UNIT 4

Human Impact on Earth

FLORIDA BIG IDEA 6

Earth Structures

The Cape Sable dam cuts through Cape Sable in Everglades National Park.

What Do You Think?

The construction of buildings, roads, parking lots, and other structures like dams and bridges can affect our water resources in a variety of ways. In what ways does human activity affect the environment? As you explore this unit, gather evidence to help you state and support a claim.

UNIT 4

Human Impact on Earth

CITIZEN SCIENCE

Investigating Water Resources

All of the water that we use comes from natural resources. Most of the water that is used in Florida is freshwater that comes from underground aquifers.

1 Think About It

What makes fresh surface water and groundwater such valuable resources?

How does human activity affect the availability of fresh water?

2 Ask A Question

Where does your water come from?

With a partner, research the source of the water used by your community. Consider contacting your local utility company as a source of information.

Things to Consider

- ☐ How do our water supplies get replenished?
- ☐ What are the most common uses for water?

3 Make A Plan

A Describe the environment that surrounds your local water source.

B Describe threats to your local water supply and how your water supply can be protected.

Threats	Ways to Protect Water Supply

C Determine what happens to wastewater and how it cycles through your environment.

Take It Home!

Trace the water used in your home to its source. Use a map to determine the route by which the water you use must be transported from its source.

LESSON 1

Natural Resources

ESSENTIAL **QUESTION**

What are Earth's natural resources?

By the end of this lesson, you should be able to understand the types and uses of Earth's natural resources.

Light produced from electrical energy helps people see at night. Some regions of Earth are still mostly dark once the sun sets. The people living in some of these regions rely more on sunlight.

SC.7.E.6.6 Identify the impact that humans have had on Earth, such as deforestation, urbanization, desertification, erosion, air and water quality, changing the flow of water.

Lesson Labs

Quick Labs

- How Is That Made?
- Renewable or Not?
- Production Impacts

Exploration Lab

- Natural Resources Used at Lunch

Engage Your Brain

1 Predict Check T or F to show whether you think each statement is true or false.

T	F	
☐	☐	Energy from the sun can be used to make electricity.
☐	☐	All of Earth's resources will last forever.
☐	☐	Food, cloth, rope, lumber, paper, and rubber come from plants.
☐	☐	Human activity can negatively affect Earth's resources.

2 Describe Name one item that you use everyday. Describe how you think that item is made.

ACTIVE READING

3 Apply Many scientific words, such as *natural* and *resource*, also have everyday meanings. Use context clues to write your own definition for each underlined word.

Oranges are a natural source of vitamin C.

natural:

His curly hair is natural.

natural:

A dictionary is a useful resource for learning words.

resource:

In the desert, water is a limited resource.

resource:

Vocabulary Terms

- **natural resource**
- **renewable resource**
- **nonrenewable resource**
- **fossil fuel**
- **material resource**
- **energy resource**

4 Identify This list contains the key terms you'll learn in this lesson. As you read, circle the definition of each term.

It's Only Natural

What are natural resources?

What do the water you drink, the paper you write on, the gasoline used in cars, and the air you breathe have in common? All of these come from Earth's natural resources. A **natural resource** is any natural material that is used by humans, such as air, soil, minerals, water, petroleum, plants, and animals.

The Earth's natural resources provide everything needed for life. The energy we get from many of these resources, such as petroleum and wind, originally comes from the sun's energy. The atmosphere contains the air we breathe, controls air temperatures, and produces rain. Rainfall from the atmosphere renews the water in oceans, rivers, lakes, and streams in the water cycle. In turn, these water sources provide food and water for drinking, cleaning, and other uses. The Earth's soil provides nutrients and a place for plants to grow. Plants provide food for some animals and humans. Petroleum is used to make fuels for cars and other machines, and also to make plastics. All of these natural resources are used to make products that make people's lives more convenient.

ACTIVE READING

5 Identify As you read, underline examples of natural resources.

Bauxite is a rock that is used to make aluminum.

Visualize It!

6 Illustrate Draw or label the missing natural resources.

A

How can we categorize natural resources?

There are many different types of natural resources. Some can be replaced more quickly than others. Thus, a natural resource may be categorized as a renewable resource or a nonrenewable resource.

Think Outside the Book

7 Claims • Evidence • Reasoning Make a claim about why water can be a renewable or nonrenewable resource. Summarize evidence to support each claim and explain your reasoning to a classmate.

Renewable

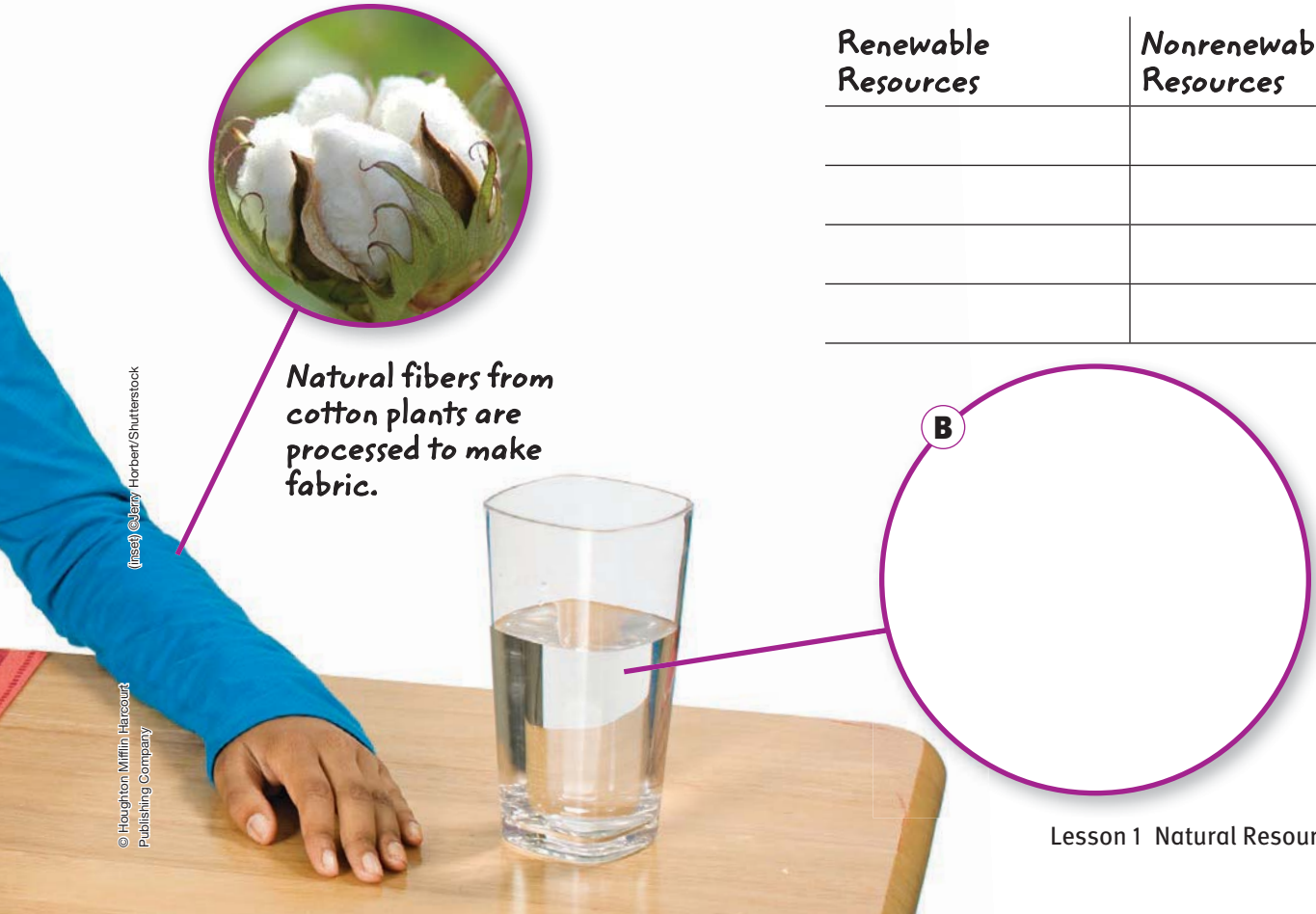
Some natural resources can be replaced in a relatively short time. A **renewable resource** is a natural resource that can be replaced at the same rate at which the resource is consumed. Solar energy, water, and air are considered renewable resources. However, renewable resources can be used up too quickly. For example, trees are renewable. But some forests are being cut down faster than new forests can grow to replace them. Some renewable resources are considered to be *inexhaustible resources* (in'•ig•ZAW•stuh•buhl REE•sawrs•iz) because the resources can never be used up. Solar energy and wind energy from the sun are examples of these resources.

