

Tests for Drinking Water from Private Wells

Why should I test my well?

As one of Wisconsin's 900,000 private well owners or private well water consumers, you probably use groundwater for doing your family's laundry, drinking, cooking, bathing and watering your garden. Municipalities are required to test their water supplies regularly to ensure the water is safe to drink. Since there is no requirement to test a private well except for bacteria when it is first drilled or the pump is changed, you are responsible for making sure your water is safe.

Most private wells provide a clean, safe supply of water; however, contaminants can pollute private wells, and unfortunately you cannot see, smell or taste most of them. Consequently, you should test your water on a regular basis. The decision on what to test your water for should be based on the types of land uses near your well.

This brochure gives information about several common contaminants found in private wells. It should help you decide when to sample your well and how often, how to find a certified laboratory and how to get more information.

What tests should be done on my water?

Total Coliform Bacteria and E.coli

Coliform bacteria live in soil, on vegetation and in surface water. Coliform bacteria found in the intestines of warm-blooded animals and their feces are called E.coli. Some strains of coliform bacteria can survive for long periods in soil and water and can be carried into well casings by insects. Bacteria washed into the ground by rainwater or snowmelt are usually filtered out as the water seeps through the soil, but they sometimes enter water supplies through cracks in well casings, poorly-sealed caps, fractures in the underlying bedrock, and runoff into sinkholes. Coliform bacteria are the most common contaminants found in private water systems. A 1994 Wisconsin survey found them in 23% of the wells tested and E.coli in 2.4% of the wells.

Most coliform bacteria do not cause illness, but indicate a breach in the water system. However, since E.coli bacteria are found in fecal material, they are often present with bacteria, viruses and parasites that can cause flu-like symptoms such as nausea, vomiting, fever and



diarrhea. Private wells should be tested at least once a year for bacteria, by a laboratory that performs an E.coli test when total coliform are present. Test again if there is a change in the taste, color, odor or appearance of your water.

The coliform test is one of the most important tests you should have done on your well water. However, bacteria are only one of many possible contaminants. A negative bacteria test is good news, but does not mean your well is free of other contaminants.

Nuisance bacteria

Iron and sulfur bacteria may also be present in well water. Although these organisms do not pose a health threat, they can affect the taste, odor and appearance of water. You may have a nuisance bacteria problem if your water has a rotten egg smell or if you notice slime in the toilet tank. If you suspect a nuisance bacteria problem, try disinfecting the well and water system before testing for iron or sulfur bacteria.

Nitrate

Nitrate forms when nitrogen from fertilizers, animal wastes, septic systems, municipal sewage sludge, decaying plants and other sources combines with oxygenated water.

In infants under six months of age, nitrate exposure can cause a serious condition called methemoglobinemia or "blue-baby syndrome." Infants with this condition need immediate medical care because it can lead to coma and death. Nitrate taken in by pregnant women may reduce the amount of oxygen available to the growing fetus. Test for nitrate if a pregnant woman or infant will be drinking the water.

Everyone should have their water tested for nitrate at least once. If you live in an area within ¼ mile of a corn, soybean or vegetable field, you should test your water for nitrate regularly. Well owners should also test for nitrate regularly if their well is located near an area where fertilizers are manufactured or handled; or an animal feed lot or manure-storage area. In general, shallow wells and wells with short or cracked casings have the highest risk of contamination; however, deep wells are also at risk in some areas. A 2007 random survey of Wisconsin domestic wells found nitrate above the 10 parts per million (ppm) standard in 14% of the wells. Forty-eight percent had nitrate above 2 ppm.

Pesticides

Pesticides are chemicals used to control "pests" such as weeds and insects. Several pesticides have been found in Wisconsin's groundwater. Some of these have entered groundwater as a result of their use on farm fields. Others have been found in groundwater following spills and improper disposal. Long-term use of drinking water that contains pesticide residues may increase your risk of developing cancer or other serious health problems.

If your well is located within ¼ mile of a corn, soybean or vegetable field, you should test your well water for pesticides. You should also consider a pesticide test if your well is within ¼ mile of an area where pesticides are manufactured, stored, mixed or loaded into application equipment. Well owners who are uncertain about the use of pesticides in their area may also want to consider having their water tested at least once.

The most common pesticide found above health-based standards in Wisconsin's groundwater is atrazine, which is used to control weeds in corn crops. An atrazine "screen," which costs around \$25, is generally a good first indicator of pesticide contamination in wells that are located near cornfields. In a 2007 random survey of Wisconsin domestic wells, 12% had atrazine present and 1% had atrazine above the drinking water standard.

Well owners who want their wells tested for other pesticides should consider a more comprehensive test. Although a comprehensive pesticide test is more expensive than a "screen," it is also more accurate and is able to detect other pesticides if they are present.

Lead

Lead was a component of plumbing solder that was used in homes with copper plumbing installed before 1985. It has also been used in brass fixtures. When water is naturally soft or acidic, lead can leach from solder or brass into drinking water. Wells located near existing or former cherry orchards in Door County may also contain lead, due to historical use of lead arsenate pesticides.

