

SECTION

4

Using Water Wisely

BEFORE YOU READ

After you read this section, you should be able to answer these questions:

- What are two forms of water pollution?
- How is wastewater cleaned?
- How is water conserved?

Is Water A Limited Resource?

Although the Earth is covered with oceans, lakes, and rivers, only 3% of the Earth's water is fresh water. Most of that 3% is frozen in the polar icecaps. Therefore, people must take care of and protect their water resources.

Cities, factories, and farms can pollute water. Water can become so polluted that it is no longer safe to use. Two types of water pollution are point-source pollution and nonpoint-source pollution.

Where Does Water Pollution Come From?

Pollution that comes from one specific site is called **point-source pollution**. For example, a leak from a sewer pipe is point-source pollution. Because point-source pollution comes from a single place, it is easier to control than nonpoint-source pollution. ✓

Pollution that comes from many sources is called **nonpoint-source pollution**. Most nonpoint-source pollution gets into water by runoff. *Runoff* is water that flows over the ground into rivers, streams, or oceans. As runoff flows over the ground, it can pick up chemicals and other pollutants. These pollutants are carried to clean bodies of water.



People use chemicals, such as fertilizers, on the land. Runoff can carry these chemicals to clean bodies of water.

STUDY TIP

Identify As you learn about different types of pollution, think about where you live. Make a list of some sources of pollution in your community.

READING CHECK

1. Define What is point-source pollution?

TAKE A LOOK

2. Explain How can chemicals that are spilled on land end up in oceans or other water bodies?

SECTION 4 Using Water Wisely *continued*

Why Does Water Have To Be Clean?

Water is important to many organisms. If the water is not clean, the organisms using it will not be healthy. Three important properties of water that affect water quality are dissolved oxygen, nitrates, and pH.

DISSOLVED OXYGEN

Fish and other organisms that live in water need oxygen to survive. The oxygen that is dissolved in water is called *dissolved oxygen*, or *DO*. If the DO in water is too low, many organisms can become sick or die. ✓

Pollution can cause the DO level in water to decrease. An increase in water temperature can also cause the DO level to decrease. Many energy facilities, such as nuclear power plants, release hot water into the environment. This can increase the temperature of water in natural water bodies. This *thermal pollution* can decrease DO levels.

NITRATES

Nitrates are naturally formed compounds of nitrogen and oxygen. All water contains some nitrates. However, too much nitrate in the water can be harmful to organisms. An increase in nitrate levels can also cause the DO level to decrease. Some kinds of pollution, such as animal wastes, increase the level of nitrates in water.



Animal wastes contain a lot of nitrates. Runoff can carry these nitrates to water bodies, causing water pollution.

TAKE A LOOK

4. Identify What is one source of nitrates in water?

pH

The *pH* of water is a measure of how acidic the water is. Most organisms cannot live in very acidic water. Acid rain and some kinds of wastes can make water bodies more acidic. Water with a high *alkalinity*, or ability to react with acids, can protect organisms from acid rain and other pollution.

SECTION 4 Using Water Wisely *continued*

How Can Dirty Water Be Cleaned?

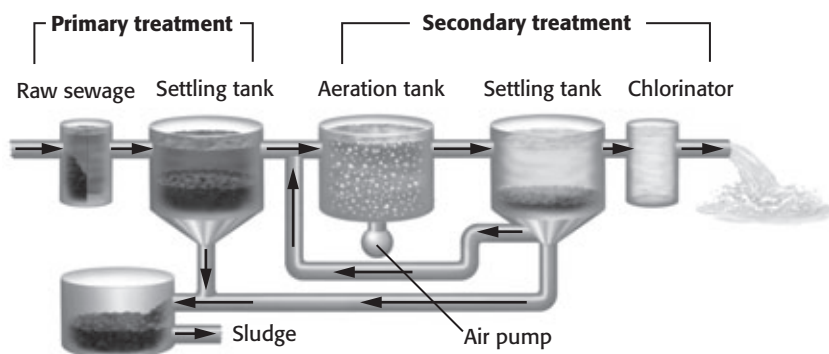
What happens to water that you flush down the toilet or wash down the drain? If you live in a city or a large town, the water probably flows through sewer pipes to a sewage treatment plant. **Sewage treatment plants** are facilities that clean waste materials out of water. After water has passed through a sewage treatment plant, it can safely be released into the environment. ✓

A sewage treatment plant cleans water in two ways. The first steps are called the *primary treatment*. First, the dirty water is passed through a large screen. This screen catches solid objects, such as paper, rags, and bottle caps.

