Household Wastewater

Septic Systems and Other Treatment Methods

This fact sheet covers three factors that affect pollution risks due to home wastewater systems:

Part 1. Septic system design and location. Topics covered in this section include knowing your septic tank capacity, soil type in the drainfield and system's location.

Part 2. On-site system maintenance. Pumping the septic tank, protecting the drainfield and watching for signs of trouble are discussed in this section.

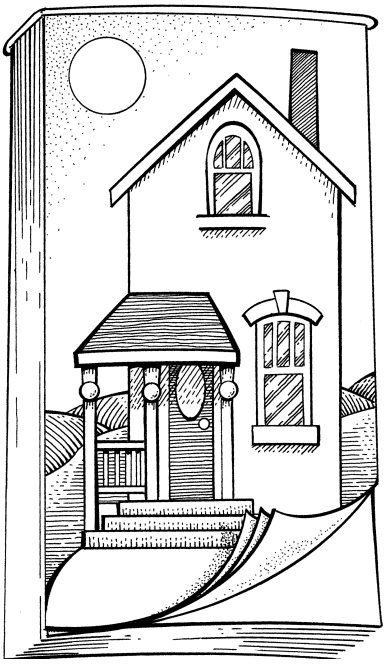
Part 3. Septic or sewage system inputs. Reducing the amount of water, solids and harmful chemicals going into your individual septic or municipal wastewater treatment system is reviewed in this section.

This fact sheet will help you evaluate your septic system and pinpoint risks before they become problems. It provides general guidelines for safe management of household wastewater.

The Missouri Department of Health has jurisdiction over individual wastewater systems that have a designed or actual flow of 3,000 gallons per day or less.

County or city laws, however, may impose more stringent or additional requirements.

Contact your nearest county Department of Health or a septic system contractor for advice.



Why should you be concerned?

Wastewater treatment systems help protect your health and the environment. Wastewater from sinks, toilets, washing machines and showers carries dirt, soap, food, grease and bodily wastes "down the drain" and out of your house (*see figure 4.1 on page 2*).

Wastewater carries disease-causing bacteria, viruses and other pathogens. It also carries nutrients like nitrogen, phosphorus and organic wastes. Such nutrients promote weed growth and lower oxygen levels in surface water and thus affect fishing and recreational use of rivers and lakes.

Wastewater treatment systems are designed to remove or break down most of these contaminants before they enter groundwater — the source of drinking water via wells — or nearby lakes, streams or wetlands.

Wastewater treatment is often out-of-sight and out-of-mind until problems occur. Knowing the basics about your household system and taking simple precautions can prevent problems. It's a wise investment to keep your system working well, since replacing a failed system can cost thousands of dollars.

Where is your wastewater treated?

Do you have a septic system or other on-site system to treat wastewater?

This fact sheet is designed for homeowners or tenants who have septic systems buried in their yards. However, even if wastewater is not treated on your home site, there are still ways you can reduce the impact your wastewater has on your community and the environment (see Part 3 of this fact sheet).

A typical septic system consists of a septic tank and drainfield, also known as a soil absorption field, leach field, or tile field (*see figure 4.1 on page 2*).

It is important to maintain your wastewater treatment system and use it wisely whether you

