

HOME WATER SAFETY

Evaluating the Condition of Your Public Community Water Supply

by Christine Mechenich, Elaine Andrews and Jim O. Peterson

This fact sheet is part of a series designed to help you determine the quality of your home drinking water, and to show you techniques available for improving it. To make the best use of these publications, include them in a household file containing well information and water test results.

Other titles in the series are:

Keeping Your Home Water Supply Safe (G3558-1)

Evaluating the Condition of Your Private Water Supply (G3558-2)

Interpreting Drinking Water Test Results (G3558-4)

Choosing a Water Treatment Device (G3558-5)

The Extension bulletin *Maintaining Your Home Well Water System* (G3399) can be used with these publications.

This series was developed by the University of Wisconsin Cooperative Extension in cooperation with the Wisconsin Department of Natural Resources and the Wisconsin Department of Commerce.

Safe public drinking water supplies were one of our country's first public health priorities. Today, all public water supplies must be tested regularly and meet water quality standards set by federal and state governments.

However, all public water supplies are not always as pure as we would like. Violations of water quality standards sometimes occur. Even when the water meets safety standards, there may still be a need to treat public water for undesirable "aesthetic" characteristics such as a metallic or chlorine taste. Some people may wish to reduce contaminants to a level below established safety standards. Finally, all public water supplies benefit from users who are concerned about protecting those supplies from contamination.

This publication tells you how to make sure that water from a public supply source is safe when it comes into your home. It also explains how to evaluate your home plumbing to keep water safe.

Who Regulates Public Water Supplies?

Public community water supplies are those with 15 or more service connections or which serve 25 or more persons on a year-round basis. Such water supplies are required to meet the construction standards of the Wisconsin code and the water quality standards of the Federal Safe Drinking Water Act of 1974 as amended in 1986 and 1996. Public wells and water systems are periodically inspected by water system personnel, and results are reported to the Wisconsin Department of Natural Resources (DNR). The DNR also gathers information about public water supplies through independent inspections.

Evaluating the Quality of Your Water

To properly evaluate the quality of the water coming out of your tap, it is important to understand where the water comes from, what is added or removed by the public water utility, and what is added (deliberately or inadvertently) in your home plumbing system.

HOW OFTEN ARE PUBLIC WATER SUPPLIES TESTED?