Nonrenewable

A **nonrenewable resource** is a resource that forms at a rate that is much slower than the rate at which it is consumed. Some natural resources, like minerals, form very slowly. Iron ore, aluminum, and copper are important minerals. A **fossil fuel** is a nonrenewable resource formed from buried remains of plants and animals that lived long ago. For example, coal is a fossil fuel that takes millions of years to form. Oil and natural gas are other types of fossil fuels. Once these resources are used up, humans will have to find other resources to use instead. Some renewable resources, such as water, may also be considered nonrenewable if they are not used wisely.

8 Compare List some examples of renewable and nonrenewable resources.

Renewable Resources	Nonrenewable Resources



Natural fibers from cotton plants are processed to make fabric.

B

Material World

How do we use natural resources?

When you turn on a computer, take a shower, or eat food, you are using natural resources. A variety of natural resources are used to make common objects. The energy required for many of the activities that we do also comes from natural resources. Earth's natural resources can be divided into material resources and energy resources depending on how the resource is used.

As Material Resources

A **material resource** is a natural resource that humans use to make objects or to consume as food or drink. These resources can come from Earth's atmosphere, crust, fresh waters and oceans, and from organisms, such as plants and animals.

Earth's atmosphere provides the oxygen needed by plants and animals, including humans. Minerals and rock in Earth's crust are used for construction and other industries. Salt, a mineral, comes from ocean water. Fresh water sources and the oceans provide drinking water and food. Some plants, such as cotton, produce fibers that are woven into cloth or braided into ropes. Trees supply fruit crops, lumber, and paper. The sap of some trees is used to make rubber and maple syrup. Animals provide meat, leather, and dairy and egg products.

10 State Your Claim Make a claim about what other items you can think of are made of wood.

_____

_____

_____

_____

_____

ACTIVE **READING**

9 Identify As you read, underline examples of material resources and energy resources.

Trees are a material resource when they are used to make products, such as this guitar.

As Energy Resources

Energy resources drive the world. An **energy resource** is a natural resource that humans use to generate energy. Most of the energy used by humans comes from fossil fuels. When fossil fuels are burned, they release energy, usually in the form of heat. Power plants and machines use that heat to produce mechanical and electrical energy. In turn, electrical energy is used to power lights and most of the appliances we use every day.

Other energy resources include moving water, solar power, and wind power. Trees supply fuel in the form of heat. Horses, camels, and other animals are used as transportation in some places. All of these resources are renewable energy resources.

Trees are energy resources when they are burned in a campfire.

©Gaertner/Alamy

Visualize It!

11 Claims • Evidence • Reasoning Make a claim about what two types of energy are generated from fire. Summarize evidence to support each claim and explain your reasoning to a classmate.

12 List Think about all the products you use every day. Fill in the chart with three of these products and the resources needed to make them or use them.

Product	Material and Energy Resources Needed
computer	plastic, metal, glass, electricity

Visual Summary

To complete this summary, circle the correct word. You can use this page to review the main concepts of the lesson.

Natural resources can be categorized as nonrenewable resources or renewable resources depending on how quickly they can be replaced.

13 Bauxite is a nonrenewable / renewable resource.

14 Cotton plants are a nonrenewable / renewable resource.

Natural Resources

A material resource can be used to make objects or to consume as food or drink. An energy resource is used to generate energy.

15 Trees that are used to make paper products are material resources / energy resources.

16 Claims • Evidence • Reasoning Make a claim about how a natural resource could be used as both a material resource and an energy resource. Summarize evidence to support your claim providing examples of each. Explain your reasoning.

Lesson Review

LESSON 1

Vocabulary

Fill in the blank with the term that best completes the following sentences.

1 Nonrenewable and renewable are the two categories of _____.

2 A(n) _____ can be used to make objects.

Key Concepts

3 Evaluate Why are natural resources important to humans? Explain your reasoning.

4 Identify Give one example of a material resource and one example of an energy resource.

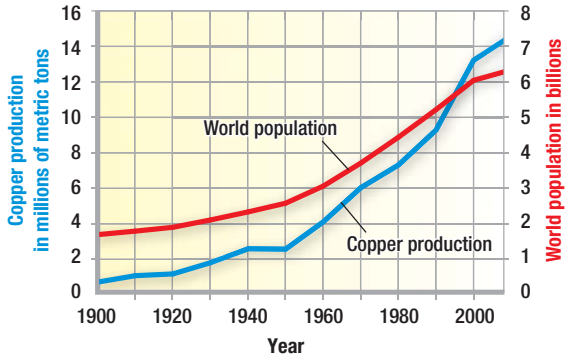
5 Claims • Evidence • Reasoning Make a claim about how nonrenewable resources and renewable resources differ. Provide evidence to support your claim and explain your reasoning.

6 List Name two material resources, one renewable and one nonrenewable. Explain your answer.

Critical Thinking

Use the graph to answer the following three questions.

World Copper Production, 1900–2004



Sources: U.S. Bureau of Mines, U.S. Geological Survey, and U.S. Census Bureau

7 Interpret In what year was the most copper produced?

8 Claims • Evidence • Reasoning Make a claim about the trend in copper production over the past 100 years. Use evidence to support your claim and explain your reasoning.

9 State Your Claim Copper is used in making electronic devices. Make a claim about how the use of copper might change as copper becomes more scarce.

10 Claims • Evidence • Reasoning Make a claim about how human activity affects Earth's natural resources. Provide evidence to support your claim.