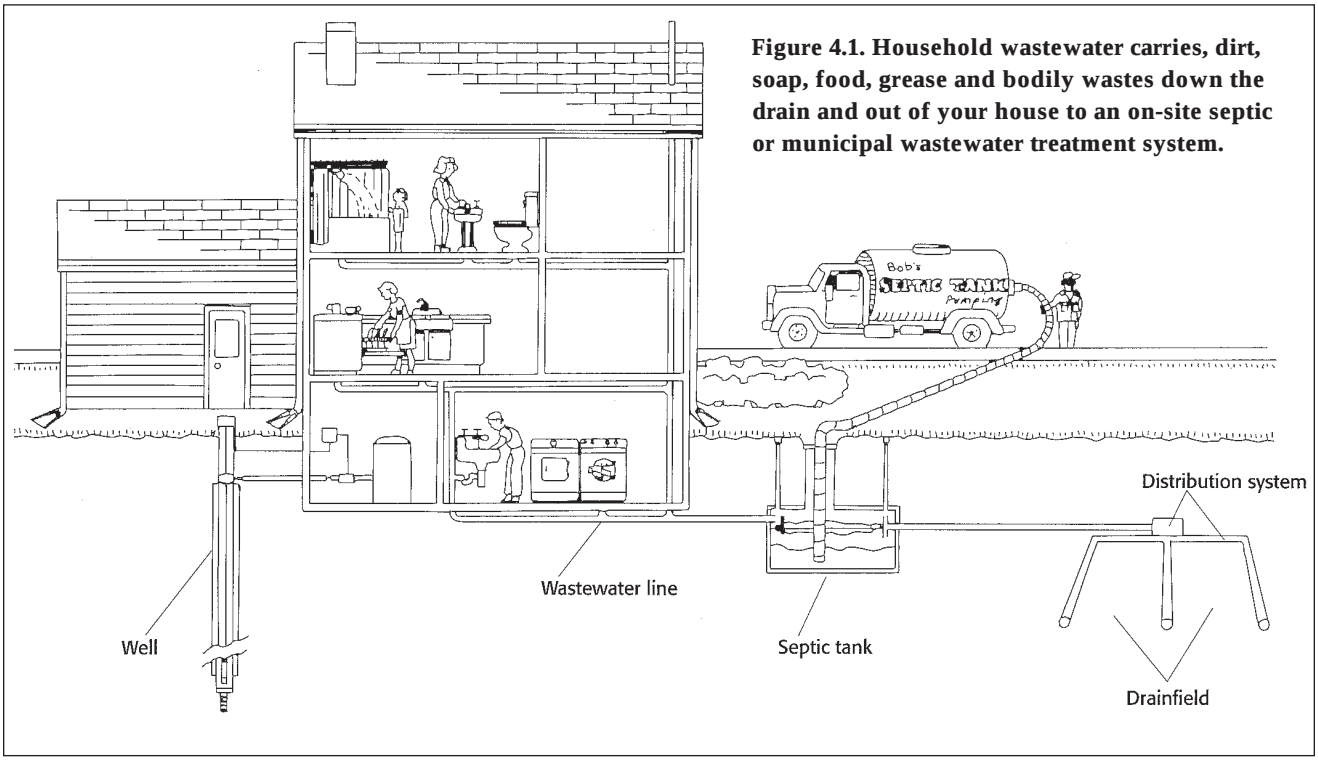


Figure 4.1. Household wastewater carries, dirt, soap, food, grease and bodily wastes down the drain and out of your house to an on-site septic or municipal wastewater treatment system.

have a holding tank or septic tank followed by a mound, sand filter or other alternative on-site treatment system. (These types of systems are discussed further on the following pages.)

How does a conventional septic system work?

First, wastewater flows through a sewer pipe out of your house and into the septic tank, a box or cylinder commonly made out of concrete (*see figure 4.2 on page 3*). Fiberglass and polyethylene tanks are also used. The tank must be watertight to keep sewage from leaking out and groundwater from seeping in.

Lighter solids in the wastewater — like grease, hair and soap — float to the top of the tank and form a scum layer. Heavier solids settle to the bottom and form a layer of sludge.

Bacteria in the tank begin to break down some of the sludge into simple nutrients, gas and water. The remaining solids are stored in the tank until they are pumped out.

A baffle or a sanitary tee pipe at the tank inlet slows the incoming rush of water, so the sludge is not stirred up. A baffle or a sanitary tee pipe located at the tank's outlet keeps solids from leaving the tank. Many newer systems have a removable filter at the outlet to prevent solids from entering the disposal field. Inspection pipes at the top of the tank are for inspecting the inlet and outlet pipes, baffles and tee pipes.

Next, the liquid waste, or effluent, flows out of the tank, through the distribution system,

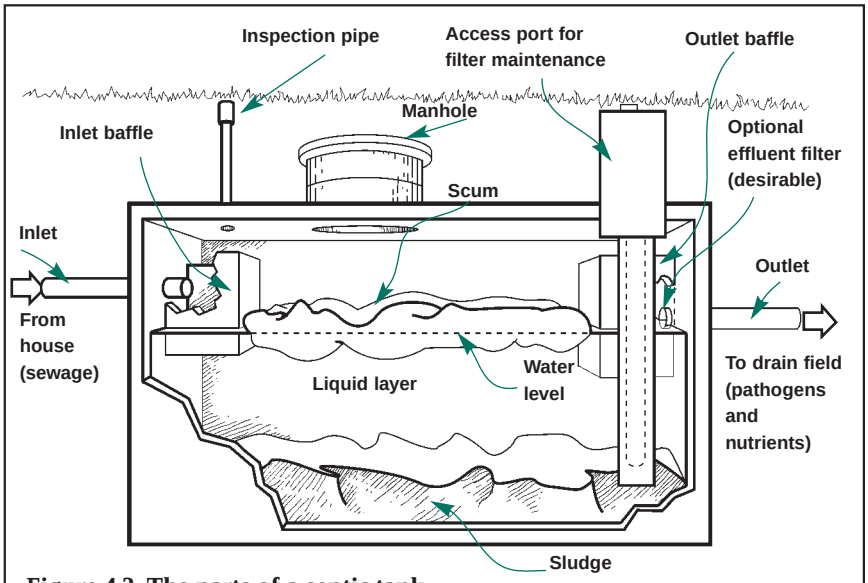
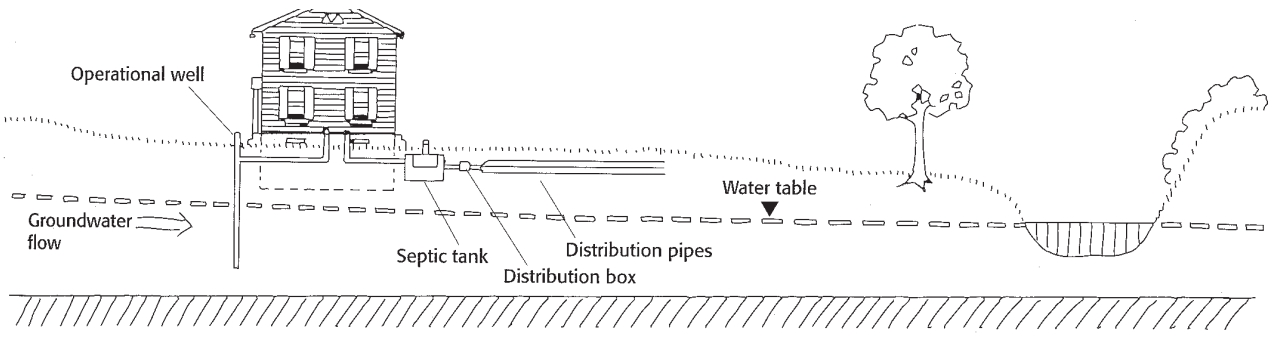


Figure 4.2. The parts of a septic tank.

