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Drinking Water From Household Wells



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INTRODUCTION

Approximately 15 percent of our nation's population relies on individually owned and operated sources of drinking water, such as wells, cisterns, and springs. Forty-six states license or register individuals who install domestic water wells and construction standards for household wells are in place in forty-two states. In addition, local health departments may have requirements. Ultimate responsibility for a household well and the drinking water it provides, however, rests with the well owner.

What if you are among the 15 percent getting your drinking water from your own well—do you know if your water is safe? What kinds of things pose a threat to your well and to the ground water which is its source? What health risks do you and your family face? Who can you turn to for help or advice?

This pamphlet helps answer these questions, and provides you with more information about drinking water from individual, household wells.

GROUND WATER OCCURRENCE AND EXTENT OF POLLUTION

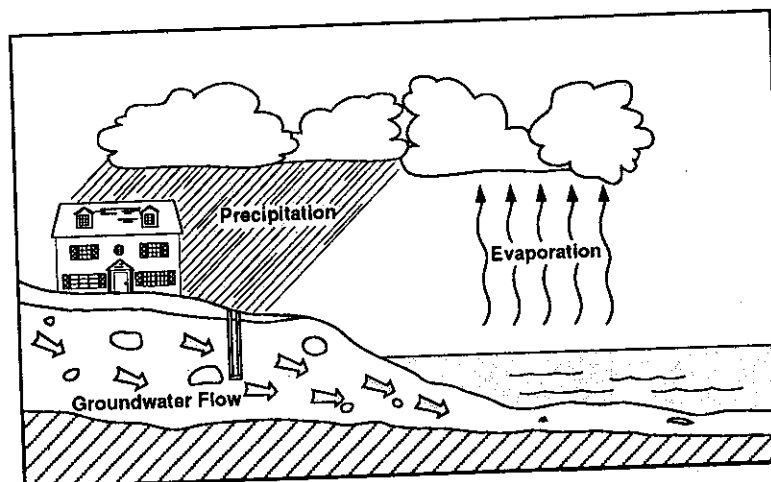
Ground water is a vast resource that underlies the earth's surface. Ground water occurrence, its vulnerability to contamination, and its value and use as a resource, vary from place to place. The vulnerability of ground water to contamination depends on hydrogeologic conditions, such as the extent and location of the recharge area, the depth of ground water, the soil and rock composition overlying the aquifer, the recharge rate, and the specific properties of the chemical contaminants.

Ground water contamination has been documented in every state of the United States. However, the exact extent of ground water contamination is not known. It has been estimated that less than 2 percent of ground water is contaminated at this point in time.

POTENTIAL GROUND WATER CONTAMINATION SOURCES

Understanding and identifying the potential sources of contamination of your well is a first step toward assuring safe drinking water for you and your family. Some of these potential threats come from nature—naturally occurring “contaminants”—that, if present in your drinking water, may present a health risk. Other potential sources come from past or present human activity—things that we do, make, and use, which may result in the pollution of the water we drink.

Following are these potential contamination sources, including the actual contaminants and an explanation of how they might end up in your drinking water:



**The
Hydrologic
Cycle.**

Source: The National Water Well Association.

Naturally Occurring Contaminants

- **Microorganisms:** Bacteria, viruses, protozoans, and other microorganisms are sometimes present, particularly in water sources close to ground level which might be exposed to surface water influence (e.g., shallow wells). While these naturally occurring organisms are usually harmless, some of them can cause a variety of illnesses (with symptoms such as nausea and diarrhea), and most importantly, these illnesses can occur shortly after one drinks contaminated water.
- **Radionuclides:** Radioactive elements such as uranium and radium may be present in underlying rock and may end up in the drinking water. Radon—a gas that is a natural product of the breakdown of uranium in the soil—may also pose a threat. Radon is most commonly a threat when inhaled and is considered a known human carcinogen that can contribute to lung cancer. Radon is less dangerous when consumed in water, but remains a risk to health.
- **Nitrates and Nitrites:** Although elevated nitrate levels are usually a result of human activity (see below), they may be found in ground water due to the breakdown of naturally occurring nitrogen compounds. Consumption of excessive amounts of nitrates and nitrites is particularly threatening to infants and children.
- **Heavy Metals:** Underlying rocks and soil may contain arsenic, cadmium, chromium, lead, and selenium. These contaminants are rarely found in individual wells at levels that present a problem, but activities such as mining and construction can release larger amounts into nearby ground water sources. If released and consumed at excessive levels, these contaminants pose a health risk.
- **Fluoride:** Although fluoride is considered essential for good dental hygiene, in some cases, consumption of excessive amounts of naturally occurring fluoride can actually damage bone tissue. Discoloring of teeth may also be a concern, although it is not a health risk.

