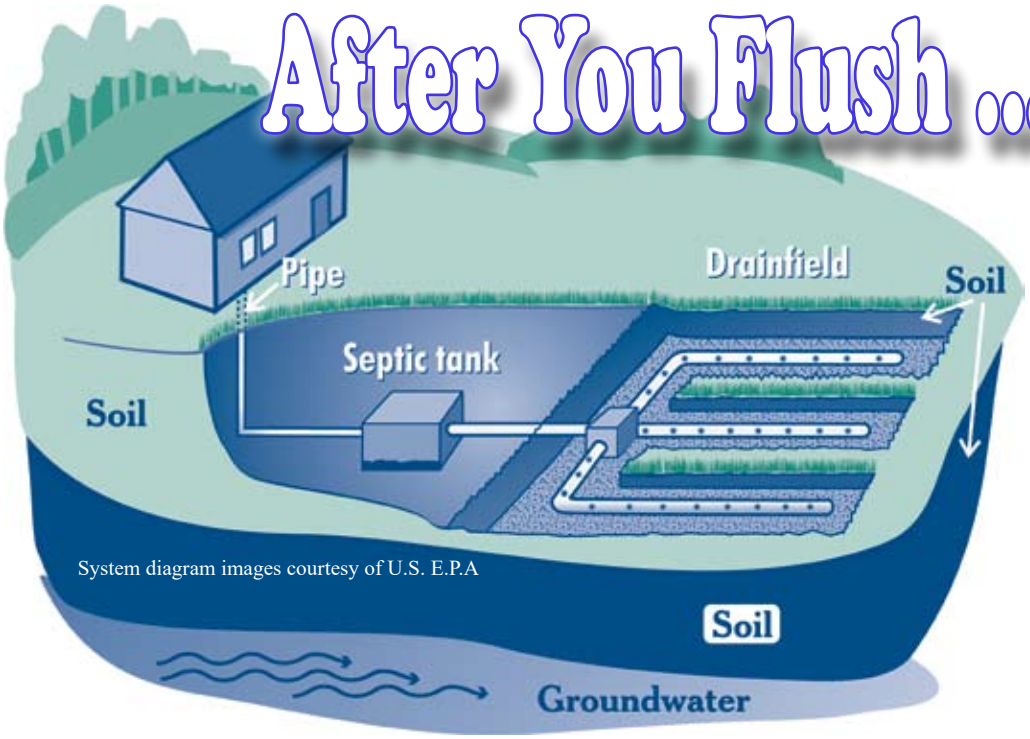
After You Flush ....



System diagram images courtesy of U.S. E.P.A

A generous grant from the **Rathmann Family Foundation.** has enabled us to produce this information about nitrogen pollution in the Westport River for the Westport Estuaries Committee. The Westport River Watershed Alliance (WRWA) is a nonprofit, citizens group formed in 1976 to protect and conserve the natural resources of the Westport River and its 100-square mile watershed located in Southeastern Massachusetts.

Westport River Watershed Alliance
www.wrwa.com
508-636-3016

Septic Systems

When you flush your toilet, take a shower, or rinse food down the sink, you are creating wastewater. Wastewater is made up of two very different components: liquids and solids.

The solids are captured in your septic system's "holding tank." The holding tank is basically a big concrete box where your wastewater sits for a while so that solids can sink to the bottom or float to the top. The solids are then stored or "held" in the holding tank until they can be removed by a pump-out contractor. While the solids are being held, bacteria break-down the waste and reduce its volume. But remember, it's not magic! The solids in your holding tank shrink as they break down, but they never disappear. Eventually, the solids have to be cleaned-out.