Figure 4.3. Cross section of a septic system showing the septic tank and distribution system.



and into the drainfield or soil absorption field (*figure 4.3*). The distribution system consists of a series of perforated plastic distribution pipes laid in the ground, usually in gravel-filled trenches. Effluent can be fed into the pipes by gravity or by a pump. The effluent moves slowly out of the trench and is absorbed into the soil. An effluent filter at the tank outlet is recommended, because particles carried out of the septic tank can clog the drainfield.

The soil must be of a suitable type and must be deep enough to treat wastewater before it reaches groundwater. The soil filters out larger particles and pathogens, which eventually die off in the inhospitable soil environment.

Under suitable conditions, beneficial soil microbes and natural chemical processes break down or remove most of the contaminants in the effluent. Hazardous synthetic chemicals such as solvents and fuels are not easily degraded in wastewater treatment systems. These chemicals can contaminate sludge in the septic tank, kill the beneficial bacteria that digest wastes, and travel into groundwater.

Soils vary in their ability to absorb and treat wastewater. Well-drained, medium-textured soils such as loam are best. Coarse gravel or sandy soils allow wastewater to flow too quickly for treatment. In fine clay or compacted soils, water moves too slowly. Soil microbes need oxygen to digest wastes quickly. If the air spaces between soil particles remain filled with water, the lack of oxygen prevents the rapid breakdown of wastes by aerobic (oxygen-requiring) soil microbes.

Anaerobic soil microbes (those that live in the absence of oxygen) digest wastes slowly and give off putrid, smelly gases characteristic of a failing septic system.

Anaerobic conditions occur when soils are poorly drained, groundwater levels are high, surface runoff saturates the drainfield, or excessive amounts of water are used in your household.

Good wastewater treatment depends on good dispersal of wastewater over the drainfield. In a conventional, gravity-fed distribution system, the distribution pipes are often laid out in a fork-shaped pattern joined by a distribution box (*see figure 4.3, above*). Leveling devices on the distribution box help ensure an even flow of wastewater to every trench. Often, however, certain trenches or low points in the distribution system receive more effluent than others.

A dosing or enhanced-flow system has a pump or siphon to improve the distribution of effluent. Periodically pumping a certain volume of effluent to wet the entire drainfield area and then allowing the soil to drain between doses provides a period of aeration, which helps microorganisms in the soil digest the wastes.

In a pressure distribution system, effluent is pumped directly through small-diameter pipes, not sent through a distribution box. Wastewater is evenly distributed throughout the entire drainfield, promoting better treatment of wastewater and system longevity.

Alternating trenches are another means of providing a period of aeration (*see figure 4.4 on the following page*). Adjusting the outlet levels or using a plug or valve in the distribution box allows effluent to flow into only some of the trenches while other trenches are allowed to rest for about six months.

A serial distribution system is designed so that the trenches are used in sequence; when the first trench is overloaded, the wastewater overflows into the next trench down.

Seepage pits and cesspools are perforated tanks or pits lined with concrete blocks or bricks through which wastewater can seep into the soil. They are usually less effective than other soil absorption systems because they are located closer to the water table than trenches and often lack sufficient soil surface area for good wastewater treatment. Without a

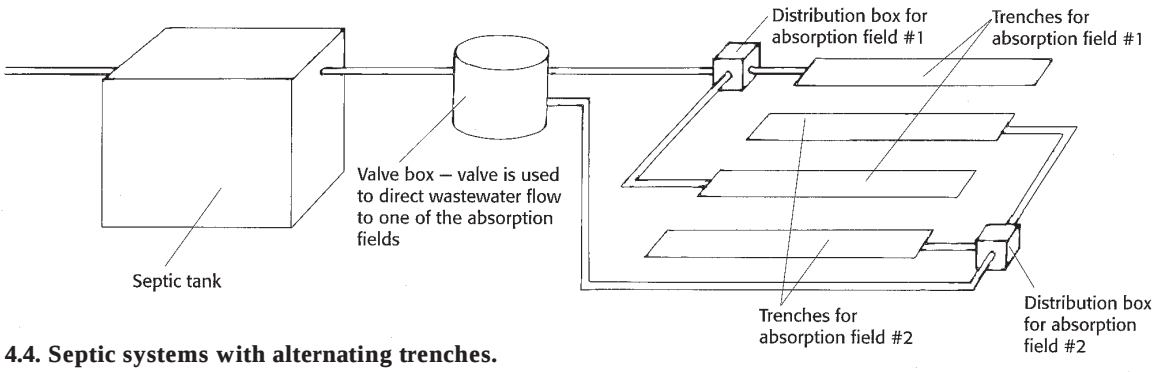


Figure 4.4. Septic systems with alternating trenches.

septic tank for pretreatment, a cesspool has the added problem of sludge accumulation in the pit. Cesspools may be a safety hazard for children and pets and are not allowed for new construction in Missouri.

