THE UNIVERSITY OF TENNESSEE
AGRICULTURAL EXTENSION SERVICE
SP508 E

TENNESSEE

Home•A•Syst

Assessing Your Private Water Supply

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The goal of *Home•A•Syst* is to protect your health and the environment from pollutants in and around your home.

The following checklist is designed to help you pinpoint potential problem areas concerning your water supply if you use a well or spring. These problem areas may contribute to the contamination of your drinking water if they are not managed properly. If a statement reflects the current situation in your household, check "Agree." If the statement does not describe your household, check "Disagree."

If you disagree with any of these statements, or if you are unsure, you may have a problem with your water supply that could affect the environment or your

Agree	Disagree	
O	O	1. My well or spring is uphill from all possible sources of pollution, such as fuel storage tanks, pesticide or fertilizer mixing and storage areas, and farm fields.
O	O	2. My well or spring is more than 50 feet from my septic tank and drainfield *or* more than 75 feet from a pit privy or sewer line, *and* more than 100 feet from any other contamination sources.
O	O	3. My well or spring is located in a fine-textured soil (fine loam or clay).
O	O	4. My well cap is tight. *or* My spring is enclosed in a watertight box.
O	O	5. I've checked my well casing recently, and it shows no signs of corrosion or cracking. *or* My springhouse shows no signs of cracking and the removable clean-out cover fits tightly.
O	O	6. My well casing is at least six inches above ground level. *or* My well is in a floodplain, and the casing is more than 24 inches above the high-water mark.
O	O	7. My well is less than 50 years old.

Continued on p.2

Agree	Disagree	
O	O	8. My well is a drilled well.
O	O	9. I have a wellhouse or other protective enclosure for my wellhead. *or* My spring area is fenced to keep out livestock.
O	O	10. I never store fuel, pesticides, or other possible contaminants in the wellhouse or springhouse.
O	O	11. When filling pesticide sprayers or other containers directly from my well, I never allow the end of the hose below the water level in the container.
O	O	12. Any unused wells on my property are capped and protected.
O	O	13. I've had my drinking water tested within the last three years.
O	O	14. My water met the recommended water-quality standards when it was tested.
O	O	15. I follow the maintenance procedures recommended by the manufacturer for any water-treatment equipment that I use.

health. Refer to the fact section with the same number as that statement (under the heading, "What you should know about . . .") for more information.

Don't be alarmed if you disagreed with many or even all of these statements. That does not automatically mean you have a water-quality problem. It may, however, tell you that change is needed to avoid potential problems. In the same way, agreeing with every statement does not mean you are *not* at risk or cannot make improvements.

Why should you be concerned?

Most private wells in Tennessee have clean water. But many common activities around your home or farm can affect the quality of your well water, which in turn can affect your family's health and the health of livestock or pets. Contamination of **groundwater** on your property (the underground water that supplies wells and springs and recharges surface water bodies) can also pollute the water supplies of your neighbors.

If you are the owner of a private well, it is your responsibility to see that your water supply is free of harmful contaminants. The chances are good that your well is safe, but you cannot automatically assume so. If a well is improperly constructed or maintained, bacteria, pesticides, fertilizers, oil products, or other materials can contaminate it.

Both the condition of your well and its distance from pollution sources determine the risk of contamination. For example, a cracked well casing allows pollutants to enter the well more easily. Septic tanks or fuel storage systems that are not working properly or are too close to a well increase the risk of contamination.

Springs provide drinking water for some Tennessee homes and are more susceptible to pollution than wells. In limestone (**karst**) areas, surface water may flow directly into a spring through cracks and channels in the limestone. Contaminants in this water have had little chance to be removed by the natural physical, chemical, and biological processes that occur when water filters through soil. Therefore, if you use a spring, protection and regular water testing are very important.

Prevention is the key to protecting water quality. If the groundwater that supplies your well or spring

is contaminated, it will not be easy to clean up. Your only options are to treat the water, drill a new well, or get water from another source. These options are expensive and inconvenient. The best solution is always prevention.

Your drinking water is least likely to be contaminated if you use as many of the low-risk practices suggested in this self-assessment as you can.

Home•A•Syst is only for your own use and benefit. It is a voluntary program intended to provide general information about protecting and improving water quality. Information from a *Home•A•Syst* assessment will not be collected by Extension or any other outside agency and should remain in your private records.

What you should know about . . .

1. Slope of the land

A well or spring that is downhill from a fuel tank, a pesticide or fertilizer storage area, a septic system, or any other source of contaminants faces greater risk of pollution than a well or spring that is uphill from possible contaminants.

