

Why is water necessary?

As You Read

What You'll Learn

- **List** ways that water is important to life on Earth.
- **Describe** methods for conserving freshwater.

Vocabulary

irrigation
water conservation

Why It's Important

Less than one percent of Earth's water is available for human use; therefore it must be used wisely.

Water and Life

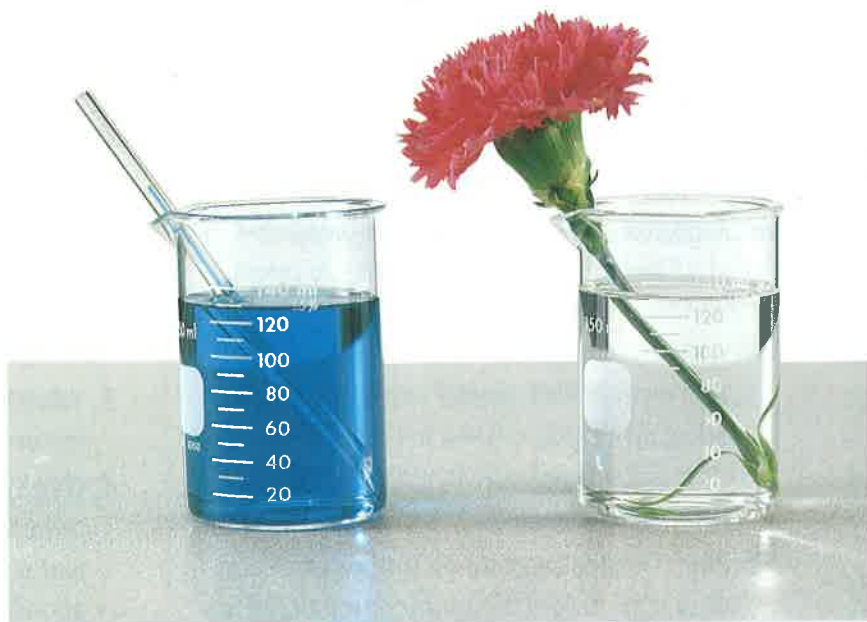
Everyone knows that people can't survive long without water to drink. Even more than food, water is critical to your immediate survival. If you think about all the ways water allows you to live and thrive on Earth, you'll come up with a long list. You drink it, wash in it, and play in it. Water is all around you, and it's all through you. About 70 percent of your body is water. It fills and surrounds the cells of your body, enabling many of your body's processes to occur. Water helps move nutrients throughout your body, control your body temperature, eliminate wastes, digest food, and lubricate joints. When you feel thirsty, your body is telling you that you need more water.

Water not only is important to humans but to all life on Earth. The oceans, streams, rivers, and lakes are full of activity and provide habitats for organisms within and around them.

Water molecules are attracted to other polar molecules. Together with cohesion, this allows for the capillary action that pulls water upward within the narrow tubes inside plant stems as shown in **Figure 8**. Water moves by this method from the ground to the leaves where photosynthesis occurs.

Figure 8

A plant stem works the same way a capillary tube in a chemistry lab would work. Water travels up the tube or plant stem because of capillary action.



Water and Society

Take one look at a globe and you'll soon realize how important water is to society. The need for water explains why major cities are located near large bodies of water. Desert areas have far fewer towns and sparser populations.

Water for Production Industry and agriculture together account for about 88 percent of the water used in the United States. Industries use water for processing and cooling during the production of paper, chemicals, steel, and other products. Water also is necessary for transporting manufactured goods. Mining and refining Earth's natural resources call for large amounts of water.

Figure 9 shows how water is used in the United States. In general, communities located near water are better able to attract industry and often have the most productive economies.

Agriculture accounts for the use of about 44 percent of all water used in the United States, the largest percentage of any sector. Most of that is used for irrigation of farmland. **Irrigation** means piping in water from elsewhere and using it to grow crops, as shown in **Figure 10**. The water could come from a nearby lake, river, or reservoir or it might have been pumped from the ground.