What are some alternative systems?

If soil or site conditions are not suitable for a conventional drainfield, an alternative system might be used.

A sand filter consists of layers of sand and gravel in which the wastewater is treated before it is distributed into the soil. Other types of filters use small foam pieces or peat as a filter medium.

With suitable climate and soil conditions, other alternative systems such as evapotranspiration systems, constructed wetlands, spray irrigation, lagoons or mechanically aerated systems for household wastewater treatment are approved in some localities. Descriptions of these systems are beyond the scope of this publication; please see the last page of this guide for additional resources.

Aerobic treatment units operate much like a municipal sewage treatment plant, where wastewater is mixed with air, promoting bacterial digestion of organic wastes and pathogens. The biological breakdown of wastes in a septic tank's anaerobic (oxygen-deprived) conditions is relatively slow. Aerobic units are more expensive and require significantly more maintenance than conventional septic tanks.

However, they provide good wastewater treatment on homesites that are otherwise unsuitable for development because the soil type, depth or area is inadequate for an on-site treatment system. The effluent from an aerobic unit can be discharged into a soil absorption system. Missouri regulations do not permit surface discharge of wastewater effluent.

Holding tanks may be used in temporary situations, such as when you are awaiting a new system hookup or are at a summer residence. Unlike a septic tank, a holding tank has no outlet and must be pumped frequently to take the wastewater to a treatment facility.

Disposal of toilet wastes does not have to mean flushing away great volumes of water. Composting toilets use microbes to aerobically digest toilet wastes; they work well only if the right temperature, moisture level, oxygen level and nutrient mixture is maintained.

Other types of waterless toilets include incinerating toilets recirculating oil-flush toilets, and chemical disinfecting toilets.

Without the blackwater (water carrying human waste) from toilets, greywater (wastewater other than sewage) from sinks, tubs and washing machines can be treated in a household wastewater system sized to handle about half the volume of a standard wastewater system.

Missouri regulations state that all liquid waste and washwater shall be discharged into a sewage tank, with the following exceptions: drainage from roofs, garages, footings and surface water; cooling water discharges; and hazardous wastes. These types of wastewater should be excluded from sewage tanks. Backwash from water softeners and swimming pool filtration systems may be excluded from the sewage tank to reduce overloading.

Greywater may contain infectious bacteria and viruses (for example, from soiled diapers or clothing worn by someone with an infectious disease). Direct contact with greywater must be prevented. Beware that certain detergents, bleach and salts may damage the health of plants and soils.

In areas with limited water resources, particularly during drought periods, water conservation methods (*see page 9 for suggestions*), along with unrestricted uses of clear water (for example, flushing toilets with shower warm-up water), are encouraged.

Household Wastewater: Part 1

Septic system design and location

How much wastewater can your system handle?

Both the septic tank and drainfield should have adequate capacity to treat all the wastewater generated in your house, even at times of peak use. The system must be designed for the maximum occupancy of your home. The amount of wastewater flowing out of a house may average 100 to 200 gallons or more per bedroom per day multiplied by the number of bedrooms in the home. Missouri has standardized procedures for calculating wastewater flow and sizing on-site treatment systems. Installing low-flow toilets and water-saving faucets may reduce the size of the system needed.

The septic tank should be large enough to hold two days' worth of wastewater. (Two days is long enough to allow solids to settle out by gravity.) Typically, a new three-bedroom home is equipped with a 1,000-gallon tank. A two-compartment tank or a second tank after the first one can improve sludge and scum removal and help prevent drainfield clogging.

In Missouri, the septic tank size for a newly constructed system should be 1,000 gallons for a three-bedroom home, based on a flow of 120 gallons per day per bedroom. A four-bedroom home would have a minimum tank size of 1,250 gallons, and a five-bedroom home a minimum of 1,500 gallons.

Consult your county health department for assistance in sizing a new system.

Required length of drainfield trenches is based on the amount of wastewater produced by the system and how much water a unit area of soil can treat. The better the soil type or greater the amount of absorptive trenches, the higher the system's capacity for wastewater treatment.

Contact your home contractor, septic system installer or local health department for information they may have on file about your septic system age, design and location.

Is your septic tank capacity adequate?

Water use in your household in excess of the system's design capacity leads to inadequate wastewater treatment or system failure. Conserving water or more frequent pumping may extend the life of the system.

The addition of a bathroom, bedroom or water-using appliance (such as a hot tub, garbage disposal, dishwasher or water softener) to your home may require expanding your system.

The use of former vacation cottages as permanent dwellings or as heavily used vacation rentals may render an existing system inadequate. Several teenagers living in a house may overload the system's capacity.

How close is too close?

To prevent contamination of water supplies, the drainfield must be at least 100 feet from any wetland, shoreline, stream bed or drinking water well. State and local regulations regarding separation distances may vary. The greater the distance, the lower the chance of contaminating the water supply.

If your system is downhill from a well, the well will be better protected. (If you do not know where your system is located, see Part 2 of this fact sheet.)

You should test your well water more often for nitrates and bacteria if your system is closer to your well than recommended.