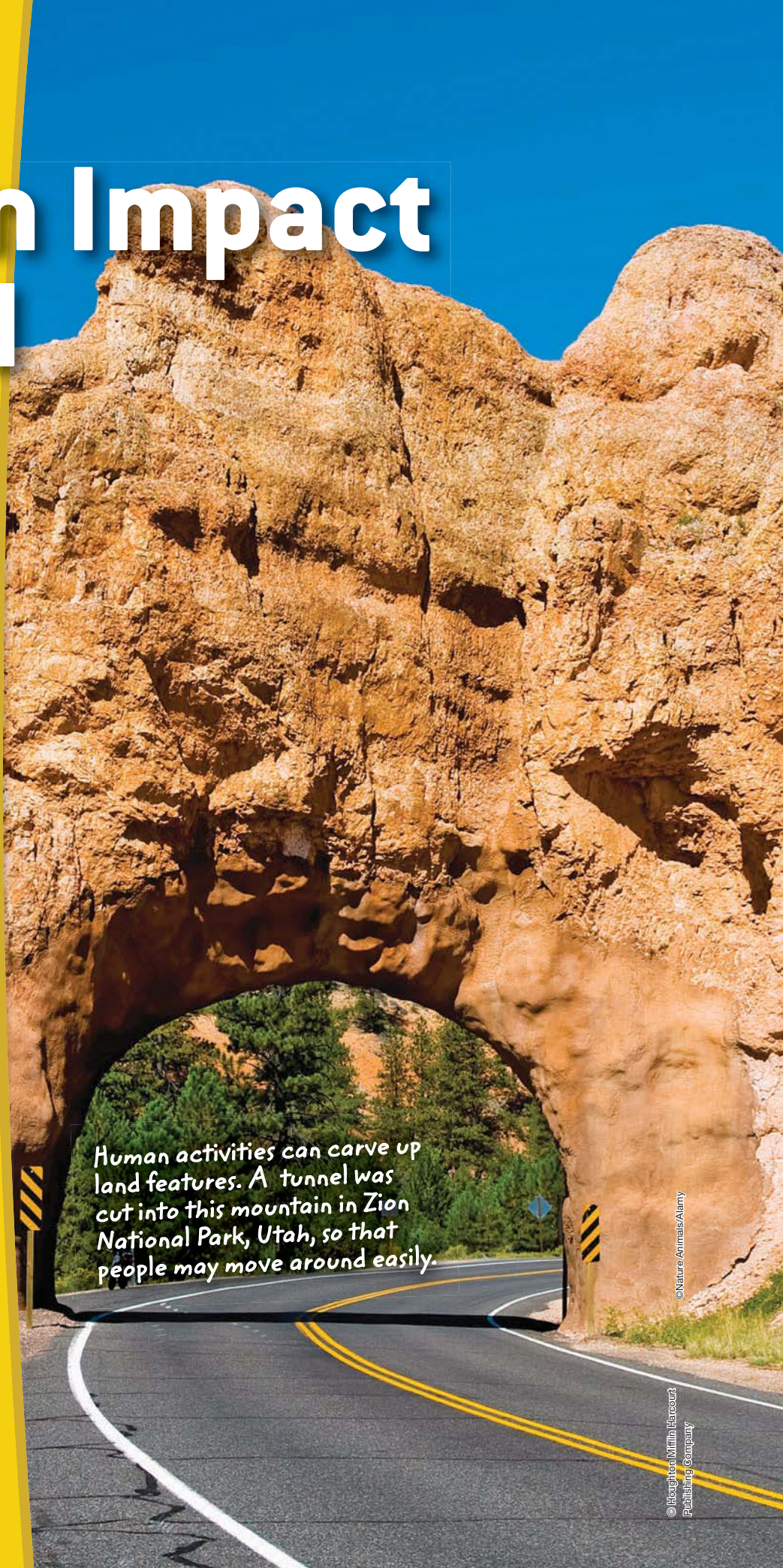
LESSON 2

Human Impact on Land

ESSENTIAL **QUESTION**

What impact can human activities have on land resources?

By the end of this lesson, you should be able to identify the impact that human activity has on Earth's land.



Human activities can carve up land features. A tunnel was cut into this mountain in Zion National Park, Utah, so that people may move around easily.

SC.7.E.6.6 Identify the impact that humans have had on Earth, such as deforestation, urbanization, desertification, erosion, air and water quality, changing the flow of water.

Lesson Labs

Quick Labs

- Debating Human Impact
- Roots and Erosion

Engage Your Brain

1 Predict Check T or F to show whether you think each statement is true or false.

T	F	
☐	☐	Urban areas have more open land than rural areas do.
☐	☐	Many building materials are made from land resources.
☐	☐	Soil provides habitat for plants but not animals.
☐	☐	Soil can erode when trees are removed from an area.

2 Illustrate Draw a picture of an object or material that is taken from the land and that is commercially important.

ACTIVE READING

3 Synthesize You can often define an unknown word if you know the meaning of its word parts. Use the word parts to make an educated guess about the meaning of the words *land degradation* and *deforestation*.

Word part	Meaning
degrade	to damage something
deforest	to remove trees from an area
-ation	action or process

Vocabulary Terms

- **urbanization**
- **land degradation**
- **desertification**
- **deforestation**

4 Apply As you learn the definition of each vocabulary term in this lesson, create your own definition or sketch to help you remember the meaning of the term.

land degradation:

deforestation:

Land of Plenty

Why is land important?

It is hard to imagine human life without land. Land supplies a solid surface for buildings and roads. The soil in land provides nutrients for plants and hiding places for animals. Minerals below the land's surface can be used for construction materials. Fossil fuels underground can be burned to provide energy. Land and its resources affect every aspect of human life.

Visualize It!

5 Claims • Evidence • Reasoning Imagine you live in this area. Choose two land uses shown here and make a claim about why they are important to you. Summarize evidence to support your claim and explain your reasoning.

What are the different types of land use?

We live on land in urban or rural areas. Cities and towns are urban areas. Rural areas are open lands that may be used for farming. Humans use land in many ways. We use natural areas for *recreation*. We use roads that are built on land for *transport*. We grow crops and raise livestock on *agricultural* land. We live in *residential* areas. We build *commercial* businesses on land and extract resources such as metals and water from the land.

Recreational

Natural areas are places that humans have left alone or restored to a natural state. These wild places include forests, grasslands, and desert areas. People use natural areas for hiking, bird-watching, mountain-biking, hunting, and other fun or recreational activities.

Transport

A large network of roads and train tracks connect urban and rural areas all across the country. Roads in the U.S. highway system cover 4 million miles of land. Trucks carry goods on these highways and smaller vehicles carry passengers. Railroads carrying freight or passengers use over 120,000 miles of land for tracks. Roads and train tracks are often highly concentrated in urban areas.

Agricultural

Much of the open land in rural areas is used for agriculture. Crops such as corn, soybeans, and wheat are grown on large, open areas of land. Land is also needed to raise and feed cattle and other livestock. Agricultural land is open, but very different from the natural areas that it has replaced. Farmland generally contains only one or two types of plants, such as corn or cotton. Natural grasslands, forests, and other natural areas contain many species of plants and animals.

ACTIVE READING

6 Identify As you read, underline the ways rural areas differ from urban areas.

Residential

Where do you call home? People live in both rural and urban areas. Rural areas have large areas of open land and low densities of people. Urban areas have dense human populations and small areas of open land. This means that more people live in a square km of an urban area than live in a square km of a rural area. **Urbanization** is the growth of urban areas caused by people moving into cities. When cities increase in size, the population of rural areas near the city may decrease. When an area becomes urbanized, its natural land surface is replaced by buildings, parking lots, and roads. City parks, which contain natural surfaces, may also be built in urban areas.

Commercial and Industrial

As cities or towns expand, commercial businesses are built too, and replace rural or natural areas. Industrial businesses also use land resources. For example, paper companies and furniture manufacturers use wood from trees harvested on forest land. Cement companies, fertilizer manufacturers, and steel manufacturers use minerals that are mined from below the land's surface. Commercial and industrial development usually includes development of roads or railways. Transporting goods to market forms the basis of commerce.

ACTIVE READING

7 Identify What effects does urbanization have on land?

Why is soil important?

Soil is a mixture of mineral fragments, organic material, water, and air. Soil forms when rocks break down and dead organisms decay. There are many reasons why soil is important. Soil provides habitat for organisms such as plants, earthworms, fungi, and bacteria. Many plants get the water and nutrients they need from the soil. Because plants form the base of food webs, healthy soil is important for most land ecosystems. Healthy soil is also important for agricultural land, which supplies humans with food.

ACTIVE READING

8 Identify As you read, underline the ways that soil is important to plants.

It Is a Habitat for Organisms

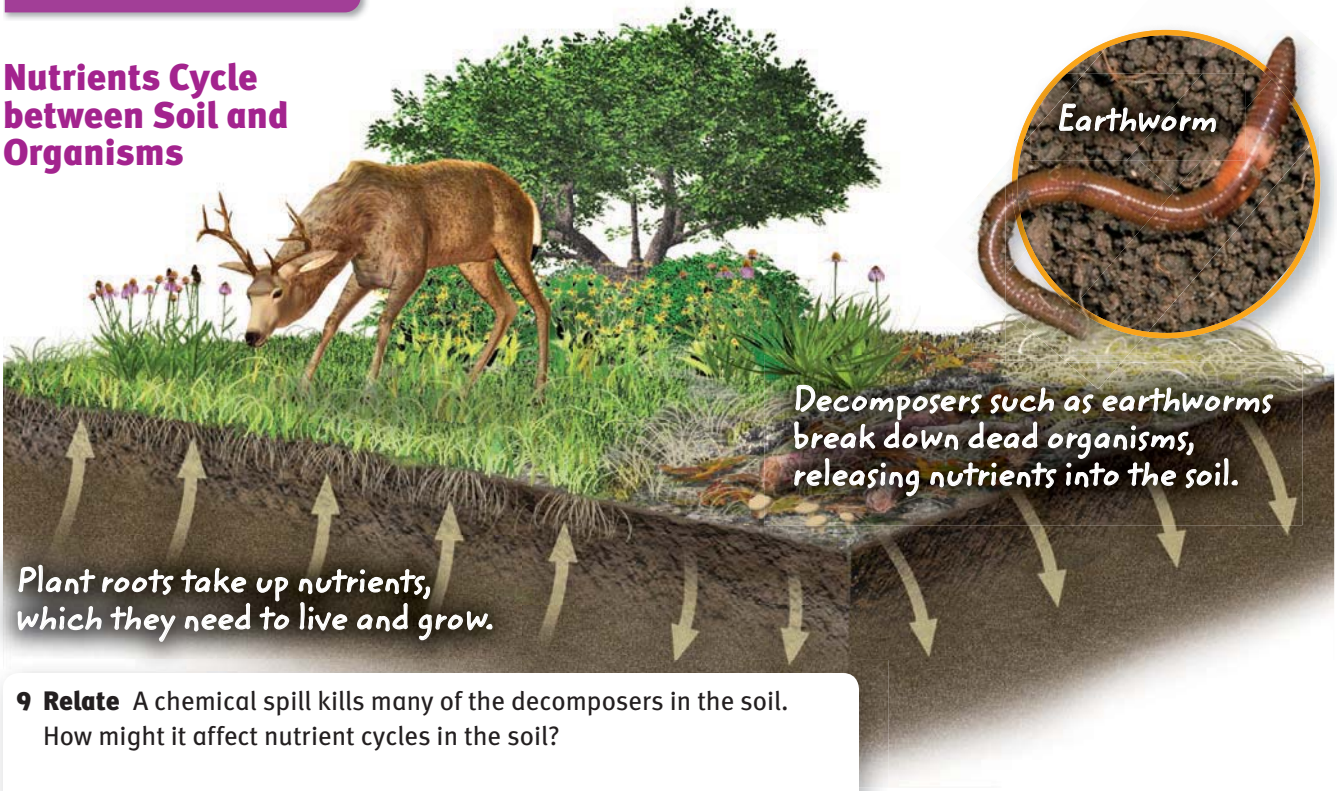
Earthworms, moles, badgers, and other burrowing animals live in soil. These animals also find food underground. *Decomposers* are organisms that break down dead animal and plant material, releasing the nutrients into the soil. Decomposers such as fungi and bacteria live in soil. Soil holds plant roots in place, providing support for the plant. In turn, plants are food for herbivores and are habitats for organisms such as birds and insects. Many animals on Earth depend on soil for shelter or food.