Once the solids have separated from the liquids in the holding tank, the liquids flow out of the tank to the "leaching field." The leaching field spreads the liquids over a large underground area. Beneficial bacteria in the soil digest the pollutants in the liquid, and then the water percolates through the ground. **Here's the problem: properly working septic systems remove bacteria and pathogens from the wastewater, but do little to reduce the amount of nitrogen going into the groundwater.**

Wastewater treatment systems throughout the Westport River watershed are a mix of old-style cesspools, old septic tanks with minimal leach fields, more recent TitleV ("title-five")conforming septic systems with larger, engineered leach fields, and, in a few cases, modern alternative-technology systems that approximate the performance of centralized sewer systems. The irony is that only the modern alternative-technology systems achieve a significant reduction in the nitrogen. Nitrogen is the biggest threat to the sustainable health of the watershed. Even the alternative systems differ in terms of their ability to reduce nitrogen. All of the other systems, including the TitleV-conforming systems, leach nitrogen into the groundwater and eventually into the river.

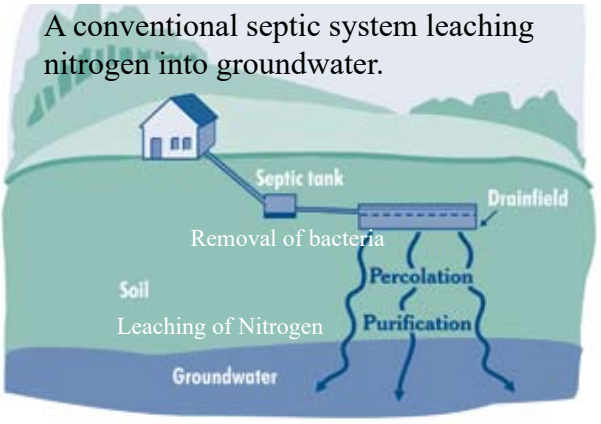
If the old cess pools and septic systems are far enough removed from the river and wetlands, the natural attenuation of the wastewater as it passes through the soil will remove much of the nitrogen and bacteria. But if these older systems, and the TitleV systems are close to waterways and to groundwater, they quickly transfer nitrogen into the groundwater and the river.

An "alternative" system is any septic system or part of one that is not designed or constructed in a way consistent with a conventional TitleV system. A conventional system has a septic tank, a distribution box or dosing mechanism, a soil absorption system (SAS) and a reserve area. Some examples of alternative systems are recirculating sand filters, aerobic treatment units, Wisconsin mounds, peat filters, humus/composting toilets, and intermittent sand filters.

What Systems Remove Nitrogen?

New alternative/innovative technologies

In recent years many new technologies have been developed to treat wastewater more effectively and reduce nitrogen. They can be divided into two main categories: those involving special treatment units incorporated within or linked to septic tanks; and those involving special distribution of the wastewater effluent in the drain, or leach field.



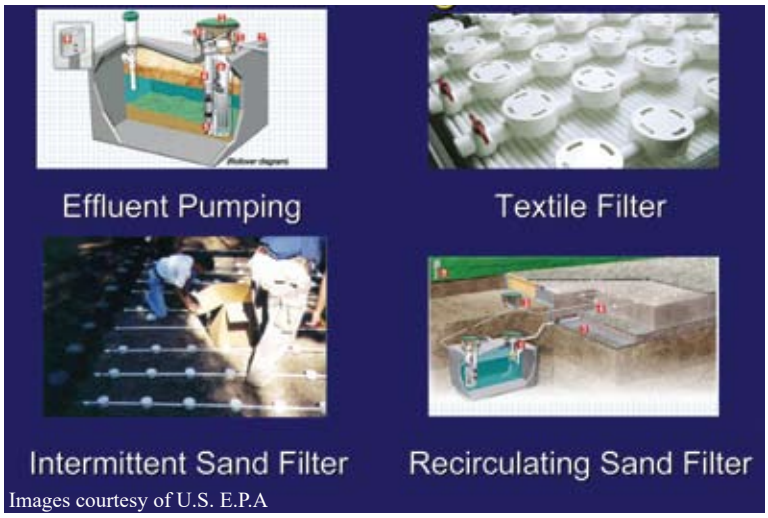
A conventional septic system leaching nitrogen into groundwater.