For information on certified laboratory testing, contact your local University Outreach and Extension center or county health department, or look under "laboratories" or "water" in the yellow pages. Fact Sheet 3 in this series, Drinking Water Well Management, provides more information on well protection.

When was your septic system installed?

Septic systems should last 15 to 40 years or longer, depending on how appropriately they were designed for a site and how well they are maintained. If your septic tank is made of steel, it will rust and need replacement. The older your system, the more likely that it does not meet the latest standards. Even a relatively new system can fail if it is located in poor soil, undersized, or not properly installed or maintained. Look for the signs on failure listed in Part 2 of this guide.

Do you have an effluent filter and gas baffle installed at the septic tank outlet?

Solids that do not settle out in the tank can be carried out of the tank with effluent, clog the drainfield, and lead to premature system failure. Effluent filters on the outlet capture small particles and prevent them from clogging the drainfield; it is important to periodically clean the filter. Gas bubbles are produced by anaerobic bacteria as they slowly digest wastes in the tank. A gas baffle near the outlet deflects the bubbles and the disturbed sludge away from the outlet.

Does your system need safety devices?

To prevent hazardous sewage overflows, tanks and chambers should have a storage capacity above normal working levels. In addition, an alarm should be installed on holding tanks or pumping chambers to warn you if the tank is nearly full. If your system depends on a pump (and not gravity), you may need to have a backup power supply available in addition to adequate storage capacity in the tank.

In flood hazard areas, backflow valves should be installed on the main distribution line to prevent wastewater and solids from flowing back into the tank and your home.

Assessment 1: Septic system design and location

Use Assessment 1 in the work sheet to begin rating your risks related to septic system design and location. For each question, mark your risk level in the right-hand column. Although some choices may not correspond exactly to your situation, choose the response that best fits.

Minimum set-back distances

Minimum Distance From	Sewage Tank[1] (feet)	Disposal Area[2] (feet)	Lagoons (feet)
Private water supply well[3]	50	100	100
Public water supply well	300	300	300
Cistern	25	25	25
Spring	50	100	100
Classified stream, lake or impoundment*	50	50	50
Stream or open ditch[4]	25	25	25
Property line	10	10**	75
Building foundation	5	15	100
Basement	15	25	100
Swimming pool	15	15	100
Water line under pressure	10	10	10
Suction water line	50	100	100
Upslope interceptor drains	—	10	10
Downslope interceptor drains	—	25	25
Top of slope of embankments or cuts of two feet (2')	—	20	20
Edge of surficial sink holes	50	100	500
Other soil absorption system except repair area	—	20	20

**A classified stream is any stream that maintains permanent flow or permanent pools during drought periods and supports aquatic life.*

*** Recommend twenty-five feet (25') of downslope property line initially, but repair may be allowed to ten feet (10') of downslope property line.*

[1]Includes sewage tanks, intermittent sand filters and dosing chambers.

[2]Includes all systems (sand filter, wetland and the like) except wastewater stabilization ponds.

[3]Unplugged abandoned wells or wells with less than eighty feet (< 80') of casing depth shall have one-hundred-fifty feet (150') minimum distance from all above.

[4]Sewage tanks and soil absorption systems should never be located in the drainage area of a sinkhole.

Household Wastewater: Part 2

On-site system maintenance

Do you know exactly where your system is located?

To take proper care of a septic system, you must know where it is. The exact locations of system components are not obvious, because they are below ground. If the location of your system is not in your home records, then a previous homeowner, county health department, or pumper's records may hold the answer.

You may be able to locate your septic tank yourself. In the basement, look for the sewer pipe leaving the house and note the direction in which it goes through the wall. Then, go outside and probe the ground with a narrow metal rod or dig into the ground 10 to 20 feet away from the house in the direction of the house sewer line.

There may be settlement or depressions over the tank and absorption field. There may be more lush vegetative growth over absorption fields.

The septic tank is usually within 2 feet of the ground surface. The distribution box and drainfield are usually located downslope from the septic tank. In some situations, wastewater is pumped to a drainfield uphill from the septic tank.

Once you've located the septic tank, sketch a map of your house

and yard (Fact Sheet 1, "Site assessment," will get you started on a map). Note the distances from the septic tank opening to at least two permanent points such as the corner of the house foundation or survey stakes on the property line. As long as the distances are correct, the map doesn't have to be drawn to scale. If known, show the location of the drainfield. Keep the map on file along with other maintenance records and pass it on to subsequent owners of the house.

Do you know when your tank was last pumped or inspected?

Keeping good records each time your septic system is pumped, inspected, or repaired will help you make cost-effective maintenance decisions (see sidebar below). This information will also be valuable if you sell or transfer your property.

How often should your tank be pumped?

Regular pumping is the most important action you can take to maintain your system. As more solids accumulate in the tank, particles are more likely to flow out of the tank and into the drainfield. The cost of pumping a septic tank ($100 to $250) is far less than the expense of replacing a drainfield clogged by escaping solids ($2,000 to $8,000 depending on site conditions and the size of the home).

The best way to determine when to pump your tank is to have it inspected annually. The tank needs to be pumped if (*see figure 4.5*):

■ The sum of the solid layers (sludge plus scum) takes up more than half of the tank capacity,

■ The top of the sludge layer is less than 12 inches below the outlet baffle or tee, or

■ The bottom of the scum layer is within three inches of the bottom of the outlet baffle (or top of the outlet tee).

