



# Protecting Our Ground Water



*Groundwater bursts forth in a spectacular display from Yellowstone National Park's geyser Old Faithful.*

# Ground Water: A Vital, Fragile Resource

## Ground Water Contamination Threatens Our Drinking Water Supplies

The largest supplies of fresh water — up to 96 percent of the world's total water resources — lie *under* the earth's surface.

Approximately 140 million Americans — more than half the population — get their drinking water from underground sources.

Contaminated ground water can threaten the health of people whose drinking water comes from underground sources. Forty-four percent of the waterborne disease outbreaks between 1981 and 1988 were linked to contaminated ground water.

### Prevention Is Better Than The Cure

Cleaning up contaminated ground water is expensive, difficult, and sometimes impossible. Since ground water moves slowly, contaminants do not mix or spread quickly. Instead, they remain concentrated in slow-moving plumes that may persist for many years. When ground water becomes contaminated, surface water systems are at risk because the contaminants may eventually spread into springs, rivers, lakes, or other surface water bodies.

## Basic Facts About Ground Water

### Underground Reservoirs

Ground water is stored primarily in underground layers of rock, sand, or gravel known as *aquifers*. Rarely is ground water found in large underground lakes or streams.

Ground water tends to travel slowly, sometimes only a few inches or a few feet each year. It moves within an aquifer much like water seeps through coffee grounds in a drip filter. (Of course, the forces that affect the rate and direction of ground water flow are much more complex than the forces at work in making coffee.)

### The Ground Water/Surface Water Connection

Ground water doesn't remain underground forever. It comes to the surface through springs, or it seeps into rivers, lakes, and other surface water bodies, and is pumped to the surface by water supply wells. In some areas of the country, especially the arid regions, aquifers contribute large portions of the water found in streams. This helps plants, animals, fish, and birds survive during droughts.

### Recharging Ground Water Supplies

Aquifers are replenished, or recharged, by water on the surface of the land that seeps into the ground. The water may come from precipitation, or it may come from rivers, lakes, or ponds.



In many parts of the country, recharge areas lie close to the surface of the land. Consequently, they are vulnerable to contamination caused by agricultural, industrial, or residential activities. The depth of the aquifer, the types of soil above it, and many other factors affect the potential for ground water contamination.

## Sources of Ground Water Contamination

Ground water resources across the country are threatened by a number of contamination sources. These include leaking storage tanks, septic systems, hazardous waste sites, landfills, and the widespread use of chemicals.

**Storage tanks** contain gasoline, heating oil, chemicals, and countless varieties of other liquids either above or below ground. When

storage tanks leak, their contents may contaminate ground water.

An estimated 10 million storage tanks are buried in the U.S. Over time, many of these tanks corrode or crack, and when they do leaks can result. Studies estimate that between 3 and 25 percent of all **underground storage tanks** are leaking at any given time.

The 1990 Water Quality Report to Congress ranked **septic systems** as the second greatest source of ground water contamination. Approximately 20 million American households dispose of 3.5 billion gallons of liquid waste in septic systems each day. Improperly located, designed, constructed, or maintained septic systems can leak bacteria, nitrates, viruses, detergents, household chemicals, and other pollutants.

There are about 19,000 known abandoned and uncontrolled **hazardous waste sites** in the U.S., and their ranks are expected to grow as surveys continue to find new ones. Preliminary studies of 10,000 sites found some degree of ground water contamination at 4,000 locations.

U.S. communities and industries dispose of household and nonhazardous wastes in some 93,000 **landfills** nationwide. The great majority of these landfills are current or potential sources of ground water contamination.

Hazardous and nonhazardous liquid wastes

from municipalities and industry are held in more than 180,000 **surface impoundments** such as pits, ponds, and lagoons. Older impoundments were often situated and designed without regard for protecting ground water supplies. Consequently, many impoundments are located directly over, and threaten to contaminate, aquifers that supply drinking water.

