How is groundwater contaminated?

In the past, because we did not understand how vulnerable groundwater was, we have been careless. Even today gasoline and other harmful liquids leak from underground storage tanks into the groundwater supply. Pollutants soak into groundwater from poorly constructed landfills or septic systems. Groundwater is polluted by runoff from fertilized fields, livestock areas, abandoned mines, salted roads and industrial areas. Few people realize it, but homeowners can contribute to groundwater contamination by dumping household chemicals down the drain or pouring them on the ground. Further, because groundwater moves so slowly, the contamination is likely to remain concentrated and close to the point where the pollution occurred. When contaminated, groundwater quality must be restored before it can be used.

What are the effects of groundwater contamination?

Groundwater contaminated with bacteria, chemicals, pesticides, gasoline or oil can result in serious human health problems. Those who drink it or come in contact with it can suffer bacterial diseases, nervous system disorders, liver or kidney failure, or cancer. Feedlots, malfunctioning septic systems, and the overuse of farm chemicals can pollute groundwater with bacteria and nitrates. The health of people and animals drinking contaminated groundwater can be jeopardized.

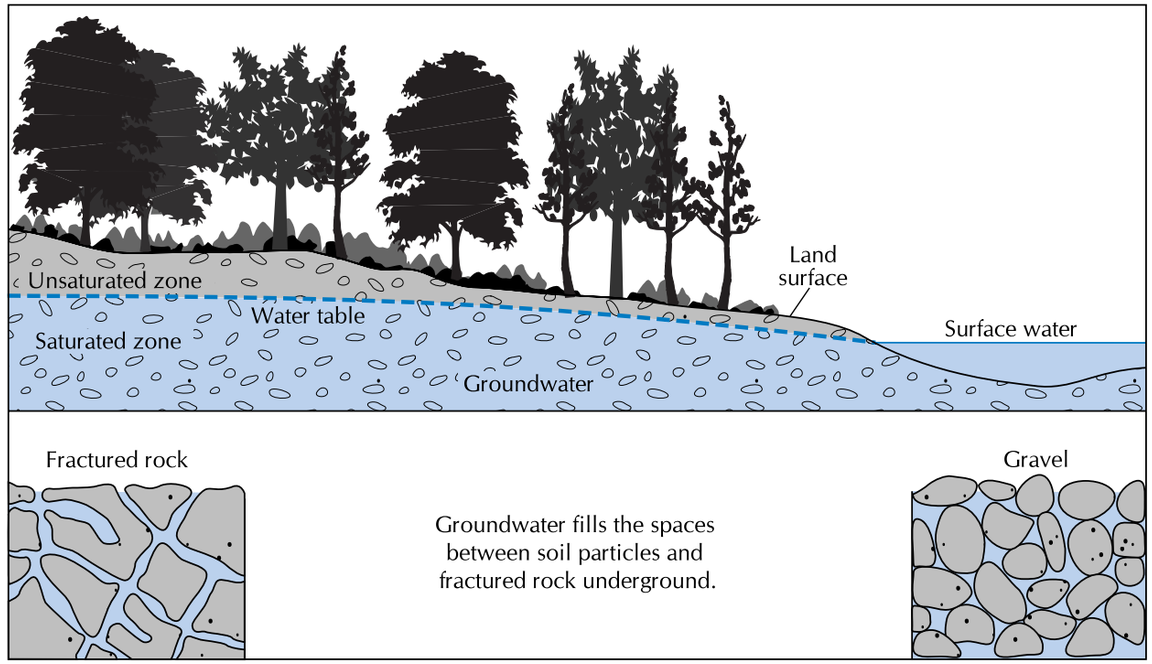

Image adapted from the United States Geological Survey

terms

aquifer: an underground geological formation able to store and yield water

discharge: an outflow of water from a stream, pipe, groundwater aquifer, or watershed; the opposite of **recharge**, when water enters the saturation zone through precipitation such as rain or snow

groundwater: water found in the spaces between soil particles and cracks in rocks underground; groundwater is a natural resource that is used for drinking, industry, and growing crops

hydrologic cycle: (also known as the water cycle) The paths water takes through its various states—vapor, liquid, solid—as it moves throughout the ocean,atmosphere, groundwater, streams, etc.

impermeable layer: a layer of materialsuch as clay in an aquifer through which water does not pass; also known as a confining layer

saturation zone: the portion below the earth's surface that is saturated with water is called the zone of saturation. The upper surface of this zone, open to atmospheric pressure, is known as the water table

unconfined aquifer: an aquifer containing groundwater, that has an impermeable layer below but not above it; a **confined aquifer** is groundwater between two layers of impermeable clay or rock

water table: the top of an unconfined aquifer; indicates level below which soil and rock are saturated with water

Groundwater facts

- Groundwater is a natural resource that is used for drinking, recreation, industry, and irrigation.
- The average American uses 100 gallons of water each day.
- Nearly 3/4 of the water that comes to our homes goes down the drain.
- Of all of the earth's water that's useable by humans, 98% is groundwater.
- It takes 1,303 gallons of water to produce a single hamburger.
- Little leaks can waste a lot of water. A faucet that leaks at a rate of one drop per second wastes five gallons of water per day and 2,082 gallons per year.
- Americans drink more than one billion gallons of tap water per day.
- What is poured on the ground today can end up in our drinking water many years later.
- We all have the responsibility to protect groundwater.

Sources: United States Geological Survey
United States Environmental Protection Agency

How is groundwater used?

