



## Assessing Your Private Well

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The goal of this *Farm•A•Syst* factsheet is to help you protect and improve the groundwater that supplies your drinking water as well as the ponds, lakes, rivers, and streams that make Tennessee beautiful.

The following questions are designed to help you pinpoint potential problem areas on your farmstead. These problem areas may contribute to the contamination of your drinking water if they are not managed properly.

If your answer to any of these questions is *YES*,

or if you don't know the answer, you may have a high-risk situation in your home or on your farmstead. Refer to the fact section with the same number as that question (under the heading, "What you should know about . . .") for more information.

Don't be alarmed if you answer *YES* to many or even all of these questions. 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, answering *NO* to every question does not mean you are *not* at risk.

YES	NO	
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- |                          |                          |   |
|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | 1. Is your well downhill from possible sources of pollution, such as livestock pens, fuel storage areas, pesticide or fertilizer mixing and storage areas, or the farm dump?      |
| <input type="checkbox"/> | <input type="checkbox"/> | 2. Is your well less than 50 feet from your septic tank and drainfield, less than 75 feet from a pit privy or sewer line, or less than 100 feet from other contamination sources? |
| <input type="checkbox"/> | <input type="checkbox"/> | 3. Is your well located in a coarse-textured soil (sands or sandy loam)?  |
| <input type="checkbox"/> | <input type="checkbox"/> | 4. Is the well cap loose or missing?  |
| <input type="checkbox"/> | <input type="checkbox"/> | 5. Can you see cracks or holes in the well casing?  |
| <input type="checkbox"/> | <input type="checkbox"/> | 6. Is the casing less than six inches above ground level, or, if the well is in a floodplain, less than 24 inches above the high-water mark?                                      |
| <input type="checkbox"/> | <input type="checkbox"/> | 7. Is your well more than 50 years old?   |
| <input type="checkbox"/> | <input type="checkbox"/> | 8. Is it a dug well?  |
| <input type="checkbox"/> | <input type="checkbox"/> | 9. Is the well in an open area, without a wellhouse or other protective enclosure?  |

*Continued on p.2*

**YES**   **NO**

- |                          |                          |   |
|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | 10. Do you store fuel, pesticides, or other possible contaminants in the wellhouse?   |
| <input type="checkbox"/> | <input type="checkbox"/> | 11. When filling pesticide sprayers or other containers from your well, is the end of the hose ever below the water level in the container? |
| <input type="checkbox"/> | <input type="checkbox"/> | 12. Do you have unused wells that are not capped and protected on your property?  |
| <input type="checkbox"/> | <input type="checkbox"/> | 13. Has it been more than three years since your well water was tested?   |
| <input type="checkbox"/> | <input type="checkbox"/> | 14. Did the water fail to meet water quality standards when it was tested?  |
| <input type="checkbox"/> | <input type="checkbox"/> | 15. Do you use water-treatment equipment without following the maintenance procedures recommended by the manufacturer?                      |

## Why should you care?

**Groundwater** is the underground water that supplies wells and springs and recharges surface water bodies. It is the source of drinking water for many Tennesseans. Up to 20 million gallons of groundwater may be stored under the typical farmstead—stored within 100 feet below fertilizer and pesticide storage areas, fuel tanks, livestock pens, and septic systems, all potentially major sources of pollution. The management decisions you make on your farmstead can significantly affect the quality of your drinking water and your family’s health. These decisions can also affect your potential legal liability and the value of your property.

**Surface water** includes bodies such as ponds, lakes, rivers, and streams. Besides their aesthetic and recreational value, they are often an important source of drinking water for livestock.

Most private wells in Tennessee have clean water. But many common activities around your farm or home can affect the quality of your well water, which in turn can affect your family’s health and the health of livestock or pets. Groundwater contamination on your property can also pollute the water supplies of your neighbors.

As 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 animal waste systems that are not working properly or are too close to a well increase the risk of contamination.

Prevention is the key to protecting water quality. If the groundwater that supplies your well is contaminated, it will not be easy to clean up. Your only options may be 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 private well is least likely to be contaminated if you use as many of the low-risk practices suggested in this self-assessment as you can.

*Farm•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 *Farm•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 that is downhill from a livestock pen, a fuel tank, a pesticide mixing area, or any other source

of contaminants faces greater risk of pollution than a well that is uphill from possible contaminants.

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. Use the appropriate *Farm•A•Syst* worksheets to assess the risks associated with various sources of contamination and to find out ways to reduce those risks.

## 2. Distance from pollution sources

The closer a well 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:

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 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, 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 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 cap or seal condition

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.

## 5. Well casing condition

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.

## 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 the farmstead and is probably surrounded by many potential pollution sources. In addition, 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. Taking action to correct problems identified in other *Farm•A•Syst* assessments can also help minimize the risks that older wells present.

## 8. Well construction

A well's construction type influences its ability to keep out contaminants. A **dug well** 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.

**Drilled wells**, which include all other kinds of private wells, are usually four to eight inches wide. Properly constructed, they present a low risk of contamination.

## 9. Well protection

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, or livestock.

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.

## 10. Hazardous product storage

A wellhouse 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 reduces risk. Other practices like fueling machinery, mixing pesticides, rinsing sprayer equipment, and discarding empty pesticide containers should also be handled as far away from your well 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 should 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 livestock 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.

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 well water. Some labs offer a drinking-water test package for common contaminants that is cheaper 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 or hurt livestock performance.














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.

### Remember:

-  Relocate possible contamination sources downhill from your well.
-  Divert surface-water flow away from your well.
-  Fill in depressions and mound up soil around your well.
-  Relocate possible contamination sources as far away from your well as possible.
-  Cap or seal the top of the casing.
-  Repair holes or cracks in the well casing.
-  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.
-  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 annually.

 Maintain water-treatment equipment according to the manufacturer's recommendations.

 Use *Farm•A•Syst* Worksheets to assess conditions and activities around your farm and home. Do what you can to reduce any risks identified.

## If you want more information . . .

### Contact:

- Your county 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.

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

### Download:

These sites on the World Wide Web (WWW) are good places to start when browsing the Internet for information about water quality:

- <http://funnelweb.utcc.utk.edu/~utext>  
(University of Tennessee Agricultural Extension Service)
- <http://www.epa.gov>  
(U.S. Environmental Protection Agency)
- <http://www.usda.gov>  
(U.S. Department of Agriculture)
- <http://h2o.usgs.gov>  
(U.S. Geological Survey)
- <http://wwwdtnsh.er.usgs.gov>  
(Tennessee division of USGS)
- <http://hermes.ecn.purdue.edu:8001/server/water/water.html>  
(National Extension Water Quality Database Website, Purdue University)

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Agricultural Extension Service

Billy G. Hicks, Dean