Chronic exposure to lead can damage the brain, kidneys, nervous system, and red blood cells. Pre-school-aged children are particularly sensitive to the toxic effects of lead. Exposure during pregnancy can affect the developing fetus.

Copper

Copper is present in plumbing lines in most households. Homes that have new copper plumbing or a naturally soft water supply are more likely to have copper-contaminated water. Symptoms caused by excessive copper exposure include stomach upsets, abdominal cramping, diarrhea and headaches. Because copper is also very toxic to fish, avoid using water containing high levels of copper to fill aquariums.



Lead and Copper Testing

Testing for lead and copper should be done on "first draw" water that has been stagnant in the distribution pipes for at least six hours. If lead and copper levels are high due to plumbing, they can usually be reduced to acceptable levels by flushing the faucet for a minute or two before collecting water for drinking. This method is not effective in large buildings and when the source of the lead or copper is distribution lines located outside the home.

Solvents, gasoline, and fuel oil

Household and industrial solvents, gasoline and fuel oil are examples of volatile organic chemicals or VOCs. Some VOCs are relatively non-toxic, while others can cause cancer, birth defects and reproductive problems.

Fuel oil and gasoline can enter groundwater as a result of a leaking storage tank or spill. Wells that are located within $\frac{1}{4}$ mile of an active or abandoned gasoline station, home or farm fuel tank or bulk storage tank have about a 25% chance of being contaminated and should be tested at least once for pVOCs (VOCs from petroleum products).

Paint thinners, dry cleaning chemicals and industrial solvents can enter groundwater from spills, improper disposal, leaking storage tanks and landfills. Wells that are located within $\frac{1}{4}$ mile of a landfill, dry cleaner, auto repair shop or industrial site where solvents have been used should be tested for VOCs. Because solvents, gasoline and fuel oil are common in our environment, all owners of private wells should consider having their water tested for VOCs at least once.

If you notice a solvent-like or gasoline taste or odor in your water, you should use an alternate, safe source of drinking water until your water can be tested for VOCs.

PCBs

PCBs (polychlorinated biphenyls) are suspected cancer-causing agents that were manufactured and used between 1930 and 1979. Some submersible well pumps that were built before 1979 contain PCB-containing oils and have the potential to release PCBs and contaminate drinking water supplies if they fail.

If your well has a submersible pump that was installed before 1979, you should contact a licensed pump installer to help you determine whether it contains PCBs. If you notice an oily sheen or petroleum odor in the water, switch to an alternate, safe source of drinking water and call a pump installer for assistance.

Minerals and radioactivity

In some regions of Wisconsin, groundwater contains high levels of toxic minerals and radioactivity. The location and depth of your well determine its susceptibility to these contaminants.

Arsenic

Arsenic occurs at low levels in soil and bedrock, but has been found at levels above drinking water standards in wells in all areas of the state, especially in northeastern Wisconsin. Arsenic also may occur in wells near landfills that received paint or electronic components. Exposure to arsenic at high levels can result in nervous and digestive system problems. Long-term exposure to arsenic has been linked to skin and other cancers.

Because arsenic has been found in wells across the state in various geologic formations, and the test is relatively cheap, every well owner should have their water tested at least once for arsenic.

Radium

Radium is a radioactive element found in soil and bedrock that can be released into groundwater. Radium levels above the drinking water standard have been detected in eastern and west central Wisconsin where wells draw water from deep sandstone formations, and in a few areas of northern Wisconsin where wells are constructed into granite. Exposure to high levels of radium over a period of several years can increase your risk of developing bone cancer. Consult DNR on whether to test for radium.

Boron

Boron is often present in groundwater and foods at low levels. High levels of boron can enter groundwater from landfills or other sites where fly ash has been deposited. Long-term exposure to boron can cause reproductive and developmental problems. Wells located within ¼ mile of a fly ash landfill should be tested for boron.

Radon

Radon is a colorless, odorless soil gas that can enter homes through cracks in the foundation. Radon can also be present in groundwater and may escape into your home from your water supply. Deep bedrock wells are more susceptible. Breathing air that contains radon can significantly increase your chance of developing lung cancer.

If you live in a newer, energy-efficient home or have a floor in your basement or crawl space that is dirt or is not completely sealed, you should test the air in your home. Because only a small portion of the radon gas found in a home comes from the water supply, it is not necessary to test your water unless other remedies fail to reduce radon levels in the air.

Fluoride

Water consumed by infants and preschool-aged children should be tested for fluoride. Discuss your test result with your child's doctor or dentist to decide whether he/she needs fluoride supplements. You may be advised to switch to an alternate source of water for drinking if the fluoride concentration exceeds 4 parts per million.

How can I have my well tested?

Laboratories

Use a certified laboratory to test your drinking water for possible contaminants. Labs that test for bacteria in water are certified by the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) and can be found online at: dnr.wi.gov/org/water/dwg/PrivateLabs.pdf. Labs that test for contaminants such as nitrate, pesticides, metals, and VOCs are certified by the Wisconsin Department of Natural Resources (DNR) and can be found online at: dnr.wi.gov/org/es/science/lc/PW/Lablists.htm. Laboratories are also listed in the business pages of your telephone directory under "Laboratories – Testing."