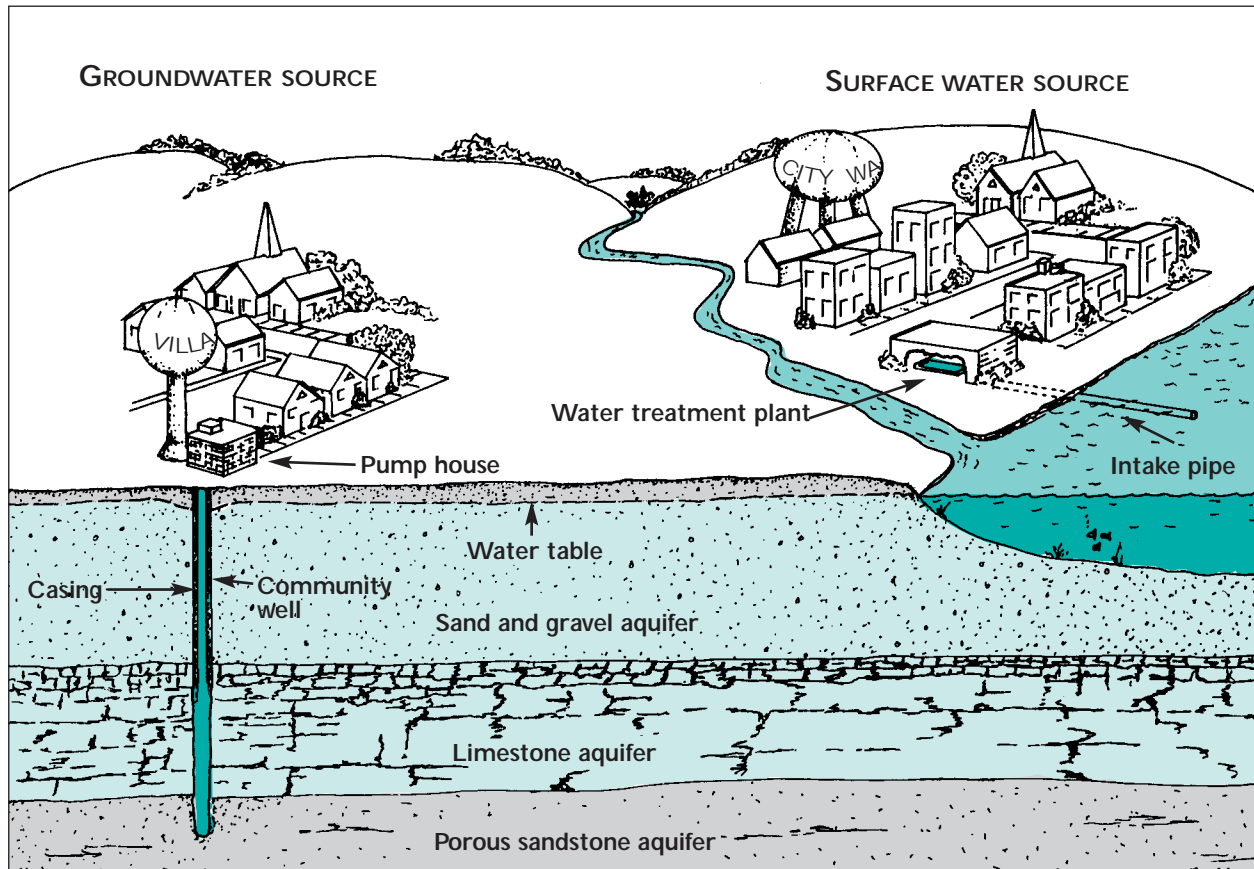
Public water supplies are tested for compliance with the primary and secondary standards on a schedule determined by federal regulations. For example, water is tested for bacteria at least once a month. Nitrate is checked every year. VOCs such as gasoline and solvents are checked every three to six years, and radioactive elements such as radium are checked every four years.

Where does the water come from?

GROUNDWATER. Most public water systems in Wisconsin obtain water from wells sunk deep into the state's abundant groundwater aquifers. The water is typically free of harmful bacteria, low in suspended matter and free of undesirable taste and odors. Some well water requires no treatment.

However, groundwater is never simply hydrogen and oxygen atoms (H_2O). Water naturally contains elements of the rock and soil formations from which the water is drawn. In many areas, groundwater is "hard"; that is, high in calcium and magnesium because it is drawn from limestone rock formations. In other areas, the water contains higher than average concentrations of iron, manganese or sulfur compounds that can add objectionable tastes, colors or odors. Some natural elements, such as the radioactive elements radium and radon, present a potential health risk when present. Finally, contaminants from human activities are sometimes detected in groundwater. Nitrate and certain synthetic chemicals have been found in some public well water. However, because public wells are usually drilled to deep aquifers, they are less likely to be contaminated by human activities than private wells.

COMMUNITIES MAY USE GROUNDWATER OR SURFACE WATER AS THEIR DRINKING WATER SOURCE.



SURFACE WATER. While most public water supplies in Wisconsin rely on groundwater, some cities along Lakes Michigan, Winnebago and Superior draw their water from the lakes. Surface water is less expensive to pump than groundwater, and is available in large quantities. However, surface water typically contains bacteria, algae, sediment and other suspended solids, and a variety of compounds (both naturally occurring and the result of human activities) that add unpleasant tastes and odors. Therefore, surface water often requires more treatment than groundwater.