The water is then placed in a large tank. As the water sits, small pieces of material sink to the bottom of the tank. These small pieces, such as food or soil, are filtered out. Any material that floats on the surface is also removed.

After going through primary treatment, the water is ready for *secondary treatment*. During secondary treatment, the water is placed in an *aeration tank*. There, the water mixes with oxygen and bacteria. The bacteria use the oxygen to consume the wastes dissolved in the water.

The water is then placed in a settling tank. Any dirt in the water sinks to the bottom of the tank and is removed. The water is then mixed with chlorine to disinfect it. Finally, it is sent to a river, lake, or ocean.



✓ READING CHECK

5. Identify What do sewage treatment plants do?

Critical Thinking

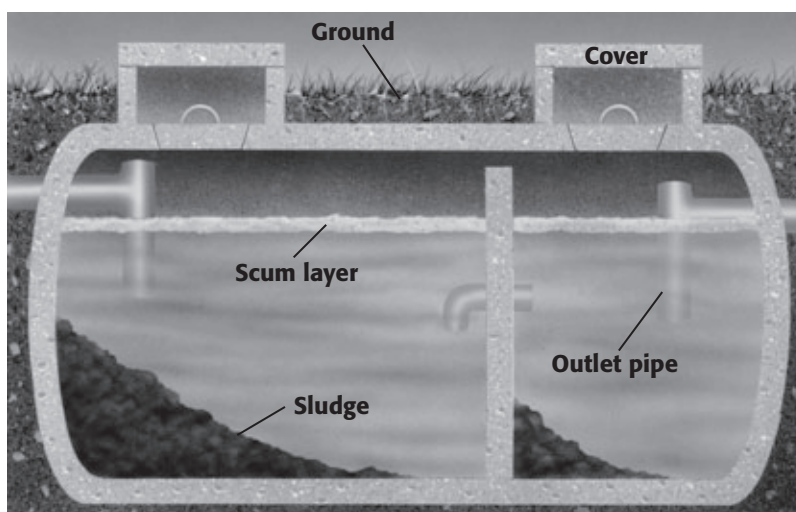
6. Infer Why is secondary treatment necessary?

TAKE A LOOK

7. Identify What is the purpose of the chlorinator?

SECTION 4 Using Water Wisely *continued***SEPTIC TANKS**

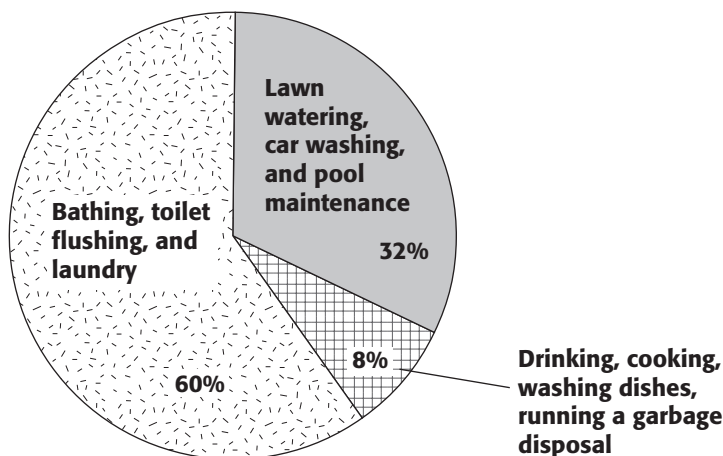
If you live in an area without a sewage treatment plant, your waste probably goes into a septic tank. A **septic tank** is a large underground tank that cleans the wastewater from one household. The wastewater flows into the tank, where the solids sink to the bottom. Bacteria break down these solids. The water then flows into pipes buried underground. The pipes take the water to nearby ground called a *drain field*.

**TAKE A LOOK**

8. Identify Why do people use septic tanks?

How Do People Use Water?

The average household in the United States uses 100 gallons of water each day. The graph below shows how an average household uses water.



The average U.S. household uses 100 gallons of water per day.

Math Focus

9. Read a Graph What does an average United States household use most of its water for?

SECTION 4 Using Water Wisely *continued***INDUSTRY AND AGRICULTURE**

About 19% of the water used in the world is used by industries. Water is used in manufacturing, mining minerals, and electricity generation. Most industries recycle and reuse water. Recycling helps keep more water in the environment.