It Stores Water and Nutrients

Falling rain soaks into soil and is stored between soil particles. Different types of soil can store different amounts of water. Wetland soils, for example, store large amounts of water and reduce flooding. Soils are also part of the nutrient cycle. Plants take up nutrients and water stored in soil. Plants and animals that eat them die and are broken down by decomposers such as bacteria and earthworms. Nutrients are released back into the soil and the cycle starts again.

Visualize It!

Nutrients Cycle between Soil and Organisms



9 Relate A chemical spill kills many of the decomposers in the soil. How might it affect nutrient cycles in the soil?

WHY IT **MATTERS**

Dust Bowl

EYE ON THE ENVIRONMENT

In the 1930s, huge clouds of dusty soil rolled across the southern Great Plains of the United States. Areas that were once farmlands and homesteads were wiped out. What caused the soil to blow away?

Drought and Overuse

Farmers who settled in the southern Great Plains overplowed and overgrazed their land. When severe drought hit in 1931, topsoil dried out. Winds lifted the soil and carried it across the plains in huge storms that farmers called "black blizzards." The drought and dust storms continued for years.

Modern Day Dust Bowl

Today in northwest China another dust bowl is forming. Large areas of farmland were made there by clearing the natural vegetation and plowing the soil. Herds of sheep and cattle are overgrazing the land, and large dust storms are common.

Extend

10 Identify What type of land use by people contributed to the Dust Bowl? Does it remain a common use of land today?

11 Claims • Evidence • Reasoning Research another area under threat from overuse. Make a claim about what is causing the problem. Summarize evidence to explain your reasoning.

12 Illustrate Do one of the following to show how the Dust Bowl or the area you researched affected society: make a poster, write a play, write a song, or draw a cartoon strip. Present your findings to the class.

Footprints

How can human activities affect land and soil?

Human activities can have positive and negative effects on land and soil. Some activities restore land to its natural state, or increase the amount of fertile soil on land. Other activities can degrade land. **Land degradation** is the process by which human activity and natural processes damage land to the point that it can no longer support the local ecosystem. Urbanization, deforestation, and poor farming practices can all lead to land degradation.

Think Outside the Book

13 Claims • Evidence • Reasoning Make a claim about how you could help lessen the impact of urbanization on the land in the area where you live. Summarize evidence to support the claim and explain your reasoning.

ACTIVE READING

14 Identify As you read, underline the effects that urbanization can have on land.

Urban Sprawl

When urbanization occurs at the edge of a city or town, it is called *urban sprawl*. Urban sprawl replaces forests, fields, and grasslands with houses, roads, schools, and shopping areas. Urban sprawl decreases the amount of farmland that is available for growing crops. It decreases the amount of natural areas that surround cities. It increases the amount of asphalt and concrete that covers the land. Rainwater runs off hard surfaces and into storm drains instead of soaking into the ground and filling aquifers. Rainwater runoff from urban areas can increase the erosion of nearby soils.

Erosion

Erosion (ih•ROH•zhuhn) is the process by which wind, water, or gravity transports soil and sediment from one place to another. Some type of erosion occurs on most land. However, erosion can speed up when land is degraded. Roots of trees and plants act as anchors to the soil. When land is cleared for farming, the trees and plants are removed and the soil is no longer protected. This exposes soil to blowing wind and running water that can wash away the soil, as shown in this photo.

Nutrient Depletion and Land Pollution

Crops use soil nutrients to grow. If the same crops are planted year after year, the same soil nutrients get used up. Plants need the right balance of nutrients to grow. Farmers can plant a different crop each year to reduce nutrient loss. Pollution from industrial activities can damage land. Mining wastes, gas and petroleum leaks, and chemical wastes can kill organisms in the soil. U.S. government programs such as Superfund help to clean up polluted land.

Desertification

When too many livestock are kept in one area, they can overgraze the area. Overgrazing removes the plants and roots that hold topsoil together. Overgrazing and other poor farming methods can cause desertification. **Desertification** (dih•zer•tuh•fih•KAY•shuhn) is the process by which land becomes more desertlike and unable to support life. Without plants, soil becomes dusty and prone to wind erosion. Deforestation and urbanization can also lead to desertification.

Deforestation

The removal of trees and other vegetation from an area is called **deforestation**. Logging for wood can cause deforestation. Surface mining causes deforestation by removing vegetation and soil to get to the minerals below. Deforestation also occurs in rain forests, as shown in the photo, when farmers cut or burn down trees so they can grow crops. Urbanization can cause deforestation when forests are replaced with buildings. Deforestation leads to increased soil erosion.

Visualize It!

15 Claims • Evidence • Reasoning Make a claim about how human activity affected the forest in this photo. Use evidence to support your claim and explain your reasoning.

Visual Summary

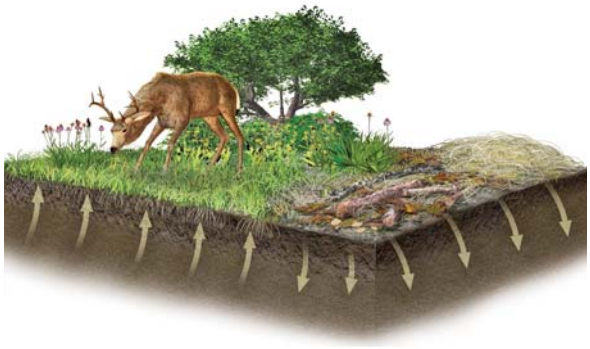
To complete this summary, circle the correct word or phrase.
You can use this page to review the main concepts of the lesson.

Humans use land in different ways.

16 Crops are grown on recreational/agricultural land.

Human Impact on Land

Soil is important to all organisms, including humans.



17 Decomposers/Plants that live in soil break down dead matter in the soil.

Human activities can affect land and soil

18 Poor farming practices and drought can lead to desertification/urbanization.

19 Claims • Evidence • Reasoning Make a claim about how concentrating human populations in cities help to conserve agricultural and recreational land. Summarize evidence to support your claim and explain your reasoning.

Lesson Review

LESSON 2

Vocabulary

Draw a line to connect the following terms to their definitions.

1 urbanization

2 deforestation

3 land degradation

4 desertification

A the removal of trees and other vegetation from an area

B the process by which land becomes more desertlike

C the process by which human activity can damage land

D the formation and growth of cities

Key Concepts

5 Contrast How are natural areas different from rural areas?

6 Relate How might deforestation lead to desertification?

7 Claims • Evidence • Reasoning Think of an animal that eats other animals. Make a claim about why soil would be important to this animal. Provide evidence to support your claim and explain your reasoning.

Critical Thinking

Use this photo to answer the following questions.

