The Water We Drink

Written for youth in grades 6-12, this tool introduces public and private water systems and includes an activity on how to read a water quality test report.

Why is drinking water important to you?
You have probably heard someone say you should drink at least eight glasses of water daily, right? Water is pretty essential to your body. It makes up over 60% of your total body weight, including over 75% of your brain. Every day, water does fantastic things inside your body. Water helps to keep your body at a constant 98.6° F. Water carries nutrients and oxygen to your cells. Water cushions your joints as you move. Water flushes toxins out of organs and helps you eliminate waste. Your daily body functions use water that leaves the body through sweat, exhaling, and using the bathroom, so you need to drink new water and fluids into your body every day.

How much drinking water do we have?
When you look at a globe or a map of the Earth, it seems we have a lot of water. Water covers 72% of the Earth. Unfortunately, we can’t use most of that as drinking water. Over 97% of the Earth’s water is salt water in oceans and seas. Another 2% is frozen in icecaps and glaciers. That leaves less than 1% of the Earth’s water for everyone to drink. As the Earth’s population grows and many countries are further developed, fresh water is becoming more and more limited.

Did you know…? You can live for up to a month without eating food, but you can only live for up to a week without drinking water!

Where We Find the Earth’s Water

- Ocean Water: 97.2%
- Icecaps and Glaciers: 2%
- Water in the Atmosphere: 0.001%
- Water in Salt Lakes & Inland Seas: 0.008%
- Groundwater: 0.62%
- Fresh Water Lakes: 0.09%
- Rivers: 0.0001%

Where does your drinking water come from?
Your drinking water comes from natural sources that are either groundwater or surface water.

Groundwater comes from rain and snow that seeps into the ground. The water gets stored in open spaces and pores or in layers of sand and gravel known as aquifers. We use water wells or springs to harvest this groundwater.

Surface Water also comes from rain and snow. It is the water that fills the rivers, lakes, and streams.
Water is pumped, both from groundwater or surface water sources, into pipes or tanks. The pipes eventually lead to our homes, schools, businesses, and any place where you can turn on the tap and drink water.

Most people in the US who live in large cities and towns get their water from a public water supply. A local government agency or private industry delivers water to your home if you have a public water supply. It comes through a network of underground pipes from a large water source that you share with your neighbors and community. Your household will receive a bill from your public water supplier based on how much water you use.

How much money is clean drinking water worth to you? Did you know that most people in the US pay more each month for their cable TV or cell phone than they do for their water? If water suddenly became more expensive, what might you give up to continue having clean drinking water in your home?

People rely on private water supplies in rural parts of the US and other places where there is no public water supply. Roughly 15% of Americans have private water wells for their homes. If you have a private well, water enters your home through pipes from a nearby underground water source on your property. You don’t receive a bill from a water company when you have a private well, but there are some costs to maintain a well and power the equipment.

In Pennsylvania, there are over 1 million private water wells.

How do you know your drinking water is safe?

Because your drinking water comes from natural sources, it is exposed to pollutants. Anything on the ground or in the air can end up in the water. Some of these things can cause health problems when you drink the water, including pollutants like bacteria, lead, and nitrates. There are other pollutants that aren’t dangerous but cause foul odors and tastes or stain your sinks, such as iron, manganese, and chloride. The United States Environmental Protection Agency (US EPA) has established Safe Drinking Water Standards based on research and water testing. The Safe Drinking Water Standards state what amount of each pollutant is acceptable in your drinking water.

Has your family ever received a Boil Water Advisory?

When a public water supply fails to meet the Safe Drinking Water Standards for bacteria or a similar pollutant, they must notify you and advise you to boil your water before drinking it.

The government requires public drinking water suppliers to conduct regular tests of their drinking water. The water must meet the US EPA's Drinking Water Standards. To remove pollutants from public drinking water, the water goes through a treatment process. Dirt and solid particles are removed through a process known as coagulation (the particles are treated to all clump together) and sedimentation (the heavy clumps settle at the bottom of the water). Then the smaller particles are removed by passing the water through filters. Finally, before the finished water is distributed, bacteria and other microscopic living things are killed with a disinfectant, like chlorine.