Wells: Water running downhill can carry contaminants to the well. These contaminants can trickle down the outside of the well casing, leak through cracks in the casing, or seep through faulty seals to pollute your well water. Contaminants can also enter the soil and be carried to your water supply by groundwater. Water in a shallow **aquifer** (an underground layer of sand, gravel, or rock used as a water source) often flows in the same direction as surface water. However, if the aquifer your well is tapping is deep underground, its slope and flow may be different from that of the land surface.

If the soil around the well has settled so that the ground around it is lower than the surrounding land, surface water can collect in the depression and leak slowly into the well.

Good well location is important in reducing the risk of water contamination. It takes careful planning. Try to locate a new well upslope from any potential sources of contaminants. If your well is downhill from contaminants, consider moving the sources or diverting surface water runoff away from the well. Fill in depressions and build up soil around the well.

Springs: Use diversion ditches or other means to keep surface water out of the springhouse.

2. Distance from pollution sources

The closer a well or spring is to a potential pollution source, the greater the risk of contamination. The Tennessee Department of Environment and Conservation's rules for water-well construction give these minimum distances for a new well (which are also appropriate guidelines for spring users):

Source	Minimum Distances
Septic tanks and drainfields	50 feet
Pit privies or sewer lines	75 feet
Sludge disposal sites	100 feet
Leaching pits / sewage lagoons	100 feet
Animal pens or feedlots	100 feet

Some possible sources like pesticide mixing areas, fuel tanks, and fertilizer or pesticide storage areas are not listed here. In general, put as much distance as possible between the well or spring and a potential contamination source; the 100-foot minimum distance is a simple guideline to remember. Separation is especially important if your property has highly permeable soil or is in a limestone (**karst**) area, where sinkholes, caves, and cracks in the bedrock create direct channels for pollution to reach groundwater.

Distance may protect your well or spring, but it does not necessarily protect the groundwater itself. Investigate any situation on your property that poses a high risk to groundwater, even if your well or spring is far away from it, since any contaminant has the potential to affect a neighbor's water supply as well as your own. A water pollution problem can also reduce your property's value and make it difficult to sell.

3. Soil type

Water and any contaminants in it move quickly through coarse-textured soils, increasing the risk of groundwater contamination. Water moves more slowly through fine-textured loams and clays, giving more time for chemical, physical, and biological processes in the soil to break down contaminants. In some of these fine-textured soils, surface water may never move down to the aquifer supplying your well.

4. Well caps and springhouses

Wells: A tight-fitting well cap or seal stops contaminants from entering the well casing. A screened vent allows air to enter the well while keeping insects out. Some wells have the pump mounted at the top of the casing; this replaces the cap and serves as a seal. The cap should be inspected periodically to see that it is in place and tightly secured.

Springs: A watertight box or house enclosing a spring helps keep contaminants out. It should have a tight-fitting cover that can be removed for cleaning. The cover should be locked, or should be heavy enough to prevent animals from moving it and to discourage passersby from lifting it. Overflow pipes and drains should be screened to prevent the entrance of insects and animals and designed to keep surface water out.

5. Well-casing and springhouse condition

Wells: A well driller installs steel or PVC casing pipe during construction to prevent collapse of the borehole. Over time, the casing may corrode or crack and allow contaminants to leak into the well.

Depending on how the well is constructed, you may be able to look for holes or cracks both at the surface and, with a light, down the inside of the casing. If you hear water running when the pump is off, there could be a crack or hole in the well casing.

The space between the casing and the borehole is a direct channel for surface water and pollutants to reach the aquifer. To seal it, the drillers fill the space with drill cuttings, cement, or bentonite clay grout. If you can move the casing around by pushing against it, the grout and seal may be broken, permitting pollutants to seep into the well.

Springs: Springs can become polluted if the springhouse is cracked, letting in surface water or shallow groundwater. Contaminants can also enter if the cover does not fit well. You should regularly inspect the springhouse inside and out for warning signs that pollution may be entering, such as cracks, missing screens, and roots that have forced their way through joints.

6. Casing height

The risk of contaminants seeping into a well is higher if the casing is at or below ground level.

To reduce the level of risk, Tennessee regulations require the casing for a new well to extend at least six inches above ground level. In areas subject to flooding, the casing must extend at least 24 inches above the maximum recorded flood elevation. Also, the top of the casing cannot end in a basement, a pit, or any other place below ground level.

Pipe can be added to extend the casing and reduce the level of risk in wells that do not meet these standards.

7. Well age

A well constructed 50 or more years ago is likely to be a shallow well located in the middle of your property and is probably surrounded by many potential pollution sources. Also, casing materials deteriorate with time and become more susceptible to contamination. Old wells may have porous clay tile or concrete casing which can allow seepage of pollutants into the well. Old well pumps are also more likely to leak lubricating oils into the well than new ones.

Regular water testing to detect problems can reduce the risks associated with old wells.