Pumping as needed based on the results of periodic inspections will minimize your maintenance costs and maximize the system's longevity. Inspections can also identify problems with system components before they cause a backup or drainfield failure.

A general rule of thumb is to have a septic tank pumped by a licensed pumper every three to five years. But how often a tank needs to be pumped depends on the size of your tank, the amount of wastewater generated in your household, the amount of solids carried in the wastewater, and the age of the system.

You can estimate how frequently your tank needs to be pumped using the table on page 8. Find your tank size (in gallons) along the left side of the table. Go across the row for your tank size and down the column for the number of people in your home. Where the row and column intersect, you'll find the estimated number of years between pumpings.

After pumping, the tank should also be inspected by a professional for cracks and the condition of the baffles. Any outlet filters should be rinsed off. Leaks should be repaired promptly. Never crawl inside or lean into a septic tank without proper ventilation and safety procedures — **the gases inside the tank can be deadly**.

The distribution box should be periodically checked to be sure that the distribution pipes are properly leveled.

Solids accumulating in the distribution box indicate damaged baffles, inadequate septic tank pumping, or that the tank is too small to handle the wastewater load. If the system includes a pump, the pump should be

Keep a maintenance record

Keeping good records each time your septic system is pumped, inspected or repaired will help you make cost-effective maintenance decisions.

Sample maintenance record

Date	Work done	Work performed by
May 20 2000	Installed septic system	Installer's name, phone number

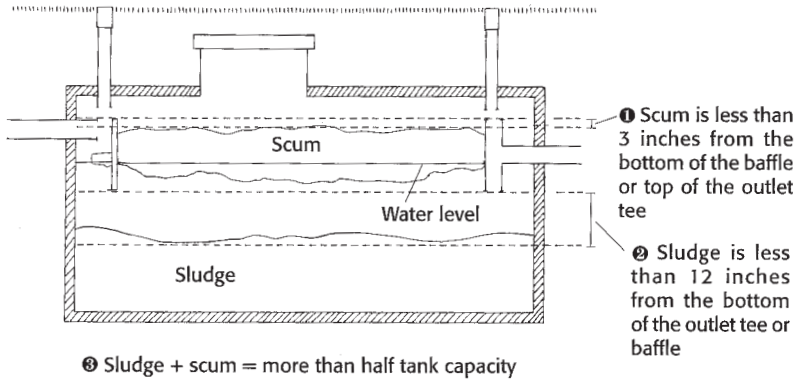


Figure 4.5 Three conditions under which a septic tank needs to be pumped.

checked along with the float switch, alarm and air vents to the dosing tank.

A holding tank must be pumped frequently because it has no outlet. Depending on the amount of wastewater generated and tank capacity, you may need to pump it every month or every week.

If you assume that every person in the house uses 25 to 75 gallons of water a day, four people can fill a 1,500-gallon tank in five to fifteen days. Overflows are a sure sign that you need to schedule pumping more often.

Estimated number of years between septic tank pumpings

	Number of people in your household					
Tank size (gallons)	1	2	3	4	5	6
500	5.8	2.6	1.5	1.0	0.7	0.4
1,000	12.4	5.9	3.7	2.6	2.0	1.5
1,500	18.9	9.1	5.9	4.2	3.3	2.6
2,000	25.4	12.4	8.0	5.9	4.5	3.7

Note: More frequent pumping is needed if a garbage disposal is used.
Source: Karen Mancl, "Septic Tank Maintenance," Publication AEX-740, Ohio Cooperative Extension Service, 1988.

How can you protect your drainfield?

A septic system depends on good soil conditions for treatment and disposal of effluent. Water must be able to percolate through the soil at a reasonable rate. To protect the drainfield:

■ Do not drive vehicles on the drainfield.

■ Do not pave, build, pile logs or other heavy objects, or put a swimming pool over the drainfield. These activities compact the soil, and soil microbes need oxygen to digest wastes.

■ Divert roof runoff, footer drains, sump pumps and other surface runoff away from the drainfield. Saturated soil is less effective at treating wastewater.

■ Avoid planting water-loving trees and shrubs whose deep roots can damage piping. Grass is the best drainfield cover.

■ Remove grass clippings and build compost piles elsewhere to avoid the build-up of excess nutrients.

■ Install an effluent filter or screen on the septic tank outlet to prevent the carryover of solids into the drainfield.

What are the signs of trouble?

■ Foul odors in your home or yard tell you that your system is not working well.

■ Slow or backed-up drains may be caused by a clog in the house pipes, septic tank, drainfield or roof vent for your household plumbing.

■ Wet, spongy ground or lush plant growth may appear near a leaky septic tank or failing drainfield.

■ Repeated intestinal illnesses in your family may occur if your water is contaminated by poorly treated wastewater. Have your drinking water tested annually for coliform bacteria and nitrates.

■ Algal blooms and excessive weed growth in nearby ponds or lakes can be caused by phosphorus leaching from septic systems or excess build-up in the soil absorption field.

Respond quickly to any problems you observe. You may need to expand or modify your system to avoid further problems. There are many good publications and other resources to help you decide (see page 10 for sources of more information). Call local contractors, your county health department, or visit your University Outreach and Extension center to get recommendations.