Many farmers get their water from aquifers. When farmers use too much water from an aquifer, less water may be available for farming. For example, the Ogallala aquifer provides water for about one-fifth of the cropland in the United States. Recently, the water level in the aquifer has dropped a great deal. Scientists estimate that it would take at least 1,000 years for the water level to get back to normal if no more water is taken from the aquifer.

When farmers water their crops, a large amount of water is lost through evaporation and runoff. Drip irrigation, in which water is placed directly on the plant's roots, wastes less water.

How Can You Conserve Water at Home?

Individual families can conserve water also. Toilets and shower heads that use less water are good choices for conservation. If you have to water your lawn, water it at night and use a drip watering system.

Each person can do his or her part to conserve water. Simple choices, such as taking shorter showers and turning off the water when you brush your teeth, are helpful. If everyone tries to conserve water, we can make a big difference.

Things You Can Do to Conserve Water

• Use water-saving toilets and showerheads.
• Water the lawn at night or don't water it at all.
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•
•
•

Math Focus

10. Calculate What fraction of the water used in the world is NOT used by industry?



Investigate Find out more about ways that farmers can help conserve water. Share what you learn with a small group.

TAKE A LOOK

11. Brainstorm With a partner, come up with other ways that you can help conserve water. Write your ideas in the table.

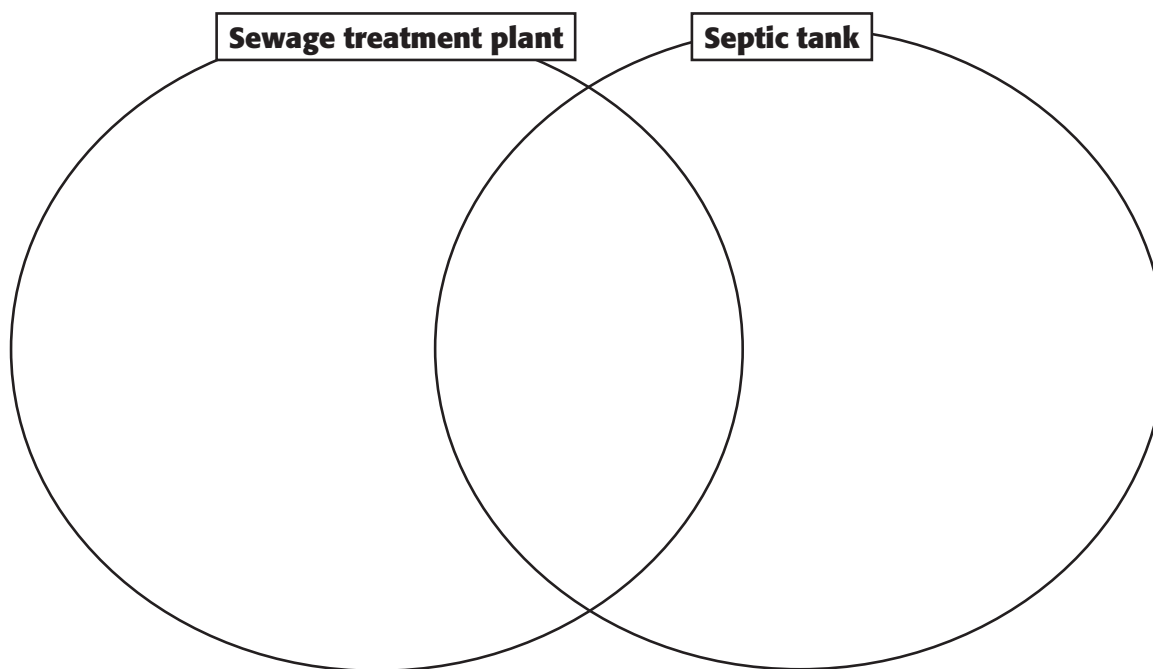
Section 4 Review

SECTION VOCABULARY

<p>nonpoint-source pollution pollution that comes from many sources rather than from a single, specific site</p> <p>point-source pollution pollution that comes from a specific site</p>	<p>septic tank a tank that separates solid waste from liquids and that has bacteria that break down solid waste</p> <p>sewage treatment plant a facility that cleans the waste materials found in water that comes from sewers or drains</p>
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- 1. Explain** How can pollution affect the level of oxygen in water? Why is this important?

- 2. Compare** Complete the Venn Diagram to compare how a sewage treatment plant and a septic tank clean wastewater.



- 3. Apply Concepts** Many farms are found along the banks of the Mississippi River. Describe what kind of pollution you might find in this river. Is the pollution point-source pollution or nonpoint-source pollution? Explain your answer.