8. Well construction

A well's construction type influences its ability to keep out contaminants. **Drilled wells**, which include most private wells, are usually four to eight inches wide. Properly constructed, they present a low risk of contamination.

A **dug well,** on the other hand, is a large-diameter hole, usually more than two feet wide, often constructed by hand. Dug wells have the greatest risk of contamination because they are usually shallow and often poorly protected from surface-water runoff.

A **driven well** is constructed by driving assembled lengths of pipe into the ground. It can only be installed in relatively loose soil, such as sand, and is usually two inches wide or narrower. Because a driven well is usually less than 50 feet deep, the risk of contamination is fairly high.

9. Well and spring protection

Wells: The chance of surface water contaminating a well increases if the well is uncovered. A well without a house, fence, or posts around it can also be damaged accidentally by vehicles, equipment, livestock, or pets.

A covered wellhouse, fence, or posts reduces risk by providing physical protection to the well. Risk is also reduced if the ground slopes away from the well in all directions.

Springs: The area around a spring should be fenced to keep out livestock and avoid pollution. Surface-water diversions such as ditches or curbs should be within this fenced area.

10. Hazardous product storage

A wellhouse or springhouse should not be used to store fuels, pesticides, chemicals, used batteries, or other hazardous products. A leak, spill, or other accident can cause immediate contamination of your water.

Storing potential contaminants away from the well or spring reduces risk. Other practices like fueling machinery, mixing pesticides, and discarding empty pesticide containers should also be handled as far away from your well or spring as possible.

11. Backflow

Backflow is the reverse flow of a liquid caused by the sudden creation of a vacuum, much like sucking water through a straw. If a well pump shuts off while the end of an attached hose is underwater–even submerged in a puddle on the ground–backflow can suck the liquid backward through the hose into the well.

If you are filling a pesticide sprayer, for example, be sure the end of the hose is *never* submerged in the pesticide mixture. Also, never leave hoses attached to faucets lying on the ground where they can become submerged in puddles of contaminated water. Check valves or other backflow prevention devices on your faucets can also safeguard your water supply from backflow contamination.

If you have water from both a public system and a private well, Tennessee law states that each plumbing system must be separate with no cross-connections. Differences in water pressure between the systems could suck well water into the public system through a cross-connection and contaminate it.

12. Unused or abandoned wells

A well is an open pipeline to groundwater. Contaminants that get into an unused or abandoned well move directly to the aquifer.

Open wells are also safety hazards for small children and animals. In fact, young children have fallen into well openings as small as a volleyball.

An unused or abandoned well should be securely capped and sealed. Keep possible sources of contamination (for example, fuel tanks or animal pens) and activities such as pesticide mixing as far away as possible from an abandoned well. Contamination risks are high because of possible casing deterioration, shallow well depth, and poor construction.

If done correctly, filling an unused well is probably the safest solution. The goal is to restore as closely as possible the geological conditions existing before the well was built. Currently, you can legally plug a well yourself. However, many experts recommend hiring a licensed, qualified well driller or pump installer. Special equipment may be needed to remove the old pump and pipes and to install sealing materials inside the well.

13. Frequency of water testing

Water testing is the only sure way to know what is in your drinking water. Testing your well water every year is recommended. If you suspect a problem, you should test more often.

Springs are particularly susceptible to pollution. You may need to test your water even more often than once a year. A disinfecting unit may be necessary to keep your drinking water safe.

Your county health department can test for bacteria, and can also recommend state-certified labs for additional tests. Extension publication PB 1357, *Water Quality and Private Water Supplies*, outlines tests you should consider if you suspect certain problems with your drinking water. Some labs offer a drinking-water test package for common contaminants that is less expensive than buying the tests individually.

14. Water-quality test results

Some contaminants affect only the appearance or taste of your water. Others can cause health problems, shorten the life of your water heater or plumbing, or cause problems with dishwashing and laundry.

Bacteria and nitrate are the two most common well-water-quality problems in Tennessee and in the rest of the nation. They can also be indicators of other water-quality problems. High levels of bacteria or nitrate indicate contamination from some source that

may also be discharging other, more harmful substances. Your local health department or the lab you use can help you interpret test results and suggest other tests for you to consider.

Keep your test results and compare them over time to note any changes. Also keep records on well construction and any well or pump maintenance. These records can help to determine what is happening in your water system if problems occur.

15. Maintenance of water-treatment equipment

Treatment equipment to solve many water-quality problems is available. Periodic maintenance is required to ensure that the equipment works properly. For example, filtering systems used to remove contaminants from water require regular filter changes. Equipment that is not properly maintained can actually increase risk and may give you a false sense of security. Regular testing is the only way to be sure the equipment is working properly.