Advanced Treatment Systems Linked to a Septic Tank

Treatment units linked to septic tanks

The unique feature that sets alternative treatment systems apart is a separate treatment unit located after the septic tank that actually treats the effluent before it is discharged to the drainfield. The septic tank and drainfield perform the same functions that they do in a conventional system; it is the additional treatment step that enables advanced treatment systems to achieve consistently high results. This arrangement of treatment components in sequence is referred to as a "treatment train."

A variety of units can be used in a treatment train to maximize the removal of particular contaminants in the waste stream. The type of treatment unit selected depends upon the contaminant to be removed and the level of removal desired. The treatment units discussed in the following sections include media filters, aerobic systems, and special-use alternatives such as alternative drainfields.



Examples of Septic-Tank Linked Systems

1. Media Filters

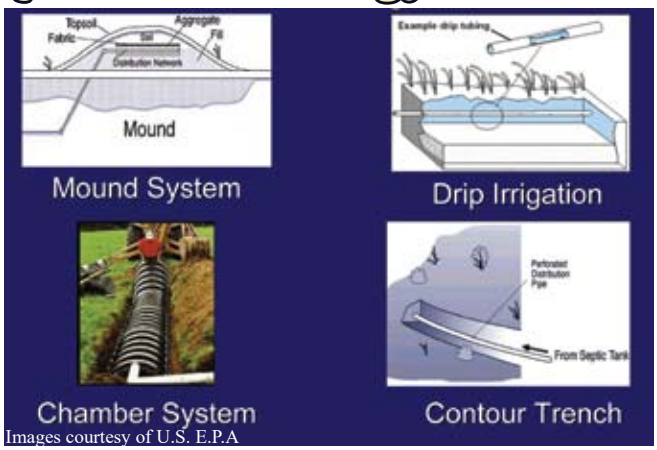
Media filters can be another boxcar on that "treatment train." They consist of a lined or watertight structure filled with different substrates called "media" that treat wastewater using physical and biological processes. The general treatment train collects effluent in a septic tank, pumps it to the top of the filter, and distributes it over the media surface. Regardless of the filter type, the media provide a surface area for bacteria and other micro-organisms, which treat the wastewater. The filter bed is never saturated with water, and the presence of air promotes the establishment of favorable micro-organisms.

2. Aerobic Treatment Units

Aerobic treatment units (ATUs) rely on air injection systems and blowers to create an oxygenated (aerobic) environment, which aids bacteria as they break down organic material. This aeration process produces an effluent that compared to a conventional system, is lower in total suspended solids (TSS) and biochemical oxygen demand (BOD) and has some reduction in bacteria. The injection of air into the ATU agitates the wastewater, so solids are mixed with the bacteria that digest organic material.

Usually there is a step in the process where any settled solids and bacteria are returned back to the aerobic portion of the tank for mixing and additional treatment. It is common for there to be at least one additional stage in the treatment process that allows solids and bacteria to settle out of the wastewater so that cleaner wastewater is distributed to the drainfield.

Dispersal Technology



Images courtesy of U.S. E.P.A

Alternative drainfields used with innovative technologies fit into the landscape, treat wastewater far more effectively, and last longer than a conventional drainfield. There are two drainfield options typically used which are both pressure dosed for uniform wastewater distribution: shallow pressurized drainfields and bottomless sand filters. Both of these alternative drainfields substitute for the raised gravel fill system, providing much better treatment with minimal site disturbance. The typical separation distances to boulders, land slopes, and trees and shrubs that apply to conventional drainfields are usually relaxed somewhat with these options, providing greater flexibility in siting.

1. Shallow Narrow Pressurized Drainfields

Shallow narrow pressurized drainfields, which are placed in the upper soil layers for maximum wastewater treatment by natural soil processes, are located about 8-12 inches from the ground surface. They can be used when the water table is at least four feet from the surface.