✓ Reading Check

What process do farmers use when they pump water from somewhere else in order to water their crops?

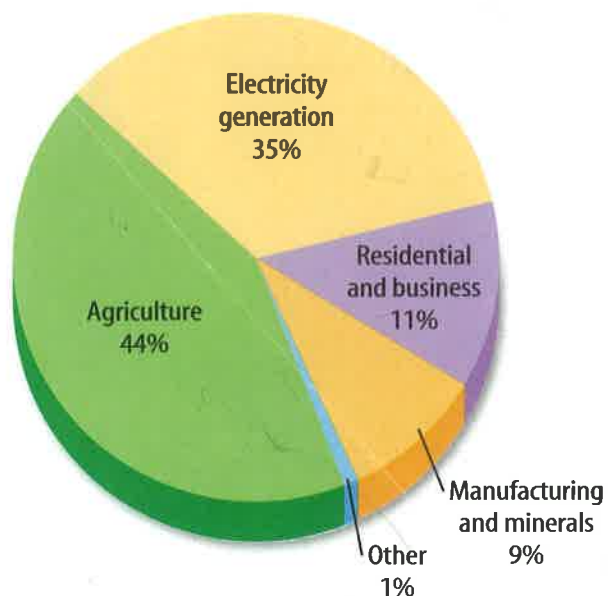


Figure 9
Water has many uses in the United States, as shown in the graph.

Figure 10
Several forms of irrigation are used worldwide. Are any forms of irrigation used in areas near you?

Figure 11

Ferries are used for recreation and transportation.



TRY AT HOME

Mini LAB

Predicting Water Use

Procedure

1. Measure the average inside area (width times length) of your bathtub.
2. Run a typical bath and measure the depth of the water. Use the water for some needed purpose.
3. Close the stopper of your bathtub and run the shower for 5 min. Measure the depth of the water at the end of the 5 min. Use the water for some needed purpose.
4. Calculate the volume of water used during a typical bath and during a typical 5-min shower. To do this multiply the area of the bathtub by the bath depth and the shower depth.

Analysis

1. Compare the volumes of water used during a bath and a shower.
2. Determine which method uses more water—a bath or a 5-min shower.
3. Infer how much water a 10-min shower would use.

Water for Transportation Although superhighways and airports are important to modern society, water remains valuable for transportation, as shown in **Figure 11**. Passenger liners are still popular. Ferries can move people, cars, and freight across bays, straights, and rivers, saving the time and expense of long land trips. Big ships often are the most economical way to move large freight within the country or across the ocean, as shown in **Figure 12**.



Reading Check

Why is water important for transportation?

Water for Recreation Do not forget the role water plays in recreation. Many people equate water with fun—fishing, swimming, scuba diving, waterskiing, and boating. Boating can provide entertainment for a wide variety of people. Sailors, canoeists, kayakers, powerboaters and whitewater rafters all spend recreation time on the water.

Water Use

When you consider all the ways that humans use water, it is clear that water is a valuable natural resource that must be conserved and protected. Not only is clean water important for all the ways that it is used in homes and by society, it is necessary for maintaining the ecological balance in nature because many species of wildlife live in and around bodies of water.

Rivers, lakes, and ponds must be clean to support the fish, frogs, and other animals and plants that live within them. Wetlands are important bird and fish habitats. They are nurseries to many important aquatic species and function as natural water purifiers. Oceans also must be kept free of pollutants such as oil, chemical and radioactive wastes, and litter.

Conserving Water Photographs of Earth taken from space show a watery planet that has blue oceans and scattered continents. But, less than one percent of Earth's water is available for any of the uses described, except for ocean transportation. That's why it is important to conserve the available freshwater on Earth. The careful use and protection of water is called **water conservation**. Water can be saved and kept clean in many ways.

