

Protecting Private Drinking Water Supplies: Household Wastewater (Sewage) Treatment System Management

Sharon O. Skipton, Extension Water Quality Educator
Jan R. Hygnstrom, Extension Project Manager
Wayne Woldt, Extension Water and Environment Specialist

This publication is one of six in a series (*Figure 1*) designed to help rural families protect their private drinking water supplies. The greatest protection of drinking water supplies can be achieved by applying principles from all publications in the series.

Nearly all families living in rural homes rely on a septic system, residential lagoon, or other onsite wastewater treatment system to treat household wastewater and return it to the environment. Families living in some of Nebraska’s small communities not served by a central/municipal wastewater treatment system also rely on an onsite system for household wastewater treatment and recycling. While these systems are generally safe, household wastewater contains contaminants that make this water unfit for drinking purposes. A properly designed, installed, and maintained treatment system will minimize the impact of the system on groundwater and surface water. Implementing good operating practices, and working with a Nebraska-certified professional to carefully construct or manage the onsite wastewater treatment system will help keep the groundwater that supplies your drinking water safe.

Begin by completing the following assessment for your type of system.

Information about your system may have been recorded when it was installed. You may have a copy of this information. Also, the contractor who installed the system may have a copy. Onsite wastewater treatment systems constructed, reconstructed, altered, or modified after January 1, 2004, were required to be registered with the Nebraska Department of Environmental Quality (NDEQ.) If your system was installed or worked on after that date, the NDEQ may have a copy of the registration. Contact the NDEQ at (402) 471-2186 for more information.

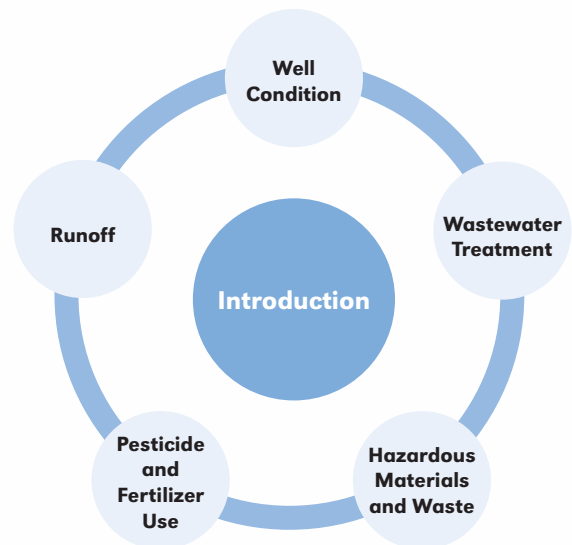


Figure 1. This NebGuide is one of six in a series designed to help rural families protect their drinking water supplies. All are available on the UNL Extension Publications website under the topic Water Management.

Using this information, respond to the following statements. Place a check mark beside only those statements that accurately describe your onsite wastewater treatment system. Unchecked statements indicate factors associated with your system’s design, location, or management that could put your drinking water supply at risk of contamination. Although voluntary, risk factors should be addressed. Work with a contractor who has been certified by the State of Nebraska to attempt to eliminate risk factors when possible.

Following the assessment is additional information on each of the topic areas to help you understand the associated risks.

Holding Tank Systems

- _____ Holding tank has a minimum volume of 1,000 gallons.
- _____ A watertight holding tank collects all blackwater and graywater.
- _____ Holding tank is at least 50 feet from well.
- _____ Tank is pumped as needed; no leakage or overflow.

Septic Tank/Soil Absorption Systems

- _____ A watertight septic tank collects all blackwater and graywater.
- _____ Tank holds at least 1,000 gallons and is sized for the number of bedrooms in home.
- _____ Tank is pumped every few years as solids build up.
- _____ All effluent from the tank goes to a soil absorption field.
- _____ Soil absorption field is sized for the number of bedrooms and soil percolation rate.
- _____ Bottom of trench in soil absorption field is at least 4 feet above groundwater or confining layer such as bedrock.
- _____ Tank is at least 50 feet, and soil absorption field is at least 100 feet from well.
- _____ Family has low to moderate water use, spreads out water use, and minimizes solids and hazardous products in the wastewater.

Residential Lagoon Systems

- _____ A lagoon with 1/8-inch or less seepage per day collects all blackwater and graywater.
- _____ Lagoon is sized for number of bedrooms in home and precipitation/evaporation rates for area.
- _____ Bottom of lagoon is at least 2 feet above groundwater.
- _____ Lagoon is at least 100 feet from well.
- _____ Family minimizes solids and hazardous products in wastewater.