TABLE 1. TYPES OF PUBLIC COMMUNITY WATER SUPPLIES IN WISCONSIN

Type	# of systems	# of people served
Surface water	20	1.5 million
Groundwater	560	2.5 million

Public Drinking Water Standards

Scientists use toxicity studies performed on laboratory animals along with data from human exposure in the workplace to make recommendations about the acceptable levels of contaminants in drinking water. All public water supplies must meet standards established by the federal government and the State of Wisconsin. Primary standards provide limits for contaminants that might affect health, such as bacteria, nitrate, lead, copper, arsenic, pesticides, solvents, radioactive elements and others. Secondary standards provide limits for contaminants that cause aesthetic problems (undesirable odors, colors, tastes) and minor health effects. Public water supplies must meet the primary standards. Treatment for secondary standards, such as iron, varies from one community to another depending on community choice and resources. Currently, there are primary standards for 82 contaminants. Every five years, the U.S. Environmental Protection Agency chooses at least five new contaminants to consider whether standards are needed; the next set of standards will be released by February, 2005.

How is the Water Treated Before It Comes into My Home?

Although the process for surface water usually involves more initial steps, surface water and groundwater are treated with many of the same methods and compounds. Possible steps in public water treatment include those listed in the sidebar.

TYPICAL STEPS IN SURFACE WATER TREATMENT

Coarse filtration—removes large debris

Micro-screen filtration—removes smaller suspended particles

Initial chlorination—kills microorganisms

Coagulation and settling—removes metals and suspended solids

Additional filtration

Final chlorination—protects water from bacterial contamination as it travels through the network of pipes

Fluoridation—helps prevent tooth decay

TYPICAL STEPS IN GROUNDWATER TREATMENT

Chlorination—protects water from bacterial contamination as it travels through the network of pipes

Fluoridation—helps prevent tooth decay

ADDITIONAL TREATMENT FOR SPECIFIC CONCERNS

Ion-exchange softening—removes hardness (groundwater)

Lime-soda ash—removes hardness, iron and manganese (usually surface water)

Aeration and filtration—removes iron and manganese (groundwater)

Silicon or phosphorus—minimizes scale formation on pipes, controls lead and copper leaching; also controls iron (in both groundwater and surface water)

Lime or soda ash—reduces the water's acidity and prevents corrosion (groundwater)

Benefits and Risks of Treatment

Obviously, water can be modified substantially by the water utility before it comes out of your tap. The U.S. Environmental Protection Agency has studied, and continues to assess, the possible health impacts of compounds added to public water supplies. There is general agreement that the health risk associated with many water treatment compounds is negligible compared to the benefits. Chlorine, however, has been the focus of intense scrutiny.

Chlorine reacts with organic matter in water to form chloroform and other chemicals known as trihalomethanes (THMs). Chlorine and its reaction products have been associated with an increased cancer risk in laboratory studies. However, public health officials have concluded that the risk from lifetime exposure to these compounds is outweighed by the health benefits—eliminating the known hazards of bacterial infections such as typhoid fever and dysentery. Public water supplies are required to routinely monitor the water to ensure that concentrations of chlorine and THMs do not exceed safety standards. THMs are generally of greater concern in surface water than in groundwater.

All the compounds found in or added to water can be removed in the home with certain specific water treatment devices. In this series, *Choosing a Water Treatment Device* (G3558-5) describes various treatment devices and their effectiveness in removing various compounds from drinking water. Choose a device approved by the Wisconsin Department of Commerce for the specific contaminants about which you are concerned.

What's added to the water in my home?

When water from the public water utility enters your home plumbing system, other compounds are often added—sometimes deliberately, sometimes inadvertently. Many homeowners add or remove compounds for “aesthetic” reasons. For example, use of a water softener is a common method of modifying household water. Many Wisconsin residents use a softener to treat excessively hard water. Softeners reduce scaling problems in pipes and water heaters by substituting sodium for the calcium and magnesium in the water. The increased sodium may not be desirable for people on a low-sodium diet. Other homeowners use a variety of treatment devices, such as a small carbon filter on the kitchen faucet, to remove undesirable tastes or odors from the family's drinking water. *When properly installed and maintained*, home water treatment devices can remove unwanted compounds and maintain safe water.

A more serious concern with changes in water quality is the inadvertent addition of lead, copper, cadmium and zinc—toxic metals that can be leached (dissolved) from pipes and fixtures. Lead was used in water main pipes, in pipes and fittings in homes until the 1930s, and in solder used to join copper pipes together until as recently as 1984.