2. Drip Distribution

The subsurface drip distribution system uses small diameter lines to disperse and recycle pre-treated wastewater just beneath the ground surface. Often, the drip distribution lines are located in a lawn or other landscaped area to maximize wastewater reuse for irrigation. The treatment train for a drip irrigation system consists of a septic tank, one or more treatment units, and a pump tank. Treated wastewater is pressure dosed to the drip distribution lines, which function as the final drainfield. To prevent clogging of the irrigation lines, wastewater must be treated to remove fine particles.

3. Bottomless Sand Filters

Bottomless sand filters provide a raised bed for final wastewater treatment and dispersal of advanced treated effluent. These are easily installed with little site disturbance, and they maximize separation distance to groundwater. As a result, they are often ideal for repairs where water tables are near the surface and where small lot size restricts other options.

Alternative wastewater treatment systems can be effectively utilized in many situations:

- Shared systems for new subdivisions with multiple dwelling units;
- Shared systems for repair of old systems of multiple dwellings in established neighborhoods;
- Individual properties either for new installations or repair of old systems.

All shared systems require binding agreements among the participants that are recorded with their property deeds and that spell out the legal responsibilities for maintenance, repair and replacement of the systems. These agreements must conform to state regulations and be approved by the Department of Environmental Protection. All alternative technology systems are also required to have an inspection and maintenance agreement with a state-certified firm to assure that these services are performed regularly and reported to the authorities.

When the results of the Massachusetts Estuaries Project for the Westport River watershed become available that set limits on nitrogen loading in the River, it may become necessary to require that all new developments in nitrogen-sensitive areas have alternative nitrogen-reducing treatment systems. Such requirements may also have to be imposed on all repairs of failed systems, and even TitleV compliant systems, for individual properties or groups of properties near the waterways and wetlands.

Costs

It is difficult to generalize as to the relative cost of alternative treatment systems. Shared systems are most likely to be less costly than individual systems for the same number of houses. Alternative systems with drip distribution fields are likely to be less costly than mounded conventional drain fields in sites where there is limited separation from groundwater. If alternative systems will be required in the future for nitrogen sensitive locations, then the question will become which system meets the nitrogen reduction standards most effectively and at least cost.

Alternative Systems in Westport

A number of alternative treatment systems with nitrogen reduction have already been installed in the Westport River watershed and others have been proposed. The Westport Village Condominiums in Central Village on Main Road, and the Back Eddy Restaurant have Aquapoint media filter treatment systems. The Paquachuk Inn at Westport Point has a Microfast aerobic treatment system. Several individual properties at Westport Point and Massquasatch have installed drip distribution systems.

Alternative septic system installation in Westport Point

For More Information Go Online:

- www.epa.gov/owm/onsite
- www.mass.gov/dep/water/wastewater/faqsia.htm
- www.mass.gov/dep/water/wastewater/septicsy.htm
- www.nesc.wvu.edu/homeowners.cfm

Start by Taking Care of Your Septic System

DO have your tank pumped out and system inspected every 3 to 5 years by a licensed septic contractor (listed in the yellow pages). Keep a record of pumping, inspections, and other maintenance. The Town of Westport has a Septic System Maintenance Regulation that requires residents to do this.

DO learn the location of your septic system and drainfield. Keep a sketch of it handy for service visits.

DON'T allow anyone to drive or park over any part of the system. The area over the drainfield should be left undisturbed with only a mowed grass cover. Roots from nearby trees or shrubs may clog and damage your drain lines.

DON'T use commercial septic tank additives. These products usually do not help and some may hurt your system in the long run.

DON'T use your toilet as a trash can by dumping nondegradables down your toilet or drains. Also, don't poison your septic system and the groundwater by pouring harmful chemicals down the drain. They can kill the beneficial bacteria that treat your wastewater.

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