**Pesticide and fertilizer use** by homeowners and farmers also can lead to ground water contamination. Chemical pesticides and fertilizers can leach directly into aquifers, or they may mix with precipitation or surface runoff first. The improper handling of animal wastes on farms, ranches, feedlots, and similar operations may also result in ground water contamination.



*Removing the leaking underground storage tank, at right, will protect the ground water below it.*



*Unless they are contained, feedlot wastes may sink directly to the aquifer below.*



## What You Can Do

The best way to protect ground water is to prevent pollution from entering your water supply. Federal and state agencies have expanded their efforts to prevent ground water contamination, but private citizens also have an active role to play. Here are a few things you can do:

- **Read this pamphlet** to learn more about how ground water is most often contaminated. Which activities take place in your community? How are they controlled? Your local fire department or local emergency planning committee (LEPC) may have information on companies that use toxic or hazardous materials and on the location of underground storage tanks.
- **Familiarize yourself with your local ground water resources.** Do you know which aquifer supplies your drinking water? Do you know how many people use it and for what purposes? Potential sources of such information include your local library and your local water supply agency.
- **Learn how waste products can threaten ground water.** Find out how your community disposes of waste products. What waste products are used or produced

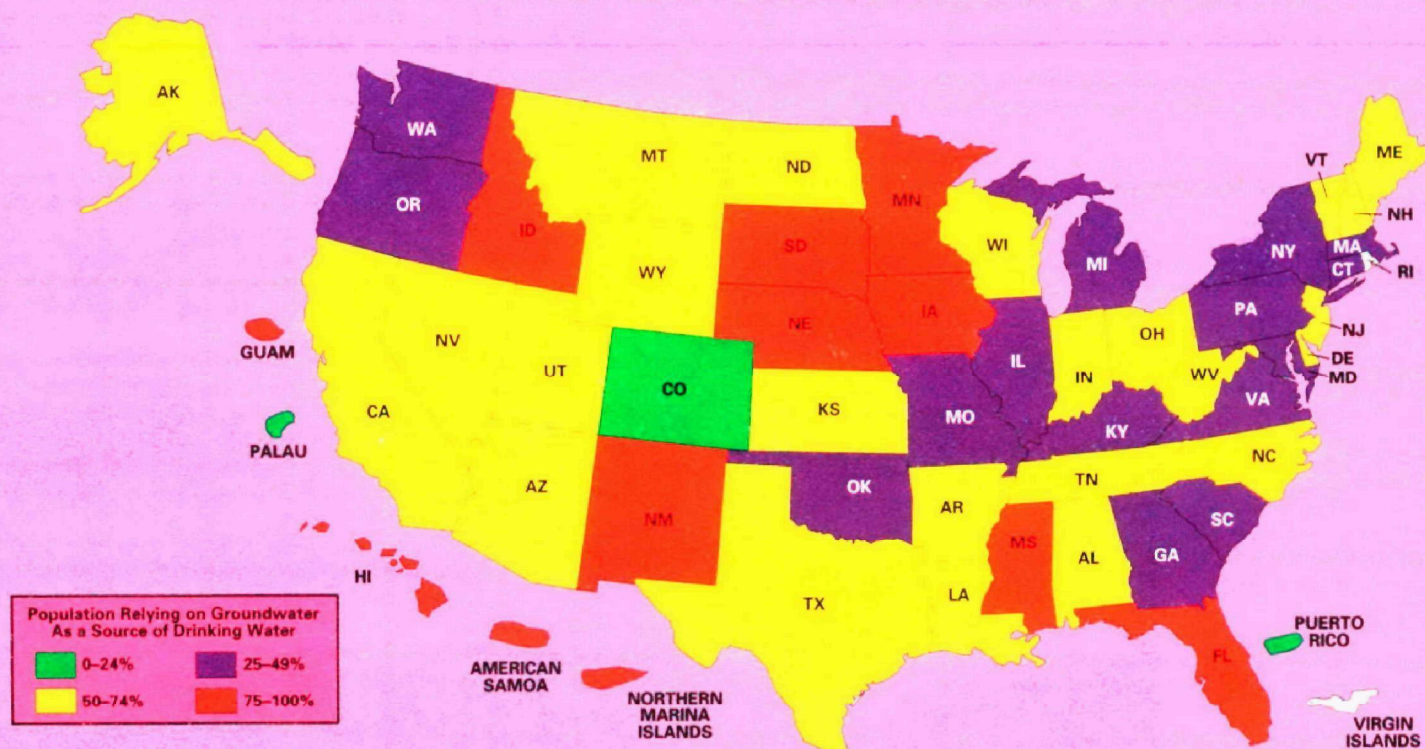
by large industries in your region? How are toxic substances used, handled, or stored? Is there a special program to dispose of household wastes such as solvents, empty paint cans, or pesticide containers? Are local ordinances governing septic tanks adequate to protect ground water?