Potential Contamination Sources from Human Activity

- **Bacteria and Nitrates:** These are abundant in human and animal waste material. If either septic tank systems or livestock management areas are located too close to a well, and if these systems or areas are not maintained properly, then contamination may result. Consumption of excessive amounts of nitrates can cause adverse health effects in very young infants and susceptible adults.
- **Household Plumbing Materials:** Corrosive water may cause plumbing materials to leach into your tapwater. Of primary concern is lead (and to a lesser extent, copper) that may have been used in pipes, solder, or fixtures. The acidity or pH, temperature, and mineral content of your water all affect how "corrosive" it is. The age of plumbing materials—in particular, copper pipes soldered with lead—is also important. The newer the pipe or solder, the more susceptible it is to corrosion. Consumption of these corrosion by-products, even at relatively low amounts, can be harmful.
- **Fertilizers and Pesticides:** In agricultural areas, fertilizers and pesticides are applied frequently. This may also be true in suburban areas where there are a lot of lawns and backyard gardens, and around golf courses. Depending upon the types and rates of chemicals used, the methods of application, and physical conditions of the local environment (soil type, topography, seasonal precipitation), these chemicals may end up in ground water. Many fertilizers contain nitrogen compounds which may break down into nitrates, possibly adding to the other sources of nitrates mentioned above. In addition, household or commercial chemicals used to treat buildings for termites or other pests may also pose a threat, again, depending on the type of chemical, the type of soil, and the amount and frequency of precipitation. For further information, see the EPA publication entitled, "Pesticides and Drinking Water Wells."

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- **Industrial Products and Wastes:** A variety of potentially harmful chemicals are used widely in local business and industry, and these chemicals may become drinking water contaminants if they are not properly managed. The most common sources of such contaminants are:
 - *Local Businesses:* Nearby factories, plants, and even small businesses such as gas stations and dry cleaners handle a variety of chemicals. Improper management, spills and improper disposal of these chemicals and their wastes can threaten ground water supplies.
 - *Leaking Underground Tanks:* Petroleum products, chemicals, and wastes stored in underground storage tanks may end up in the ground water, when improperly installed or constructed tanks or old, corroding tanks leak.
 - *Landfills and Waste Dumps:* Waste materials from nearby waste management facilities may seep out as rain falls on or floods the facility. This seepage can carry a wide variety of contaminants into ground water.
 - **Household Wastes:** Improper disposal of cleaning fluids and degreasers, used motor oil, paints and paint thinners, and soaps and detergents (often through faulty septic tanks and associated leaching fields) can contaminate ground water.
 - **Water Treatment Chemicals:** Improper handling or storage of water treatment chemicals (disinfectants, corrosion inhibitors, etc.) at the wellhead might lead to contamination.

SHOULD YOU BE CONCERNED?

YES.

The individual well owner is primarily responsible for the safety of water that is drawn from his/her well. Individual well owners do not benefit from the public health protection provided by a regulated, public water system, which must comply with federal and state regulations for various monitoring, analytical, and reporting requirements. Private wells are not subject to such federal regulations and are generally regulated on a very limited basis by the states.

In most cases, individual household wells are the concern of the local health department. Health departments may assist household well owners with periodic testing for bacteria and nitrates, as well as oversee the placement and construction of the well with respect to state and local regulations—especially with regard to the placement of a drinking water well near septic tanks, drainfields, and livestock. The bulk of the responsibility for ensuring proper construction, proper wellhead protection, and adequate maintenance, however, falls on the well owner.

The amount of risk involved is based on your physical surroundings, including the characteristics of the aquifer from which you draw your water; the quality of construction and maintenance of your well; and the human activity that takes place in your area.