8 Analyze What type of land degradation is occurring in this photo?

9 Claims • Evidence • Reasoning The type of soil damage shown in the photo can also occur in urban areas. Make a claim about how urbanization could lead to this type of degradation. Summarize evidence to support your claim and explain your reasoning.

10 Apply What kinds of land uses are around your school? Write down each type of land use. Then describe how one of these land uses might affect natural systems.

SC.7.E.6.6 Identify the impact that humans have had on Earth, such as deforestation, urbanization, desertification,erosion, air and water quality, changing the flow of water.

Angel Montoya

CONSERVATION BIOLOGIST

In 1990, Angel Montoya was a student intern working at Laguna Atascosa National Wildlife Refuge in Texas. He became interested in the Aplomado falcon, a bird of prey that disappeared from the southwestern United States during the first half of the 20th century. Montoya decided to go looking for the raptors. He found a previously unknown population of Aplomados in Chihuahua, Mexico. His work helped to make it possible for the falcons to be reintroduced to an area near El Paso, Texas.

Restoration of the Aplomado falcon became Angel's lifework. He has monitored and researched the falcon since 1992. He helps release falcons that have been raised in captivity back into the wild and monitors falcons that have already been released. It isn't easy to keep tabs on a falcon, however. "Their first year they are pretty vulnerable, because they haven't had parents," Montoya says. "Just like juveniles, they're always getting into trouble. But I think they will do just fine."

Angel Montoya releases an Aplomado falcon back into the wild.

JOB BOARD

Environmental Engineering Technician

What You'll Do: Work closely with environmental engineers and scientists to prevent or fix environmental damage. Take care of water and wastewater treatment systems, as well as equipment used for recycling. Test water and air quality and keep good records.

Where You Might Work: In a water treatment facility, or an environmental laboratory.

Education: an associate's degree in engineering technology.

Other Job Requirements: Good communication skills and the ability to work well with others.

Agronomist

What You'll Do: Study the best ways to grow crops and work with farmers to help them use their land better, and get better yields. Agronomists are scientists who study crops and soil.

Where You Might Work: On a farm, in an agricultural business, for the U.S. Department of Agriculture or state or local government agencies, or for seed companies. Agronomists may work both in fields and in laboratories.

Education: a four-year college degree in agronomy, agriculture, or soil conservation.

YUMI Someya

Fueling the Family Business

Yumi Someya's family had worked in recycling for three generations, cleaning and recycling used cooking oil. In Japan, many people enjoy fried foods. They often throw out the used cooking oil. Yumi's family business collected used oil, cleaned it, and sold it for reuse.

When Yumi traveled to Nepal, she was caught in a landslide. She learned that deforestation was one cause of the landslide and began to think about environmental issues. When she returned home, she worked with her father to find new uses for the used cooking oil. They experimented with fertilizer and soap. Then, in 1992, they learned about biodiesel—fuel made from recycled soybean oil. They thought that used cooking oil might work to fuel cars, too. With a team of researchers, they created Vegetable Diesel Fuel (VDF).

Now, VDF fuels the company's oil-collecting trucks and some Tokyo buses. Yumi hopes to eventually recycle all of the cooking oil used in Japan.

LESSON 3

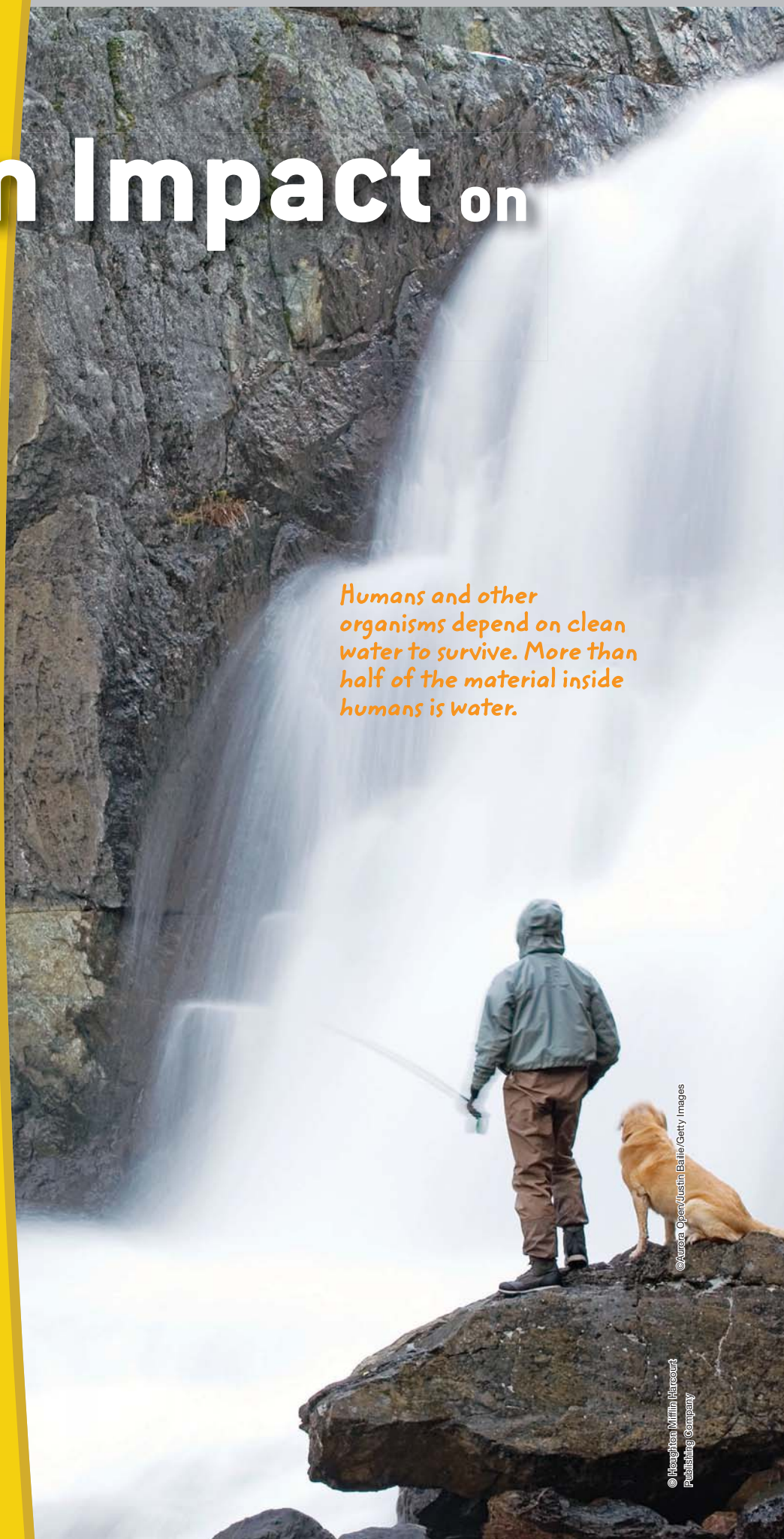
Human Impact on Water

ESSENTIAL **QUESTION**

What impact can human activities have on water resources?

By the end of this lesson, you should be able to explain the impacts that humans can have on the quality and supply of fresh water.

SC.7.E.6.6 Identify the impact that humans have had on Earth, such as deforestation, urbanization, desertification, erosion, air and water quality, changing the flow of water.



Humans and other organisms depend on clean water to survive. More than half of the material inside humans is water.

Lesson Labs

Quick Labs

- Ocean Pollution from Land
- Turbidity and Water Temperature
- Modeling Groundwater

Exploration Lab

- Filtering Water

Engage Your Brain

1 Analyze Write a list of the reasons humans need water. Next to this list, write a list of reasons fish need water. Are there similarities between your two lists?

2 Identify Circle the word that correctly completes the following sentences. The man in this photo is testing *water*/*air* quality. The flowing body of water next to the man is a *river*/*lake*.

ACTIVE **READING**

3 Synthesize You can often define an unknown word if you know the meaning of its word parts. Use the word parts and the sentence below to make an educated guess about the meaning of the word *nonrenewable*.

Word part	Meaning
renew	restore, make like new
-able	able to be
non-	not

Example sentence

Some of Earth's nonrenewable resources include coal and oil.

nonrenewable:

Vocabulary Terms

- **water pollution**
- **point-source pollution**
- **nonpoint-source pollution**
- **thermal pollution**
- **eutrophication**
- **potable**
- **reservoir**

4 Identify This list contains the key terms you'll learn in this lesson. As you read, circle the definition of each term.