In Pennsylvania, private water supplies are not regulated by the EPA or required to meet the Safe Drinking Water Standards. Private well owners are responsible for their own water testing and treatment. There are several options available for homeowners to have their well water tested. Choosing what tests to perform on well water depends on the potential pollution activities on the nearby land (agriculture, industry, mining, housing, etc.) Well water should be tested for bacteria once a year. In addition, tests for pH and Total Dissolved Solids, indicators of additional problems, should be completed once every three years. If bacteria or other pollutants are discovered in a private water well, homeowners can install treatment systems in their homes to improve their water quality.

Does your household have a private well? Penn State Extension, or the Extension Program in your state, can help you identify a certified water testing facility. When was the last time your household tested your water?

Activity: Reading a report from a water test

Below are links to two samples of drinking water test reports, one from a private supply and one from a public supply. See if you can answer the following questions:

1. What kind of bacteria tests does the report include? Were bacteria detected in either sample? Which water supply had higher bacteria levels than the maximum safe level?

2. What was the pH of the private water supply? The recommended limits for pH are 6.5-8.5. Does this private water supply meet those recommendations?

3. What was the other contaminant tested for in both samples? Which water supply showed a higher level of this contaminant? What is a possible source of that contaminant? (ppm and mg/L measurements are equivalent when working with liquids.)
4. What was the average amount of mercury in the public water supply? What is the maximum contaminant level of mercury allowed in public drinking water? Does this public drinking water supply violate the standards for mercury?

5. Now analyze your personal water test report. By contacting your water company, you can find your annual public drinking water supply report, called a Consumer Confidence Report. You can also find reports or contact info for all public water suppliers by visiting the EPA's website. For private water supplies, ask your family for a copy of your most recent water test results. If you've never had your water tested, now is a great time to encourage your family to get it done.

**SAMPLE REPORT FROM A PRIVATE WELL WATER TEST**

On the basis of the above test results, this water sample DOES NOT MEET FADEP drinking water standards.

The following notes apply to this sample:
- The Total Coliform Bacteria exceeded the max. lev. of 1 colony/100ml.
- The Iron level exceeded the limit of 0.3 mg/l.

Submitted by: ________________________
Laboratory Manager

Sample Private Well Test Report
### Are There Hormones and Drugs in my Water?

A United States Geologic Survey study of streams in 30 states found that 80% of the streams sampled contained at least one antibiotic, prescription drug, steroid, or hormone contaminant. Although these contaminants are present in tiny amounts, aquatic organisms, including fish and amphibians, are highly sensitive to even low levels of exposure. The effect on humans is unknown and needs to be further researched. Many hospitals and individuals dispose of unused pharmaceuticals by dumping them into toilets or drains, leading to wastewater treatment plants. Older wastewater treatment plants are not designed to remove these contaminants from the water. Unwanted medication collection events and education on correct methods for disposing unwanted drugs are a start toward addressing this problem. Animal manure is another source of antibiotics and pharmaceutical contaminants entering waterways through run-off and leaching. Creating better farm management plans and practices can help prevent this pollution.

### Could you have a career in the field of drinking water?

Do you think you might want a career in science or the environment? There are a variety of job opportunities available in the field of water science. Hydrologists, or scientists that solve water-related problems in society, work on issues such as finding water supplies for cities or farms or controlling river flooding or soil erosion. Other types of water science professionals may work in environmental protection: preventing or cleaning up pollution or locating sites for safe disposal of hazardous wastes. They may also be educators, teaching others how to test their private wells or manage stormwater on their properties. Many job titles include the science of water, including Environmental Engineers, GIS Specialists, Chemists and Lab Technicians, Water Conservation Specialists, Water Treatment Plant Operators, and Environmental Educators.
References


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