WHAT YOU SHOULD DO

Six basic steps will help you determine and maintain the adequacy of your drinking water:

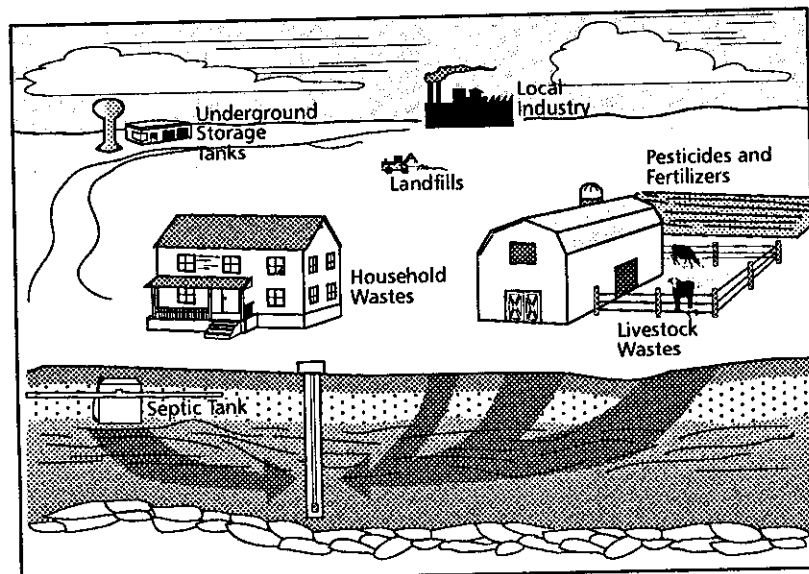
- Identify potential sources of contamination
- Have your water tested periodically
- Have the test results interpreted properly and explained clearly
- Establish and implement a regular maintenance schedule for your well and keep accurate, up-to-date records
- Consult the "local experts"
- Remedy any problems, if necessary

Identifying Potential Contamination Sources of Your Well

The actual presence of contaminants in your well will be affected by local geology and climate, your water system's construction, the extent of human activity in the area, and your proximity to contamination sources. Ground water contamination is usually localized and generalizations are difficult to make. The best way to identify potential contaminants is to consult a local expert for guidance on conditions in your area. (See "Consult the Local Experts")

- Obtain a copy of the list of Federal drinking water standards. Even though these standards do not apply to household wells, you could use it as a guide to help determine potential contaminants in your water. Keep in

mind, however, that your individual state has developed its own drinking water standards and in some cases they may be stricter or more extensive than the federal standards. To obtain the list of federal standards, contact EPA's Safe Drinking Water Hotline (see below). For the state standards, contact your state drinking water program or local health department. In addition, the EPA, Office of Drinking Water, also has chemical and health risk information for a number of drinking water contaminants available through the Hotline.



Potential Groundwater Contamination Sources

Source: The National Water Well Association.

Have Your Well Water Tested

Household wells should be tested periodically. Have a competent laboratory or health department test your water annually for total coliform bacteria (from human and animal wastes), nitrates, total dissolved solids, and pH levels. If you suspect other contaminants are present, tests for these should also be done. Chemical testing can be expensive, so you will want to reduce the list by identifying potential contaminants specific to your situation. Again, local experts may be of assistance.

In many cases, county health departments provide testing and analysis for bacteria and nitrates. For other contaminants, health departments, environmental offices, or county governments should have a list of state certified laboratories. A list of labs can also be provided by the State Laboratory Certification Officer. Call EPA's Safe Drinking Water Hotline for the name and phone number of your state's certification officer.

Laboratories often provide sampling bottles and instructions for you to use. Follow these instructions carefully to ensure proper testing and accurate results.

Your water should also be tested after replacing or repairing part of the well system (piping, pump, or the well itself) or if you notice a change in the water's look, taste, or smell.

Interpretation and Explanation of the Results

The amount of risk associated with a drinking water contaminant depends on the nature of the specific contaminant, individual susceptibility, and the concentration or amount present in the water. Some contaminants present short-term or acute risks to human health. For example, it may take only one bacterium or virus to make a person sick, and the consumption of excessive nitrate levels over a relatively short period of time can be dangerous. On the other hand, many other contaminants pose a long-term or chronic threat to your health. That is, a little bit on a regular basis over a long period of time could cause health problems.

EPA drinking water regulations for public water systems aim to protect people from both short and long term health hazards. The maximum allowable amounts of contaminants in treated water are based on a lifetime of protection. Public water systems are required to routinely monitor their water prior to delivery to ensure that it meets established standards.

The individual well owner, however, must rely on proper interpretation and explanation of lab results in relationship to federal or state drinking water standards to know if the water is safe. In some cases, the laboratory will provide a very helpful explanation. Otherwise, the well owner will have to rely on others.