Close up of a mayfly larva

Water, Water

Organisms need clean water for life and good health. For example, young mayflies live in water, humans drink water, and brown pelicans eat fish they catch in water.

Why is water important?

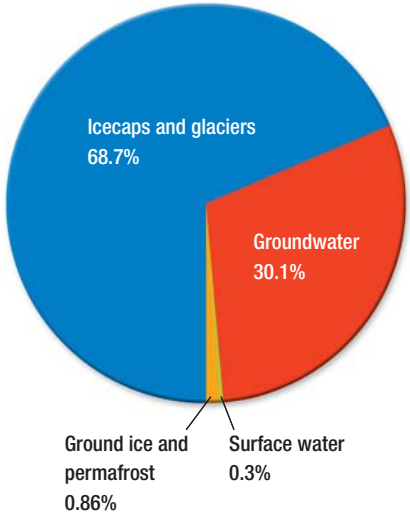
Earth is the only planet with large amounts of water. Water shapes Earth's surface and affects Earth's weather and climates. Most importantly, water is vital for life. Every living thing is made mostly of water. Most life processes use water. Water is an important natural resource. For humans and other organisms, access to clean water is important for good health.

There is lots of water, so what's the problem?

About 97% of Earth's water is salty, which leaves only 3% as fresh water. However, as you can see from the graph, over two-thirds of Earth's fresh water is frozen as ice and snow. But a lot of the liquid water seeps into the ground as groundwater. That leaves much less than 1% of Earth's fresh liquid water on the surface. Water is vital for people, so this small volume of fresh surface water and groundwater is a limited resource.

Areas with high densities of people, such as cities, need lots of fresh water. Cities are getting bigger, and so the need for fresh water is increasing. *Urbanization* (ER•buh•ny•zhay•shuhn) is the growth of towns and cities that results from the movement of people from rural areas into the urban areas. The greater demand for fresh water in cities is threatening the availability of water for many people. Fresh water is becoming a natural resource that cannot be replaced at the same rate at which it is used.

Distribution of Earth's Fresh Water



Visualize It!

5 Gather Evidence What percentage of fresh water on Earth is frozen? What percentage of fresh water is liquid?

Everywhere...

Where do we get fresh water?

Fresh water may fall directly as precipitation, or may melt from ice and snow. Earth's fresh liquid water is found as surface water and groundwater. *Surface water* is any body of water above the ground. It includes liquid salt or fresh water, or solid water, like snow and ice. Water may seep below the surface to become *groundwater*. Groundwater is found under Earth's surface, in spaces in rocks or in soil, where it can be liquid or frozen.

Aquifers and Groundwater

Aquifers and ground ice are forms of groundwater. An *aquifer* is a body of rock or sediment that can store a lot of water, and that allows water to flow easily through it. Aquifers store water in spaces, called *pores,* between particles of rock or sediment. Wells are dug into aquifers to reach the water. In polar regions, water is often frozen in a layer of soil called *permafrost.*

Rivers, Streams, and Lakes

Rivers, streams, and most lakes are fresh surface waters. A stream or river may flow into a bowl-shaped area, which may fill up to form a lake. Many millions of people around the world depend on fresh water that is taken from rivers and fresh water lakes.

What are water quality and supply?

Water quality is a measure of how clean or polluted water is. Water quality is important because humans and other organisms depend on clean water to survive. It is vital for living things to not only have water, but also to have clean water. Dirty, contaminated water can make us sick or even kill us.

Water supply is the availability of water. Water supply influences where and when farmers grow crops, and where people can build cities. *Water supply systems* carry water from groundwater or surface waters so people can use the water. The systems can be a network of underground pipes, or a bucket for scooping water from a well. A shortage of clean, fresh water reduces quality of life for people. Many people in developing countries do not have access to clean, fresh water.

ACTIVE READING

6 List What are the different sources of fresh water?

_____

_____

Think Outside the Book

7 Claims • Evidence • Reasoning Keep a water diary for a day. Record every time you use water. At the end of the day, make a claim about how you could reduce your water usage. Summarize evidence to support the claim and explain your reasoning.

Many people do not have a water supply to their homes. Instead, they have to go to a local stream, well, or pump to gather water for cooking, cleaning, and drinking.

Under Threat

What threatens fresh water quality?

When waste or other material is added to water so that it is harmful to organisms that use it or live in it, **water pollution** (WAW•ter puh•LOO•shuhn) occurs. It is useful to divide pollution sources into two types. **Point-source pollution** comes from one specific site. For example, a major chemical spill is point-source pollution. Usually this type of pollution can be controlled once its source is found. **Nonpoint-source pollution** comes from many small sources and is more difficult to control. Most nonpoint-source pollution reaches water supplies by runoff or by seeping into groundwater. The main sources of nonpoint-source pollution are city streets, roads and drains, farms, and mines.

ACTIVE READING

8 Identify As you read, underline the sources of water pollution.

Thermal Pollution

Any heating of natural water that results from human activity is called **thermal pollution**. For example, water that is used for cooling some power plants gets warmed up. When that water is returned to the river or lake it is at a higher temperature than the lake or river water. The warm water has less oxygen available for organisms that live in the water.

Chemical Pollution

Chemical pollution occurs when harmful chemicals are added to water supplies. Two major sources of chemical pollution are industry and agriculture. For example, refineries that process oil or metals and factories that make metal or plastic products or electronic items all produce toxic chemical waste. Chemicals used in agriculture include pesticides, herbicides, and fertilizers. These pollutants can reach water supplies by seeping into groundwater. Once in groundwater, the pollution can enter the water cycle and can be carried far from the pollution source. *Acid rain* is another form of chemical pollution. It forms when gases formed by burning fossil fuels mix with water in the air. Acid rain can harm both plants and animals. It can lower the pH of soil and water, and make them too acidic for life.

Biological Pollution

Many organisms naturally live in and around water, but they are not normally polluters. *Biological pollution* occurs when live or dead organisms are added to water supplies. Wastewater may contain disease-causing microbes from human or animal wastes. *Wastewater* is any water that has been used by people for such things as flushing toilets, showering, or washing dishes. Wastewater from feed lots and farms may also contain harmful microbes. These microbes can cause diseases such as dysentery, typhoid, or cholera.

Eutrophication

Fresh water often contains nutrients from decomposing organisms. An increase in the amount of nutrients in water is called **eutrophication** (yoo•TRAWF•ih•kay•shuhn). Eutrophication occurs naturally in water. However, *artificial eutrophication* occurs when human activity increases nutrient levels in water. Wastewater and fertilizer runoff that get into waterways can add extra nutrients that upset the natural biology of the water. These extra nutrients cause the fast growth of algae over the water surface. An overgrowth of algae and aquatic plants can reduce oxygen levels and kill fish and other organisms in the water.

Visualize It!

Water can become polluted by human activities in many different ways.

Chemical Pollution
Sulfur in smoke and vehicle exhausts contributes to the acidification of rain, leading to acid rain. Acid rain can affect areas far from the point of pollution.

Biological pollution

Biological Pollution
Animal and human wastes can get washed into a water supply in runoff, or through leaking pipes.

Thermal pollution

Eutrophication

Chemical pollution

9 Claims • Evidence • Reasoning Make a claim about how human activity is impacting water quality in this image. Summarize evidence to support the claim and explain your reasoning.

10 Apply Identify one point source and one nonpoint source of pollution in this image.

How is water quality measured?

Before there were scientific methods of testing water, people could only look at water, taste it, and smell it to check its quality. Scientists can now test water with modern equipment, so the results are more reliable. Modern ways of testing water are especially important for finding small quantities of toxic chemicals or harmful organisms in water.

Water is a good solvent. So, water in nature usually contains dissolved solids, such as salt and other substances. Because most dissolved solids cannot be seen, it is important to measure them. Measurements of water quality include testing the levels of dissolved oxygen, pH, temperature, dissolved solids, and the number and types of microbes in the water. Quality standards depend on the intended use for the water. For example, drinking water needs to meet much stricter quality standards than environmental waters such as river or lake waters do.