Make a note:

The table on page 6 of SP508M, *Assessing Your Homesite*, provides a space for you to list all the problem areas in your home that you find while completing *Home•A•Syst*. Take a few minutes now to list any well or spring problems you discovered as you completed *Assessing Your Private Water Supply*. Later, when you complete *Assessing Your Homesite*, you will include these items on the map you draw of your property. Potential items from this factsheet include:

- fuel or pesticides stored in your wellhouse
- any unprotected well or spring
- contaminants upslope from your well or spring
- abandoned wells
- cracked or corroded well casing

Remember:

- Relocate possible contamination sources downhill from your well or spring.
- Divert surface-water flow away from your well or spring.
- Fill in depressions and mound up soil around your well.
- Relocate possible contamination sources as far away from your well or spring as possible.
- Cap or seal the top of the well casing.
- Repair holes or cracks in the well casing or springhouse.
- Extend the casing to at least six inches above the ground surface or 24 inches above the highest flood level.
- Protect your well with a wellhouse, fence, or posts.
- Protect your spring with a watertight box or housing that encloses the spring and extends into the ground; fence off the surrounding area.
- Don't store possible contaminants in or around the wellhouse.
- Prevent backflow contamination with check valves, or by keeping hoses off the ground or above the water level when filling sprayers or containers.
- Eliminate cross-connections between public and private water systems.
- Cap and seal unused or abandoned wells. Keep possible contamination sources as far away as possible.
- Have your water tested regularly.
- Clean out and inspect your springhouse and other parts of the springwater system regularly.
- Maintain water-treatment equipment according to the manufacturer's recommendations.

If you want more information . . .

Contact:

- Your local Extension office

- Tennessee Department of Environment and Conservation (TDEC)
  (*for information about well regulations, well-water testing*)
  Division of Water Supply
  401 Church Street
  L&C Tower, 6th Floor
  Nashville, TN 37243-1549
  (800) 523-4873

- Licensed well drillers or pump installers (*well construction and inspection*)

- Your county health department (*water-quality standards, well-water testing*)

- U.S. Environmental Protection Agency's Safe-Drinking-Water Hotline
  (M-F, 8:30 a.m.-5:00 p.m. EST)
  (800)426-4791

Read:

- *Safety of Private Water Supplies.* PB 1356.

- *Water Quality and Private Water Supplies.* PB 1357.

- *Water Well Protection on Poultry Farms.* PB 1457.

- *Improving Home Water Quality*. PB 1481.

- *Coliform Bacteria - An Indication of Water Quality*. SP 392-B.

- *Well Disinfection Using Laundry Bleach.* SP 392-D.

- *Protecting Wells From Contamination: Results From the Beaver Creek Watershed*. SP 392-F.

The above publications are available from your University of Tennessee Agricultural Extension Service county office.

- *Water Treatment Notes.* 329FSW. $10.00.
  This set of 10 factsheets from Cornell University outlines water-treatment problems and methods for correction. Each individual factsheet, listed below, can be purchased separately for $2.00.

  - *Guidelines for Purchasing Water Treatment Equipment.* 329FS1.
  - *Lead in Drinking Water.* 329FS2.
  - *Activated Carbon Treatment of Drinking Water.* 329FS3.
  - *Reverse Osmosis.* 329FS4.
  - *Chlorination of Drinking Water.* 329FS5.
  - *Iron and Manganese in Household Water.* 329FS6.
  - *Hydrogen Sulfide in Household Water.* 329FS7.
  - *Private Household Water Supplies.* 329FS8.
  - *Terminology for Onsite Sewage Treatment Systems.* 329FS9.
  - *Ultraviolet Radiation for Disinfecting Household Drinking Water.* 329FS10.

  To order, write:

  Cornell University Resource Center
  8 BTP
  Ithaca, NY 14850

Download:

- http://funnelweb.utcc.utk.edu/~utext
  The University of Tennessee Agricultural Extension Service home page.

- http://www.epa.gov
  The U.S. Environmental Protection Agency home page.

- http://www.webdirectory.com
  Comprehensive environmental search engine/bulletin board–a great way to find information about any environmental topic.

- http://www.usda.gov
  The U.S. Department of Agriculture home page.

- http://h2o.usgs.gov
  The U.S. Geological Survey home page.

- http://wwwdtnnsh.er.usgs.gov
  The Tennessee division of USGS.

- http://hermes.ecn.purdue.edu:8001/server/water/water.html
  The National Extension Water Quality Database Website, Purdue University.

- http://www.ncg.nrcs.usda.gov/public.html
  The Natural Resources Conservation Service home page. See section entitled, "Public Service Information," for information on water-conservation practices and other topics.

This *Home•A•Syst* assessment does not cover all potential health or environmental risks related to your drinking-water supply. It is meant to be a starting point for identifying and addressing the most apparent risks.

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