The majority of groundwater that is pumped is used for irrigation and for drinking. In fact, half of the U.S. population depends on groundwater for drinking purposes. Industrial processes also use large amounts of groundwater. In addition, groundwater is being used at an accelerating rate. In some of this country's drier areas, "overdrafting," or withdrawing more from the groundwater supply than nature puts in, is a serious problem. In areas with porus soils and plentiful rainfall, precipitation can recharge groundwater adequately. In other areas with densely packed soils and/or less rainfall, groundwater depletion may occur.

How can you tell if groundwater is contaminated?

Basic tests can determine if bacteria and nitrates are present. More sophisticated and expensive tests are required to detect pesticides and chemicals. Local health agencies and extension educators can assist in obtaining well water analyses.

Can contaminated groundwater be restored?

Yes, it is possible but it is always time-consuming, and expensive. Many communities whose drinking water sources have become contaminated must spend millions of dollars to remove contaminants from the water before it can be piped to homes and businesses. Even then, the cleanup process rarely removes all of the contamination in the water and can double or triple the cost of water. It is far better to prevent contamination in the first place.

How is groundwater contamination prevented?

Communities generally protect groundwater and prevent pollution by carefully monitoring landuse, minimizing hazards such as shallow injection wells, and making sure other practices, such as de-icing roads, use environmentally friendly materials. Restricting certain activities near the wellfield area and removing hazardous materials such as leaky tanks is also helpful. Individuals help protect groundwater by using and disposing of chemicals properly and getting directly involved in monitoring and education activities.

What can you do?

You may be thinking, "All of this is great, but what does it have to do with me?" Plenty. Groundwater is contaminated by people and it needs to be protected by people.

Individuals can do several things to protect groundwater:

1. Dispose of chemicals properly.
2. Take used motor oil to a recycling center.
3. Limit the amount of fertilizer used on plants.
4. Take short showers.
5. Shut off water while brushing teeth.
6. Run full loads of dishes and laundry.
7. Check for leaky faucets and have them fixed.
8. Water plants only when necessary.
9. Keep a pitcher of drinking water in the refrigerator.
10. Get involved in water education.

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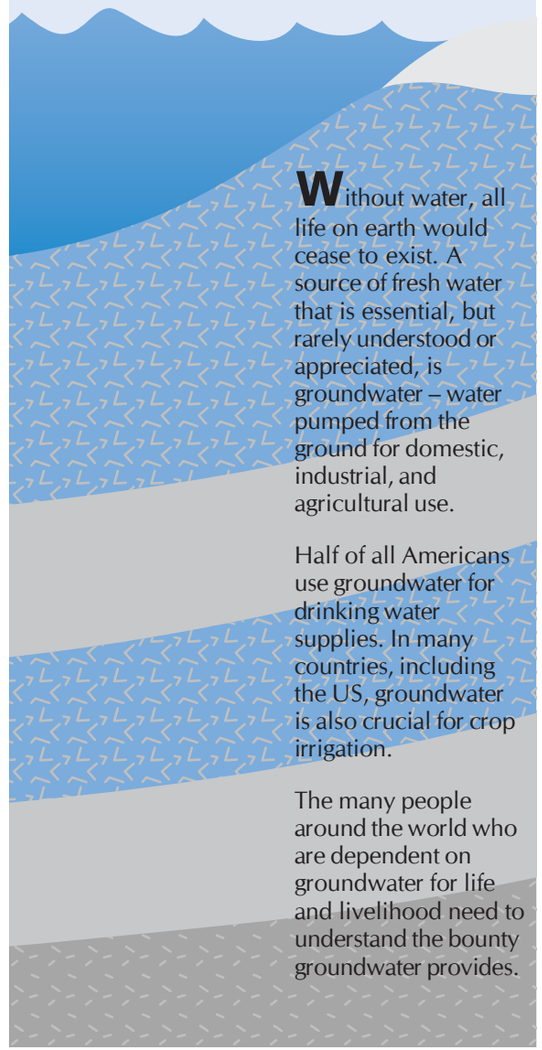
Groundwater Basics



Without water, all life on earth would cease to exist. A source of fresh water that is essential, but rarely understood or appreciated, is groundwater – water pumped from the ground for domestic, industrial, and agricultural use.

Half of all Americans use groundwater for drinking water supplies. In many countries, including the US, groundwater is also crucial for crop irrigation.

The many people around the world who are dependent on groundwater for life and livelihood need to understand the bounty groundwater provides.

What is groundwater?

Contrary to what a lot of people think, groundwater is rarely found in underground rivers or lakes in caverns. Instead, groundwater is water that fills the cracks and pores of rocks and sediments that lie beneath the surface of the earth–much the way water saturates a sponge. Due to its protected location underground, most groundwater is naturally clean and free from pollution.

Where is groundwater located?

Groundwater is available at least in small amounts nearly everywhere, though the quantity available and the geologic materials and conditions that control the occurrence of groundwater vary from one region to another. Depending on the geology of an area, for example, a person may have to drill only a few feet or may have to drill several hundred feet before penetrating geological formations that will yield enough water for use because groundwater supplies are not distributed evenly.

Where does groundwater come from and how much is there?

Groundwater, like all water on earth, comes from precipitation–rain and snow–which percolates through the soil until it reaches the zone of saturation. At this point, the water moves towards sites of groundwater discharge, such as local springs, lakes and oceans. There is a great deal of groundwater available to us; in fact, 98 percent of the world's total supply of drinkable water is groundwater.

How does groundwater move underground?

An aquifer is not only a storage reservoir, but also a pathway for water movement underground as a vital step of the water cycle. Underground, water moves from an aquifer's recharge areas (areas where water seeps into the saturation zone from rain fall, snow melt, etc.) to it's discharge areas (springs, lakes). Water moves very slowly underground, often measured in inches per day, and may take from a few days to hundreds of years to reach its natural discharge area. Groundwater is constantly on the move.