- **Remember that your life-style can affect ground water.** How you choose to live can influence the quality of your community's ground water. For example, if you change your own motor oil, how do you dispose of the used oil? Do you dispose of toxic substances properly? Do you recycle?
- **Locate your wellhead protection area.** Find out if your community has a Wellhead Protection Program to protect the area around its drinking water wells. Are the boundaries of the ground water or wellhead protection areas marked with signs? Learn what you can do to reduce the threats to the Wellhead Protection Area.
- **Plan for emergencies.** Get the phone number for reporting oil or chemical spills and other kinds of contamination that may threaten ground water supplies. Find out whether your local agencies have contingency plans for responding to spills

and leaks of toxic substances.

- **Identify the person in charge.** Learn who is responsible for managing local ground water supplies. Participate in local water planning and conservation initiatives.
- **Get involved in your community.** Determine whether existing ground water protection authorities are adequate. Find out if local ordinances protect ground water sufficiently and if there is an effective program to penalize polluters.
- **Plan for the future.** Because we rely heavily on our ground water supplies, the nation's future health and prosperity are linked to our continued supply of clean, safe ground water. The key to ensuring the future availability of this critical resource is to prevent its contamination. We all should become familiar with the common sources of ground water contamination, and we should support the efforts of our state and local governments to protect ground water supplies. For more information about ground water protection, contact your state or local department of natural resources, environmental protection, or public health. Information also is available from EPA's 10 regional offices.

## How Much Does *Your State* Depend on Groundwater?





## EPA Regional Offices

**Region I (Serving Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont)**

Office of Ground Water  
Water Management Division  
U.S. EPA, Region I  
JFK Federal Building  
Boston, MA 02203-2211

**Region II (Serving New Jersey, New York, Puerto Rico, and Virgin Islands)**

Ground Water Management Section  
Water Management Division  
U.S. EPA, Region II  
26 Federal Plaza  
New York, NY 10278

**Region III (Serving Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, and West Virginia)**

Office of Ground Water  
Water Management Division  
U.S. EPA, Region III  
841 Chestnut Street  
Philadelphia, PA 19106

**Region IV (Serving Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee)**

Office of Ground Water  
Water Management Division  
U.S. EPA, Region IV  
345 Courtland Street, NE  
Atlanta, GA 30365

**Region V (Serving Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin)**

Ground Water Protection Branch  
Water Management Division  
U.S. EPA, Region V  
77 West Jackson Boulevard (WG-16J)  
Chicago, IL 60604

**Region VI (Serving Arkansas, Louisiana, New Mexico, Oklahoma, and Texas)**

Office of Ground Water  
Water Management Division  
U.S. EPA, Region VI  
1445 Ross Avenue  
Dallas, TX 75202-2733

**Region VII (Serving Iowa, Kansas, Missouri, and Nebraska)**

Office of Ground Water  
Water Management Division  
U.S. EPA, Region VII  
726 Minnesota Avenue  
Kansas City, KS 66101

**Region VIII (Serving Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming)**

Office of Ground Water  
Water Management Division  
U.S. EPA, Region VIII  
999 18th Street  
Denver, CO 80202-2405