Water Quality Measurement

Quality measurement	What is it?	How it relates to water quality
Dissolved solids	a measure of the amount of ions or microscopic suspended solids in water	Some dissolved solids could be harmful chemicals. Others such as calcium could cause scaling or build-up in water pipes.
pH	a measure of how acidic or alkaline water is	Aquatic organisms need a near neutral pH (approx. pH 7). Acid rain can drop the pH too low (acidic) for aquatic life to live.
Dissolved oxygen (DO)	the amount of oxygen gas that is dissolved in water	Aquatic organisms need oxygen. Animal waste and thermal pollution can decrease the amount of oxygen dissolved in water.
Turbidity	a measure of the cloudiness of water that is caused by suspended solids	High turbidity increases the chance that harmful microbes or chemicals are in the water.
Microbial load	the identification of harmful bacteria, viruses or protists in water	Microbes such as bacteria, viruses, and protists from human and animal wastes can cause diseases.

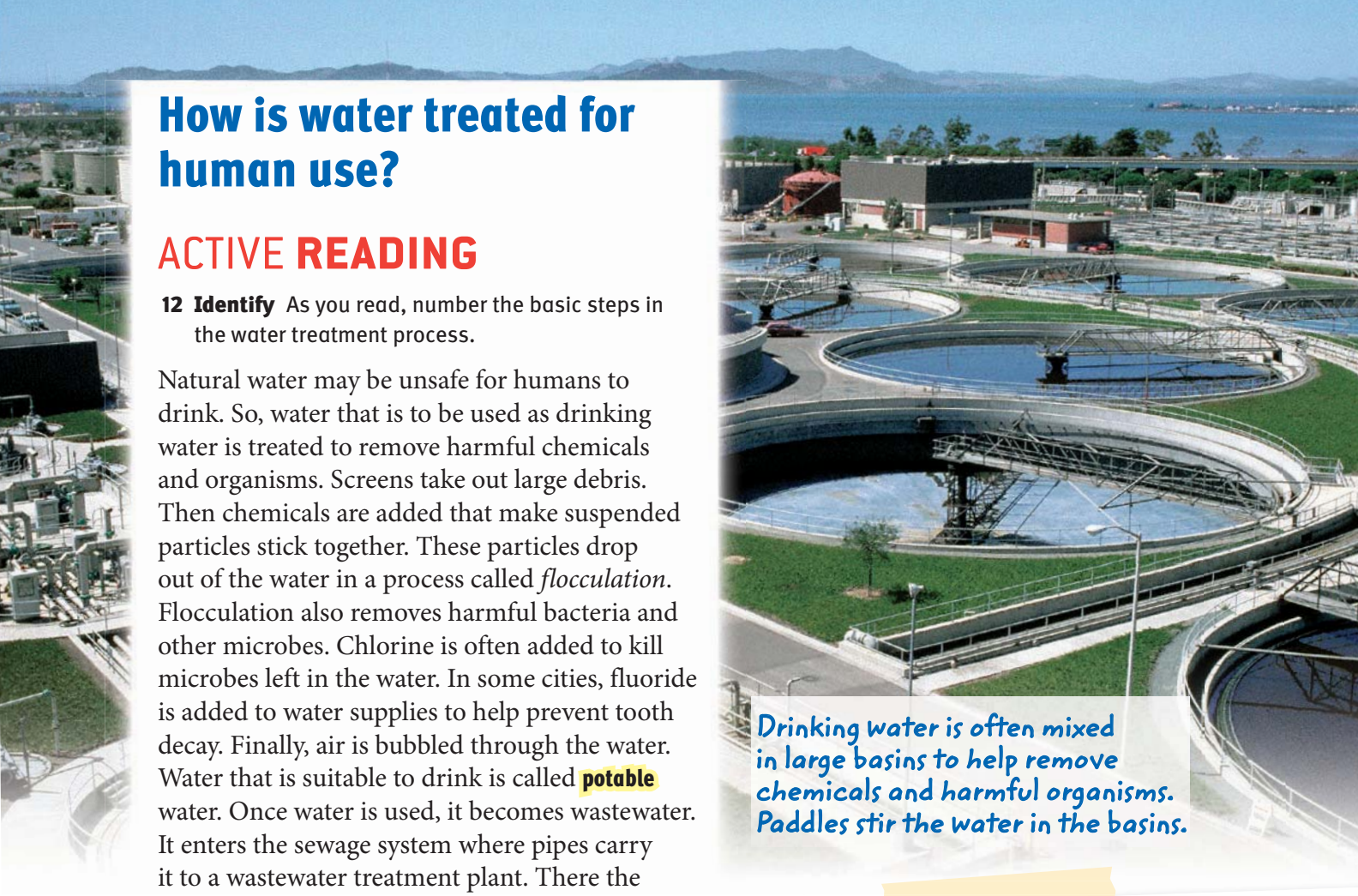
11 State Your Claim Make a claim about the relationship between increased turbidity and the likelihood of something harmful being in the water.

How is water treated for human use?

ACTIVE READING

12 Identify As you read, number the basic steps in the water treatment process.

Natural water may be unsafe for humans to drink. So, water that is to be used as drinking water is treated to remove harmful chemicals and organisms. Screens take out large debris. Then chemicals are added that make suspended particles stick together. These particles drop out of the water in a process called *flocculation*. Flocculation also removes harmful bacteria and other microbes. Chlorine is often added to kill microbes left in the water. In some cities, fluoride is added to water supplies to help prevent tooth decay. Finally, air is bubbled through the water. Water that is suitable to drink is called **potable** water. Once water is used, it becomes wastewater. It enters the sewage system where pipes carry it to a wastewater treatment plant. There the wastewater is cleaned and filtered before being released back into the environment.



Drinking water is often mixed in large basins to help remove chemicals and harmful organisms. Paddles stir the water in the basins.

Who monitors and protects our water quality?

ACTIVE READING

13 Identify As you read, underline the government agency that is responsible for enforcing water quality rules.

If a public water supply became contaminated, many people could get very sick. As a result, public water supplies are closely monitored so that any problems can be fixed quickly. The Safe Drinking Water Act is the main federal law that ensures safe drinking water for people in the United States. The act sets strict limits on the amount of heavy metals or certain types of bacteria that can be in drinking water, among other things. The Environmental Protection Agency (EPA) has the job of enforcing this law. It is responsible for setting the standards drinking water must meet before the water can be pumped into public water systems. Water quality tests can be done by trained workers or trained volunteers.

Samples of water are routinely taken to make sure the water quality meets the standards required by law.

Supply and Demand

How does water get to the faucet?

In earlier times, humans had to live near natural sources of fresh water. Over time, engineers developed ways to transport and store large amounts of water. So, humans can now live in places where fresh water is supplied by water pipes and other infrastructure. The ability to bring fresh water safely from its source to a large population has led to the urbanization of cities.