Because lead, copper and the other metals are known to have serious health effects, all public water supplies in Wisconsin have been evaluated for the presence of lead and copper. Communities are required to determine lead levels in the source of the water (surface or groundwater) and whether distribution pipes are contributing lead. Communities must also test for lead contamination in homes. Contamination may result from lead leaching from lead pipes, lead solder joints or fittings, or copper leaching from copper pipes. Water systems are now required to treat water at the source to make it less corrosive and less likely to cause lead and copper leaching.

In Wisconsin communities where testing has been completed, no significant lead levels have been detected in *water sources*.

Ensuring the Safety of Your Drinking Water

There are several positive steps everyone can take to ensure the safety of public water supplies. Here are the basics:

Review your latest Consumer Confidence Report (CCR).

Beginning in October 1999, public community water supplies must provide an annual summary of the quality of the drinking water they supply to their customers. These reports must describe the water source, the types of treatment used, what contaminants have been found and at what levels, and the health implications. Recent water tests for your community are also available on the Department of Natural Resources (DNR) web site at

<http://www.dnr.state.wi.us/org/water/dwg/index.htm>, or from DNR regional offices. *Interpreting Drinking Water Test Results* (G3558-4) and some of the other publications listed later will help you understand the basic tests and the significance of the results.

Check water system maintenance.

Maintenance of the public water system can also influence the quality of the water that comes into your home. Pipes need to be flushed periodically; equipment used for chlorination, fluoridation and other treatment needs to be kept in good working order. To learn about maintenance of your public water supply, contact the water supplier or the municipality. Ask about violations of water quality standards and management of breaks in water mains. (Breaks need to be minimized because they create opportunities for contaminants to enter the water distribution system.) You can also check with the nearest Department of Natural Resources office and ask whether the water supplier has been cited for violations.

Minimize lead and copper levels in your home.

Find out from your water supplier whether corrosivity and lead testing have been completed. If problems were found, find out whether appropriate corrective measures (treating the water to reduce its corrosion potential) have been instituted.

CROSS CONNECTIONS AND YOUR HOME'S WATER

Many plumbing system components are protected by air gaps. For example, an air gap between a toilet tank valve and the water level in the tank keeps the tank water from mixing back into the home's clean water lines. However, water supplies can sometimes be contaminated through cross connections, or "back-siphoning," which is an inappropriate connection between potable water and contaminated water. Examples of possible cross connections include a garden hose connected to a sprayer filled with pesticides or fertilizer, the drain line from a water softener stuck down into a floor drain, a laundry tub with a hose dangling down into the tub, or an illegal connection between a private well and a public water supply system. Problems occur when the water pressure in the home drops, which can happen if a water main breaks, a pumper draws water from a fire hydrant, or even if water is used elsewhere in the house. The resulting drop in water pressure can draw contaminated water back into the clean water supply.

You can eliminate these possible cross connections by installing vacuum breakers (anti-backflow devices) or air gaps. Anti-backflow devices are available in hardware stores, cost between \$5 and \$20 each, are easy to install and require no maintenance. These devices are required in new homes on outdoor faucets, laundry tubs and sprinkler systems.

If you have questions about possible cross connections in your home, contact local plumbing inspectors or contractors to inspect your home and suggest solutions.

SOURCE WATER ASSESSMENT PROGRAM (SWAP)

The 1996 amendments to the Safe Drinking Water Act require each state to prepare a Source Water Assessment Plan. Source Water Assessment will:

- 1) identify the land areas which provide water for each public water system in the state;
- 2) inventory significant potential sources of contamination within those areas;
- 3) determine how vulnerable each system is to contamination;
- 4) make the results of the assessments available to the public.

WELLHEAD PROTECTION

If your community gets water from wells, that groundwater comes from rain or snow that percolates into the ground. The land area that contributes water to the well is called its recharge area. Within the recharge area, not only rain and snow, but also pollutants that seep into the ground, can enter the well. Wellhead protection is a way to manage the land around the well so the water supply stays clean. A community can identify the land area it wants to protect around its well, identify potential contamination sources, and manage the area to protect its water supply from pollution.