When you call a laboratory, ask if the lab is certified for the test you want. When your test has been completed, the laboratory will send you the results directly. If a Wisconsin Unique Well Number (WUWN) has been assigned to your well, you may choose to have a copy of your test results stored in a permanent file for your well by writing the WUWN on the lab form and checking the box "send copy of results to DNR." Results of water quality tests done by the State Laboratory of Hygiene are automatically reported to DNR for filing. You can find your Unique Well Number close to the sampling faucet on the water pipe entering the building from the well or on the main electrical fuse box.

Sample Collection

Water collection procedures vary depending on the type of test being done. Samples for some tests can be collected easily, while others may require a drinking water professional to collect the sample. For a reliable test result, follow the laboratory instructions exactly.

Home Water Testing Kits

"Do-it-yourself" drinking water test kits are available from building supply, hardware, and discount stores. However, there is no kit that can fully evaluate the safety of drinking water. Many kits only inform whether or not a substance is present above drinking water standards, without providing the concentration. Other kits only detect a narrow range of compounds, while missing others. Well owners should check expiration dates, ask questions about the sensitivity and accuracy of the test kit, and follow up with a test by a certified laboratory. Home water testing kits may be a useful first step, but rely on certified laboratories for complete peace of mind.

Private Well Testing Recommendations

Contaminant	Which wells or homes should be tested?	How often should I test?
Coliform Bacteria	Every well	Test once every year, or when there is a change in taste, color or odor
Nitrate	All newly-constructed wells or wells with no testing history	Two tests spaced six months apart
	Wells within ¼ mile of fertilized fields or animal feed lots	Test annually
	Wells used by pregnant women and infants	Test before pregnancy and at time of birth
	Wells that had levels close to 10 ppm	Test annually
Pesticides	Wells within ¼ mile of agricultural fields, or pesticide manufacturing, storage or mixing facilities	Test once every 5–10 years
Lead	Homes with copper plumbing installed before 1985 or brass fixtures; and naturally-soft water	Consider one time test
	Wells near Door County cherry orchards	Consider one time test
Copper	Water used to prepare infant formula or if any resident in-home experiences repeated symptoms of nausea, diarrhea or abdominal cramps. Homes most at risk have new copper plumbing or naturally-soft water.	Test before and after flushing the faucet for 2 to 3 minutes Homes with new copper plumbing should be retested in 6 months
VOCs (solvents, gasoline or fuel oil)	Wells within ¼ mile of a landfill, underground fuel or gasoline tank and wells within ¼ mile of where solvents have been used (Drycleaner, automotive garage or body shop, etc)	Test once every 5–10 years or when solvent or gasoline taste or odor is noticed
PCBs	Water with an oily sheen or petroleum odor, and submersible pump installed before 1979	Test once if needed
Arsenic	Every well	Test once Test annually if arsenic is present Retest if iron levels increase or if water changes in taste or odor
Radium	Wells in specific areas of Wisconsin	Consult with DNR or UW Extension on whether to test
Boron	Wells within ¼ mile of fly ash landfill	Test once every 5–10 years
Radon	Homes with high radon levels in the air that are not reduced by sealing basement cracks and ventilation	Test once if needed
Fluoride	Wells used by infants and preschool-aged children	Test when infant is born

How can I get more information?

The following DNR brochures can provide you with more information. They are available from DNR offices and may be available from: county Extension offices; local sanitary, zoning or health department offices; or from licensed well drillers and pump installers. They are also available on the DNR website at: dnr.wi.gov/org/water/dwg/privewelltp.



Arsenic in Drinking Water
 Bacteriological Contamination of Drinking Water
 Copper in Drinking Water
 Earwigs in Your Well
 Iron in Drinking Water
 Iron Bacteria Problems in Wells
 Lead in Drinking Water
 Nitrate in Drinking Water
 Pesticides in Drinking Water
 Radium in Drinking Water
 Radon in Drinking Water
 Restoring Drinking Water—State Funds for Replacing Contaminated Wells
 Sulfur Bacteria Problems in Wells
 Volatile Organic Chemicals in Drinking Water

UW Extension has several drinking water brochures available at: uwsp.edu/cnr/gndwater/privatewells.index. Click on “Water Quality” under the “Natural Resources” drop-down menu.

Topics and Contacts

- ✓ Interpreting Test Results
 - Certified laboratories
 - DNR website
 - UW Extension website
 - County health departments
 - Wisconsin Division of Public Health
- ✓ Pesticides
 - Wisconsin Department of Agriculture, Trade and Consumer Protection
 - Wisconsin Division of Public Health
- ✓ Pump Installation
 - Licensed pump installers
 - Licensed well drillers
- ✓ Radon
 - Wisconsin Radiation Protection Council
 - Wisconsin Division of Public Health
- ✓ Water Treatment Options
 - Licensed plumbers
 - Wisconsin Department of Commerce
- ✓ Bottled water quality
 - Wisconsin Department of Agriculture, Trade and Consumer Protection

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