**Region IX (Serving Arizona, California, Hawaii, Nevada, American Samoa, and Guam)**

Office of Ground Water  
Water Management Division  
U.S. EPA, Region IX  
75 Hawthorne Street  
San Francisco, CA 94105

**Region X (Serving Alaska, Idaho, Oregon, and Washington)**

Office of Ground Water  
Water Management Division  
U.S. EPA, Region X  
1200 6th Avenue  
Seattle, WA 98101



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# Other Major Sources of Contamination

When ground water is pumped from an aquifer near the seacoast faster than it is replenished, salt water often intrudes and reduces the usefulness of the remaining fresh water. A variety of other modern-day practices — legal, illegal, or accidental — may also threaten to contaminate ground water. These include:

- The use of **highway deicing compounds** and the practice of coating road surfaces with **waste oil**;
- Illegal “**midnight dumping**” of hazardous waste and **accidental spills** of fuels or chemicals;
- Runoff contaminated by **mining wastes**;
- Inadequately designed or operated **underground injection wells** used for waste disposal or the production of oil, gas, or minerals.

## Protecting and Preserving Ground Water

**EPA Ground Water Protection Programs**  
The Ground Water Protection Division coordinates the Agency’s activities under the

various laws that relate to ground water. Similar offices in the 10 EPA regions work directly with the states. EPA’s ground water protection programs include:

- **Wellhead Protection.** This program relies on community efforts to protect drinking water supplies. While national regulatory programs can provide a “hammer” to wield over polluters, a preventive approach to ground water protection is most effective. Communities have access to information on local contamination sources and can implement land use controls to manage them. EPA recommends five steps communities can take to implement wellhead protection:

1. Form a community planning team.
2. Define the land area around the wellhead to be protected.
3. Identify and locate potential contaminants.
4. Manage the protection area.
5. Plan for the future.

- **Comprehensive State Ground Water Protection Program.** EPA developed this program to give states the primary role in coordinating federal and state ground-water-related programs. A resource-based approach established by each state fosters program coordination.
- **Sole Source Aquifers.** Anyone, including a private citizen, can petition EPA to designate an aquifer as a community's "sole or principle source" of drinking water; the petitioner must, however, demonstrate to EPA that is indeed the case. Once EPA makes a "sole source" designation, the Agency has the authority to review any proposed project that receives federal funds and that has the potential to contaminate the aquifer.

*For more information on Wellhead Protection Programs, Comprehensive State Ground Water Protection Programs, and Sole Source Aquifer designations, contact your state environmental agency or your EPA regional office.*

## **Examples of How It Works At The Community Level**

### **Dayton, Ohio**

The city of Dayton began developing a Wellhead Protection Program in 1985. Two years later, a fire at a paint warehouse called that program into action.

The warehouse was located in a Wellhead Protection Area, so fire officials consulted the Wellhead Protection Coordinator and the Water Department Director about controlling the blaze. Fighting the fire with water would flush paint into — and through — the soil into the ground water that supplied the city's drinking water wells. Consequently, officials decided to let the fire burn itself out, thus protecting the city's drinking water supply and preventing a costly contamination incident.

### **North Kingston, Rhode Island**

Residents initiated wellhead protection activities because they were concerned about the possible effects a proposed landfill expansion might have on their drinking water supply. As they put a Wellhead Protection Program in place, residents found that one of the town's drinking water wells was located in

a public works department supply yard. The routine activities that took place at the yard could have contaminated the town's drinking water. As a result of the community's wellhead protection activities, the public works department relocated its supply yard outside the Wellhead Protection Area, thus reducing the risk of ground water contamination.

### **Norway, Maine**

The town's Water District originally was surrounded by undeveloped land, but eventually several shopping centers and gas stations were built in the area. Concerned about potential threats to its drinking water well, the Water District commissioned a wellhead protection study in 1988. Two years later, when a gasoline spill was discovered only 350 feet from the town's well, the Water District used the study results to speed clean up and keep costs low.