Holding Tanks

Holding tanks collect and hold the entire wastewater flow and must be a minimum of 1,000 gallons in volume. Holding tanks require good management, including having a pumper certified by the State of Nebraska remove the contents when the tank is 90 percent full. Generally, the wastewater is disposed of at a municipal wastewater treatment facility. Septage also may be land-applied by the pumper following prescribed methods identified in regulations. Additional management includes having a certified contractor check the physical condition of the tank periodically.

Holding tanks must be located at least 50 feet from any well.

Septic Tank/ Soil Absorption Systems

The most common onsite wastewater treatment system used in Nebraska is a septic tank/soil absorption system. Wastewater flows from the household plumbing to a septic tank where waste components separate, with heavier solids settling to the bottom forming sludge, while grease, fatty solids, and light solids float to the top forming scum. Bacteria partially decompose the solids. The partially treated liquid portion (effluent) flows to a soil absorption system (sometimes called the drainfield) which is usually a series of belowground trenches, each containing perforated pipe or chambers. The effluent seeps into the soil where final treatment occurs through aeration, filtration, and biological treatment. Some effluent is used by plants or evaporates into the atmosphere. The majority of treated wastewater is returned to the environment through infiltration into groundwater. The septic tank must be located at least 50 feet from any well, and the soil absorption system must be at least 100 feet from a well.

The watertight tank must be large enough to collect and treat the peak daily flow of wastewater generated (*Table I*). The minimum tank volume allowed in Nebraska is 1,000 gallons, with 250 gallons of capacity added for each additional bedroom over three and any whirlpool tub in homes with three or more bedrooms. Tank capacity must be adjusted to accommodate remodeling or additions that result in additional bedrooms or large-capacity tubs. A certified contractor can provide information on the minimum tank volume required for new or existing systems.

Table I. Septic tank sizing for a single dwelling.

<i>Number of bedrooms</i>	<i>Tank size — gallons</i>	<i>Tank size with whirlpool bath — gallons</i>
1	1,000	1,000
2	1,000	1,000
3	1,000	1,250
4	1,250	1,500
5	1,500	1,750

The soil absorption system or drainfield must be large enough to accept the volume of wastewater generated and treat it before returning it to the environment. The size is determined by the daily volume of wastewater generated, which is estimated using the number of bedrooms in a home, and the soil percolation test, which determines the soil's ability to accept wastewater. The soil below the absorption area trench(es) must be aerobic (with oxygen) for final treatment to occur. Therefore, there must be at least 4 feet of unsaturated soil between the bottom of trenches and groundwater or any bedrock or confining layer to allow for aeration and proper

treatment. A certified contractor must conduct percolation tests at proposed installation sites and must determine the depth to seasonal highest groundwater or a confining layer such as bedrock.

Septic tank systems require good management, including having a certified pumper remove the tank contents as needed. The contractor must either dispose of the contents at a municipal wastewater treatment facility or land-apply the contents following methods prescribed in the regulations. In addition, a certified professional should check the physical condition of the system components periodically. Additional operation and management steps can be taken by the system user as outlined below.

Reducing the volume of wastewater entering the system and spreading out when wastewater enters the system will improve treatment in the septic tank by increasing the time wastewater spends in the tank. This provides more time for settling and treatment. This also will improve treatment in the soil absorption system by helping to prevent saturated conditions in the soil. Steps to take include:

- Have water-saving fixtures (toilet, showerhead, faucets) installed.
- Have water-saving appliances (washing machine, dishwasher) installed.
- Have plumbing leaks fixed.
- Avoid using the toilet to dispose of items that could go with solid waste.
- Spread out laundry loads over the week (one or two loads per day).
- Select demand-initiated water softener if one is used.
- Take short showers.

Minimizing solids in the wastewater will improve system performance. Solids add to the sludge and scum layers in the septic tank, making it necessary to have the tank pumped more often. Solids also add to the organic load in the system. Too much organic matter can produce an unbalanced system, resulting in inadequate treatment. Problems can include a clogged or saturated drainfield. A good rule-of-thumb is, as much as possible, only biological material and toilet paper should go into the system. Steps to take include:

- Eliminate or minimize use of a garbage disposal unit.
- Avoid putting fats and grease down the drain.
- Avoid flushing paper towels, tissues, “wipes,” disposable diapers, and sanitary products.
- Use toilet paper that breaks down readily.
- Use liquid detergents instead of powdered detergents, which have “fillers” in them.
- Have the tank pumped by a certified professional as needed — frequency depends on use and tank size, but could be about every two years.