To provide further assurance that your home water supply is safe, take the following steps:

- 1 Determine when your residence was built and when water service pipes were installed to see whether lead may have been used in the water system. Use of lead pipes and fittings was discontinued in the 1930s. Lead solder was used until late 1984.
- 2 If you have lead pipes or fittings, or copper pipes with lead solder, have your water tested for lead at a certified lab. Determine whether your lead level exceeds the current limit of 15 parts per billion (ppb).
- 3 If you have copper pipes, consider also testing for copper. Copper exceeding the drinking water standard can cause gastrointestinal problems, especially in children. Cadmium and zinc are other metals that may be present at unsafe levels. Copper concentrations should be less than 1.3 ppm (parts per million), cadmium should be less than 10 ppb (parts per billion) and zinc less than 5 ppm.
- 4 Try to reduce the levels of lead and other toxic metals through a simple water pipe flushing procedure. When first drawing water in the morning or after a work day, flush the pipes by running the cold water for 2-3 minutes, or until the water gets as cold as possible. In large buildings such as apartment complexes, such flushing may be ineffective. In these cases, installing a treatment device may be necessary.

Support community efforts to protect public water supplies by wise land use.

Inappropriate activities (such as intensively applying chemicals in agricultural or residential areas) or accidents (a pesticide or fuel spill) can contaminate your public water supply. If the water supply comes from groundwater, zoning or other planning to prevent local groundwater contamination (also called wellhead protection) may be important (see sidebar). If your public water supply is surface water, point-source pollution (such as factory discharges) is regulated by the Department of Natural Resources. However, local ordinances and voluntary actions are needed to prevent nonpoint source water pollution. Nonpoint source pollution occurs when rain and melting snow wash pollutants off farm fields, streets, parking lots, residential lawns and other large areas. The DNR funds local programs to help reduce nonpoint source pollution in many areas of the state. Contact your district DNR office or county Extension office for information.

Protect water around your own home.

Learn how to properly store and dispose of hazardous household materials. Minimize your use of materials such as pesticides and waste oil on the property around your home. Hazardous materials dumped or spilled on the ground (or even disposed of in landfills) can eventually find their way into groundwater. Any materials emptied into community storm sewers will flow untreated into nearby lakes or streams.

Sources of Information

Publications

University of Wisconsin-Extension

Disposing of Hazardous Wastes from the Home (a series of four publications) by Elaine Andrews, 1989.

Home and Garden Pesticides (G3453)

Paint and Other Home Improvement Products (G3454)

Solvents and Other Home Cleaning Products (G3455)

Waste Oil and Other Automotive Products (G3456)

Improving Your Drinking Water Quality by Byron H. Shaw and James O. Peterson, 1989. (G3378)

Available from your county Extension office or from Extension Publications, Room 170, 630 W. Mifflin St., Madison, WI 53703, Call toll free: 1/887/WIS-PUBS (947-7827), or visit our website: <http://www.uwex.edu/ces/pubs/>

DNR

Lead in Drinking Water

Copper in Drinking Water

Better Homes and Groundwater

Wellhead Protection: An Ounce of Prevention

For these publications and a complete publications list, contact DNR, P.O. Box 7921, Madison, WI 53707, or DNR regional offices, or visit their web site: <http://www.dnr.state.wi.us/org/water/dwg/>

Sources of Assistance

Wisconsin DNR Regional Offices

Northeast Region, Green Bay	920/492-5800
Northern Region, Rhinelander	715/365-8900
Northern Region, Spooner	715/635-2101
South Central Region, Madison	608/275-3266
Southeast Region, Milwaukee	414/263-8500
West Central Region, Eau Claire	715/839-3700

EPA Safe Drinking Water Hotline: 1/800/426-4791

EPA web site: <http://www.epa.gov/safewater>

Toxicity of water contaminants: Wisconsin Department of Health and Family Services toxicologist—
608/266-0923 or 608/266-7480



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