Try to base your decision on what is best for the environment and your health.

Assessment 2: On-site system maintenance

Use Assessment 2 on the work sheet to begin rating your risks related to system maintenance. For each question, indicate your risk level in the right-hand column. Although some choices may not correspond exactly to your situation, choose the response that best fits.

Household Wastewater: Part 3

Septic or sewage system inputs

What solid wastes are acceptable?

Your wastewater treatment system is not a substitute for the trash can or a compost pile. Dispose of tissues, diapers, baby wipes, sanitary napkins, tampons, condoms, cigarette butts and other solid waste with regular garbage and not down the toilet. These materials do not break down easily and they will cause your septic tank or the settling tanks in a municipal treatment plant to fill up faster.

Do not use a garbage grinder in the kitchen sink; it adds to the load on the system. Excess grease, fats and coffee grounds can clog your system.

Consider composting food waste and even some paper wastes as an alternative. Your local University Outreach and Extension center can provide you with information about composting.

What household chemicals can go down the drain?

Wastewater treatment systems are not designed to neutralize the wide variety of common household chemicals. Paints, solvents, acids, drain cleaners, oils and pesticides can pass untreated through your system and contaminate the groundwater.

Though generally safe when diluted, high concentrations or large volumes of water-soluble cleaners or bleach can harm septic tank microbes.

Chemical products advertised to "sweeten" or improve your septic system operation cannot replace routine pumping and may even be harmful. Buying and adding yeasts, bacteria or enzymes is not necessary; plenty of the right microbes are already digesting wastes in your system. Additives containing solvents to unclog your system can kill the microbes needed to digest wastes in your septic tank and drainfield. Furthermore, these solvents may contaminate your drinking water supply.

Why save water?

Average household water usage is shown in the chart above (*figure 4.6*). Reducing the flow of wastewater through the septic tank allows more time for solids to settle out and less chance of solid particles being carried over to the drainfield.

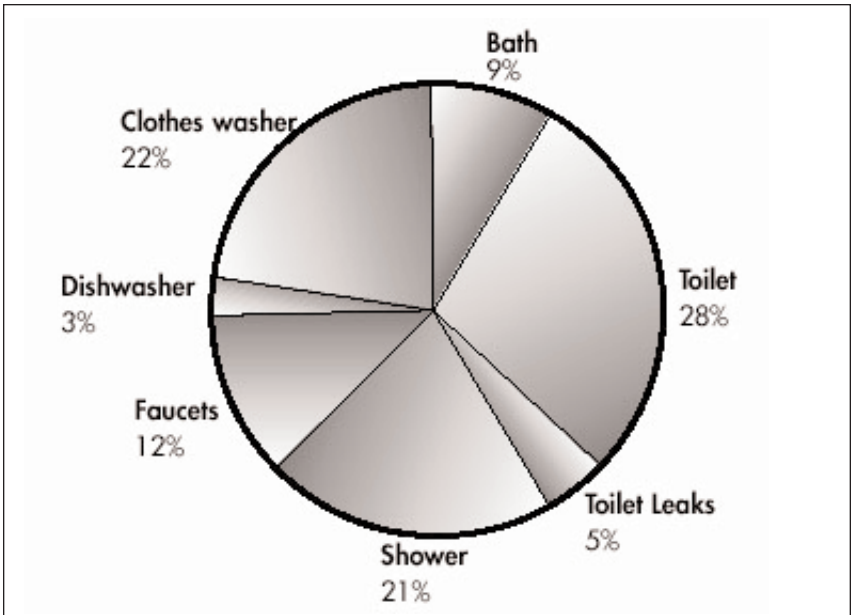


Figure 4.6. Average household water usage. Source: John Woodwell, "Water Efficiency in Your Home," 1995, Rocky Mountain Institute.

Less water in the drainfield means better aeration for the soil microbes at work in the system. There are many steps you can take to reduce how much water you use. Here are a few:

- To reduce water consumption by toilets by as much as 50%, install low-flow toilets. Water-saving shower heads and faucets also help. (Low-flow fixtures are required in some localities.)
- Take shorter showers.
- Repair leaky faucets and toilets.
- Don't run water longer than necessary; for example, turn the water off while brushing your teeth or shaving.
- Wait until dishwashers and washing machines are full before running a load; scrape but don't pre-rinse dishes before loading them into the dishwasher.
- Adjust water softener settings to reduce the amount of water needed for backwashing and regeneration, or divert away from wastewater system.
- Spread out laundry and other major water-using chores over the week or day.

Assessment 3: Septic or sewage system inputs

Use Assessment 3 in the work sheet to begin rating your risks relating to system inputs. For each question, indicate your risk level in the right-hand column. Although some choices may not correspond exactly to your situation, choose the response that best fits.

For more information

No matter where you live, there are people in agencies such as University Outreach and Extension and your county health departments who can help. Pumpers, contractors and laboratories are valuable sources of information as well.