The following sources may be able to help:

- **The state water well contractor licensing agency** can help you understand the significance of the laboratory results, and will also provide information on proper well construction and protection of your water supply. The agency is usually located in the state capital (or other major city) and is often part of the department of health or environmental protection. Check the "government pages" of your local phone book or call the American Ground Water Trust at (614) 761-2215 for the licensing agency phone number.
- **The local health department** may help you understand the results, and might also provide information about any present or potential concerns it has regarding contamination of drinking water in your area, as well as offer suggestions about how to protect the well against contamination.
- **The state drinking water program** can explain how your lab results compare to the standards established for the state's public water systems. State programs are usually located in the state capital (or another major city) and are often part of the department of health or environmental regulation. Consult the blue "government pages" in your local phone book for the proper address and phone number.
- **The U.S. Environmental Protection Agency** operates a toll-free, nationwide information service—the **Safe Drinking Water Hotline** (see last page). The Hotline can help by explaining the federal regulations that apply to public water systems, and further, by comparing the "numbers" in your lab report to the established federal standards. In addition, the Hotline can provide copies of the federal drinking water regulations, which contain a list of contaminants monitored by public water systems; provide copies of health advisories that have been prepared for specific drinking water contaminants; locate your state drinking water program; and identify your state laboratory certification officer to get a list of approved labs.

Well Construction and Maintenance

Proper well construction and continued maintenance of the system are essential to the provision of an adequate water supply. Your state water well contractor licensing agency, local health department, or local water system professional should be able to provide information on well construction.

Many homeowners tend to forget the value of proper maintenance until problems reach crisis levels that demand immediate and often drastic action. Maintaining a well involves early detection and correction of problems that could reduce well performance. Keep up-to-date records of well installation, repairs, pumping tests, and water tests. Such well records can help identify changes in the supply, contamination of the water source, or deterioration of the water system. If you encounter problems, have a local expert check your well construction and maintenance records to determine if your well is within acceptable standards.

And, importantly, protect your own well area, by proper storage and disposal of household and lawn care chemicals and wastes; careful application of fertilizers and pesticides; sound agricultural practices to reduce erosion and prevent surface runoff; routine checks of underground storage tanks that hold home heating oil or gasoline; and adequate protection from the wastes of livestock, pets, and wildlife.

Consult the Local Experts

Valuable sources of information, advice, and assistance can be found close to home. Following is a list of these "local experts":

- The local health department can help you in many ways, as mentioned above. Within the health department, a registered sanitarian is likely to be the most experienced and knowledgeable person to identify and correct problems with private wells.
- Local professional water well contractors are also knowledgeable about well drilling and familiar with the particular geology and water conditions in your area. Look in the yellow pages of your phone book or contact your state water well contractor licensing agency. Call the National Water Well Association at (614) 761-1711 to identify NWWA certified water well contractors in your area.



Source: National Rural Water Association

- The nearest **public water system** may explain what they consider common threats to their supply of water and may assist you with sampling, analysis, and interpretation of tests done on your water. Consult the local health department or the phone book for the name and address of the closest system.
- **Local or county planning commissions** may provide information about past and present land use in your area.
- **Local County Extension agents** may have information about local land use, including agriculture and forestry practices, and may also provide information about water testing.
- **The U.S. Soil Conservation Service and the U.S. Geological Survey**—both in the blue pages of your local phone book—may provide information about local soils and the hydrogeological nature of the area (i.e., where the local water supply is located, how it is recharged or replenished, and how readily it can become contaminated).
- Your **local public library** may also have records and maps that can provide this information, including the occurrence of radon.
- **Nearby colleges and universities** have research facilities that can provide a wealth of knowledge and expertise, as well as a possible place for testing.

Remedy Problems Immediately

If you determine that your well water is contaminated, remedy the problem as soon as possible. In some cases, you may need to disinfect the water source, have a new well drilled, replumb or repair your system, or possibly consider hooking into a nearby community water system (if one is available). If you have a new well drilled or connect to a community water system, the abandoned well should be properly decommissioned. Consult "local experts" for assistance.

You might also consider the installation and use of an appropriate water treatment device. Information about treatment devices can be obtained from the following:

Water Quality Association
P.O. Box 606
Lisle, IL 60532

National Sanitation Foundation
P.O. Box 1468
Ann Arbor, MI 48106

Public Information Center
U.S. Environmental Protection Agency
401 M Street, SW
Washington, DC 20460

Please note: different types of home water treatment devices are designed to remove different types of contaminants—no one device does it all; further, it is essential that home treatment devices are strictly maintained by the user to assure their continued effectiveness. For more information, obtain a copy of EPA's pamphlet, "Home Water Treatment Units."



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