Much of the water used for agricultural irrigation is lost to evaporation. Better methods can conserve water. Instead of flooding the fields, farmers can use overhead sprinklers on their crops, or they can install tubing that slowly drips water directly above the roots of the plants. Mulching the ground around the plants, as shown in **Figure 13**, also can help prevent water loss. Farmers even have used computers in the fight for water conservation. Sensors installed in the ground and connected to a computer can signal when crops need to be watered.



Reading Check

What can gardeners and landscapers do to conserve water?

Industries also can conserve water. Companies can treat and recycle the water that is used in industrial plants. Innovative manufacturing processes that conserve water also might increase plant productivity.

Figure 13

It is important to conserve water while watering crops and other plants. There are several ways to do this.

A Mulching is an effective way to conserve water in commercial and residential developments.



B Overhead sprinklers use less water than flooding fields does.

What can you do? Think about the activities you do on a daily basis that include water. Do you know how much water you use in your home and at school? Some estimates are shown in **Figure 14**. Wouldn't it be helpful to conserve some of this water? It can be done. For starters, you could conserve water in your shower. Turn the water off when you are soaping up, then use it just for rinsing. Do the same while brushing your teeth and washing your hands. See whether your home has a low-flow toilet system. Toilets are available that use only 6 L per flush compared to about 19 L per flush for older toilets.

Some ornamental plants require less water than others. What if your school administrators used these plants to landscape your school grounds? They could be watered with the used dishwater, called *gray water*, from your school cafeteria. Over the course of a year or more, small measures such as these can save large amounts of water.

Did you know the water you showered in this morning could have been in Galileo's teapot or in King Tut's reflecting pool? The water on Earth today has been around for millions, even billions, of years. In the next section, you will see how water continuously cycles through the environment.

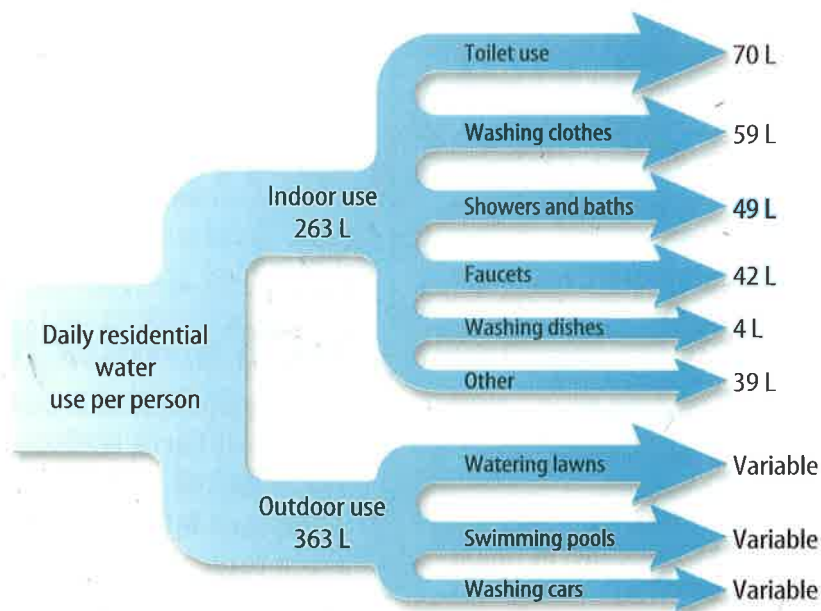


Figure 14
Humans use water every day.
How do you use water in your home?

Section 2 Assessment

1. Describe three ways water is important to life on Earth.
2. List five ways water is used for recreation.
3. Why is clean water important to nature and society?
4. Explain the methods that can be used in agriculture and industry to conserve water.
5. **Think Critically** How is water used in production in the United States, and in what ways can industries recycle the water that they use?

Skill Builder Activities

6. **Concept Mapping** Make a network-tree concept map that shows the ways water is used in society. **For more help, refer to the Science Skill Handbook.**
7. **Using A Word Processor** Use the library to research methods of irrigation. Write a brief summary of the different methods of irrigation that are used in agriculture and in small-scale gardening. **For more help, refer to the Technology Skill Handbook.**