University of Missouri Outreach and Extension Publications

To find these publications on the web, go to the following URL —
http://muextension.missouri.edu/xplor/waterq/
At the end of the address, type: *eq* plus the publication number preceded by a *0*, then *.htm*

Example:
http://muextension.missouri.edu/xplor/waterq/eq0103.htm

■ EQ103, Nitrate in Drinking Water, reviewed and adapted for Missouri by Wanda Eubank, Jerry D. Carpenter and Beverly A. Maltsberger, University of Missouri-Columbia, and Nix Anderson, Missouri Department of Health, from Nitrate in Drinking Water by Karen Mancl, Water Quality Specialist, The Ohio State University.

■ EQ401, A Homeowner's Guide: Septic Tank / Absorption Field Systems, by Robert A. Schultheis, Extension Agricultural Engineering Specialist, University of Missouri

■ EQ402, A Homeowner's Guide: Residential Waste Stabilization Lagoons, by Robert A. Schultheis, Extension Agricultural Engineering Specialist, University of Missouri

■ WQ403, Sewage Treatment Plants for Rural Homes, by Charles D. Fulhage and Donald L. Pfost, Department of Agricultural Engineering, University of Missouri-Columbia

■ WQ656, Assessing the Risk of Groundwater Contamination from Household Wastewater Treatment — Farm•A•Syst: Farmstead Assessment System Worksheet #6

■ WQ680, Reducing the Risk of Groundwater Contamination by Improving Household Wastewater Treatment — Farm•A•Syst: Farmstead Assessment System Fact Sheet #6 (a companion to WQ680)

The National Small Flows Clearinghouse

NSFC has several publications on septic system design and maintenance, as well as information about alternative systems. Contact them at NSFC, West Virginia University, P.O. Box 6064, Morgantown, WV 26506-6064, or call (800) 624-8301 to request their catalog. Some of the publications available from NSFC are:

■ Your Septic System: A Reference Guide for Homeowners, WWBRPE17. This brochure describes a conventional septic system and how it should be cared for to achieve optimal results.

■ The Care and Feeding of Your Septic Tank System, WWBRPE18. This brochure describes septic tanks and drainfields and provides guidelines to prolong their usefulness.

■ So...Now You Own a Septic Tank, WWBRPE20. This document describes how a septic tank system works and how to keep it functioning properly.

■ Preventing Pollution Through Efficient Water Use, WWBRPE26. This brochure describes efficient water use and its role in preventing pollution.

■ Homeowner's Septic Tank System Guide and Record Keeping Folder, WWBLPE30. The National Onsite Wastewater Recycling Association developed this folder to provide septic system owners with simple operation and maintenance guidelines to ensure their system will work properly.

Water testing

Contact your county health department, University Outreach and Extension staff, or private testing laboratories.

Groundwater and geology

Contact the office of your state or U.S. Geological Survey, or your local soil and water conservation district.

Drinking water quality standards

In Missouri, the Department of Natural Resources Public Drinking Water Program sets standards for public water supplies (for communities or municipalities). There are no standards for individual water supplies, such as wells or cisterns. Your county health department may have resources to test your water, or to provide sample bottles for sending samples to the Missouri Department of Health. For more information, contact your county health department.

Water conservation

Many local water utilities have booklets of water conservation tips available. The Missouri Department of Natural Resources, Technical Assistance Program has resources, and they can be contacted at 800-361-4827.

Publications are also available from the American Water Works Association; call (303) 794-7711 for more information.

The U.S. Environmental Protection Agency has publications as well, such as document number EPA/841/B-95/002, Cleaner Water Through Conservation; to order contact the National Center for Environmental Publications and Information, P.O. Box 42419, Cincinnati, OH 45242-2419; fax (513) 489-8695.

Pollution prevention at home helps ensure your safety

For more information about topics covered in the Home•A•Syst series, or for information about laws and regulations specific to your area, contact your nearest University Outreach and Extension center.

Contact the ***Missouri Farm•A•Syst/Home•A•Syst Program*** at: 205 Agricultural Engineering Building, University of Missouri-Columbia, Columbia, MO 65211; phone 573-882-0085; http://www.fse.missouri.edu/waterquality

How to order the Home•A•Syst Environmental Risk Assessment Guides:

(EQM101 through EQM105 include a fact sheet and work sheet.)

An Introduction to Assessing the Environmental Safety of Your Home ($.75).....EQM100

Site Assessment: Protecting Water Quality Around Your Home ($1.25).....EQM101

How to Manage and Control Storm Water Runoff ($1.25).....EQM102

Drinking Water Well Management ($1.50).....EQM103

Household Wastewater: Septic Systems and Other Treatment Methods ($2.00).....EQM104

Yard and Garden Care: How it Affects Your Health and Environment ($1.00).....EQM105

Home•A•Syst Risk Assessment Guide ($4.00).....EQM106
(Includes the introduction and all five fact sheets and work sheets)

Publications are available by mail from Extension Publications, University of Missouri, 2800 Maguire Blvd., Columbia, MO 65211. Please refer to the appropriate EQM number for each publication.

Enclose your check made payable to University of Missouri for the cost of publications plus handling. Handling is $1.50 for orders that total less that $5.00, and $2.50 for orders that total from $5.00 to $9.99.

For larger orders, including quantity discounts, please call the number below. Missouri residents must add 7.225% sales tax.

To order by phone, call (573) 882-7216 or toll-free 1-800-292-0969.

The complete Home•A•Syst series is available on the web at:
http://muextension.missouri.edu/xplor/

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