- Have a filter installed on the washing machine water discharge line to trap lint.
- Have an effluent filter installed at the outlet of the septic tank to prevent solids from flowing to the drainfield, and have the filter checked and cleaned periodically to avoid wastewater backup into the house.

Keeping hazardous products out of the system will increase performance and protect groundwater. The presence of hazardous products in wastewater can upset the balance in a septic system, resulting in poor wastewater treatment. In addition, hazardous products can move through the system untreated where they will enter the drinking water supply. Steps to take include:

- Don’t dispose of solvents, degreasers, acids, oils, or paints in the system.
- Use household disinfectants sparingly.
- Don’t flush excess medications down the toilet.
- Don’t dispose of pesticides in the system.
- Do not use chemicals to start, feed, or clean a septic system, or select only those with biological components such as bacteria, enzymes, or yeast. Bacteria in household waste are generally sufficient to start and operate properly maintained systems.

The soil absorption area should be protected so that system components do not break, the soil in the absorption area is not compacted, and oxygen flow to the soil absorption area is not restricted. Steps to take include:

- Divert surface water runoff to other areas.
- Do not irrigate the drainfield area as water is provided from the wastewater system.
- Do not drive over the drainfield.
- Do not site kennels or animal confinement units over the drainfield.
- Do not construct driveways, sidewalks, patios, or buildings over the septic tank or drainfield.
- Do not mound additional soil over the drainfield.
- Keep rodents and other burrowing animals out of the area.
- Do not plant trees near the drainfield.
- Maintain grass or other shallow-rooted vegetation over the drainfield.

Residential Lagoons

Residential lagoons are designed to contain all wastewater flows and rely on evaporation to return wastewater to the environment. The maximum allowable seepage rate is 1/8 inch per day, and overflow or surface discharge is not

allowed. For maximum performance, the lagoon must be maintained with a minimum of 2 feet of liquid depth and a maximum operating or liquid depth of 5 feet. A depth marker is required to monitor depth.

The lagoon must be large enough to collect and treat the volume of wastewater generated. The size is designed to balance the volume entering the lagoon through wastewater generation and precipitation with the volume leaving the lagoon through seepage and evaporation. Wastewater generation is estimated by the number of bedrooms in a home while gains from precipitation are estimated using historical records. The loss through seepage is measured at the time the lagoon is constructed, and the loss from evaporation is estimated using historical records. A certified installer collects and enters this information into a specific formula to size and design residential lagoons for use in Nebraska.

Air flow and sunlight on the lagoon are important for good wastewater treatment. Therefore no trees, brush, or weeds should extend above the top of the lagoon dike within a 50-foot radius of the dike. Check that the dike is the same height and shape as when built, and repair any erosion or damage to the dike. Check for and prevent damage to the dike by rodents and other burrowing animals. The dike should be planted with vigorous perennial grass. Cut grass often to 3 inches and maintain a height of no more than 6 inches. Do not let clippings fall into the water; totally removing clippings is a good option.

Prevent floating vegetation from growing in the lagoon. Floating plants such as water lilies or duckweed block sunlight, which the lagoon needs. Floating plants may be physically removed or controlled with herbicides. Always act when plants first appear. Select an herbicide for the specific plants to be controlled that does not harm the algae or the environment. Dead plant material resulting from herbicide control adds organic load to the lagoon, which may cause odor and increase sludge accumulation.

Monitor the lagoon color, which is a good indication of the lagoon's health (*Table II*).

Table II. Lagoon color indicates the lagoon's health.

<i>Color</i>	<i>Health of Lagoon</i>	<i>Comments</i>
Bright rich green	Great	Good conditions, plenty of algae are present.
Dull green	Not very good	Undesirable type of algae becoming dominant indicating poor conditions. Dissolved oxygen and pH dropping.
Tan or brown	Questionable	Either there is soil in the water from bank erosion or algae with different pigmentation are present.
Gray or black	Very bad	Anaerobic conditions may exist so the lagoon is not treating wastewater well. Odors are probably present.

Acknowledgments

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