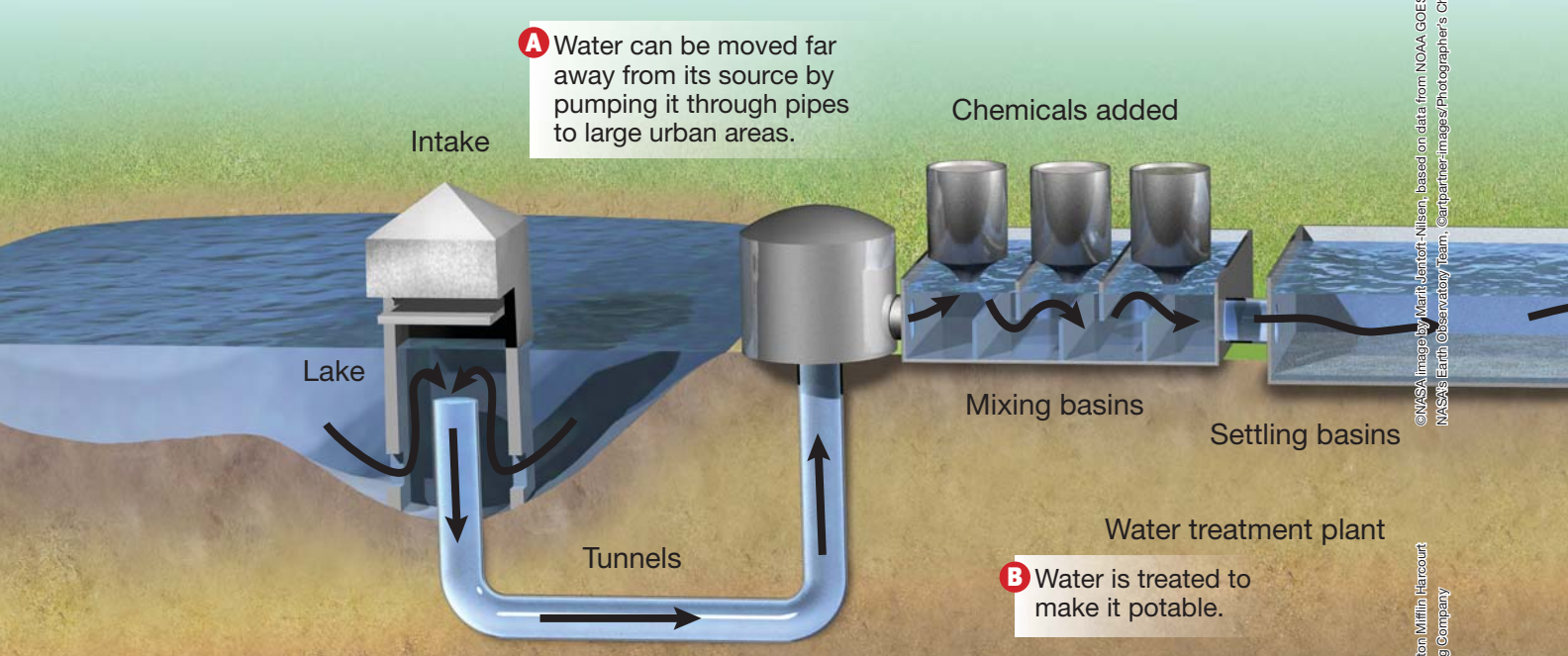
Creating Water Supply Systems

Freshwater supply is often limited, so we have found ways to store and transport water far from its source to where it is used. Surface water is collected and pumped to places where people need it. Groundwater can be found by digging wells into aquifers. Water can be lifted from a well by hand in buckets. It can be pumped into pipes that supply homes, farms, factories and cities. Piped water supply systems can deliver water over great distances to where humans need it. Water supply and storage systems are expensive to build and maintain.

Visualize It!

A public water supply includes the water source, the treatment facilities, and the pipes and pumps that send it to homes, industries, businesses, and public facilities.

Water treatment and distribution



Changing the Flow of Water

Pumping and collecting groundwater and surface waters changes how water flows in natural systems. For example, a **reservoir** (REZ•uhr•vwohr) is a body of water that usually forms behind a dam. Dams stop river waters from flowing along their natural course. The water in a reservoir would naturally have flowed to the sea. Instead, the water can be diverted into a pipeline or into artificial channels called *canals* or *aqueducts*.

What threatens our water supply?

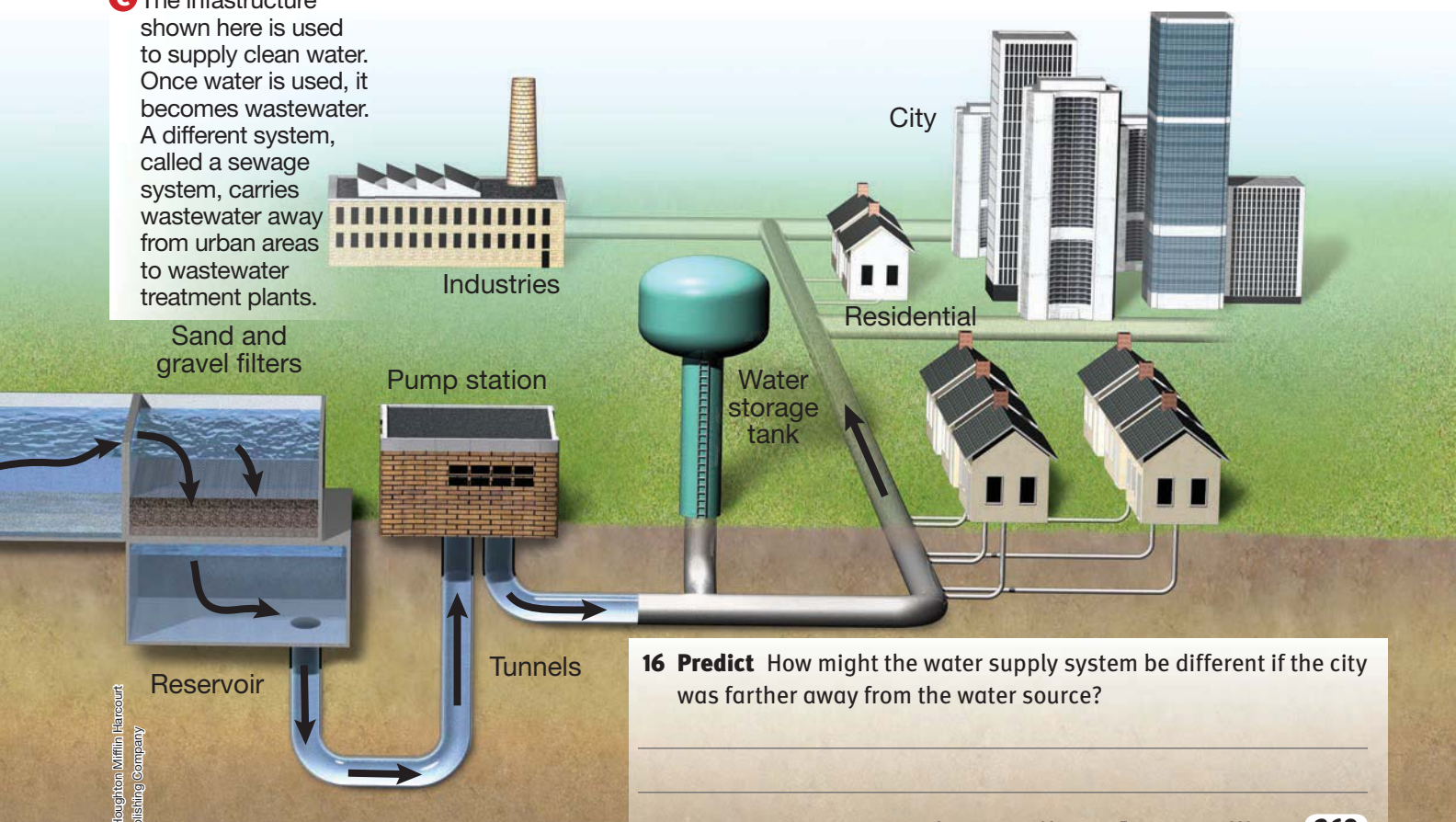
ACTIVE READING

14 Identify As you read, underline the things that are a threat to water supply.

As the human use of water has increased, the demand for fresh water has also increased. Demand is greater than supply in many areas of the world, including parts of the United States. The larger a population or a city gets, the greater the demand for fresh water. Increased demand for and use of water can cause water shortages. Droughts or leaking water pipes can also cause water shortages. Water is used to keep our bodies clean and healthy. It is also used to grow crops for food. Water shortages threaten these benefits.

15 Infer Why would a larger city have a larger demand for water? Explain your reasoning.

C The infastructure shown here is used to supply clean water. Once water is used, it becomes wastewater. A different system, called a sewage system, carries wastewater away from urban areas to wastewater treatment plants.



16 Predict How might the water supply system be different if the city was farther away from the water source?

How do efforts to supply water to humans affect the environment?

Growing urban populations place a greater demand on water supplies. Efforts to increase water supply can affect the environment. For example, building dams and irrigation canals changes the natural flow of water. The environment is physically changed by construction work. The local ecology changes too. Organisms that live in or depend on the water may lose their habitat and move away or die.

Aquifers are often used as freshwater sources for urban areas. When more water is taken from an aquifer than can be replaced by rain or snow, the water table can drop below the reach of existing wells. Rivers and streams may dry up, and the soil that once held aquifer waters may collapse, or *subside*. In coastal areas, the overuse of groundwater can cause seawater to seep into the aquifer in a process called *saltwater intrusion*. In this way, water supplies can become contaminated with salt water.

Increasing population in an area can also affect water quality. The more people who use a water supply in one area, the greater the volume of wastewater that is produced in that area. Pollutants such as oil, pesticides, fertilizers, and heavy metals from city runoff, from industry, and from agriculture may seep into surface waters and groundwater. In this way, pollution could enter the water supply. This pollution could also enter the water cycle and be carried far from the initial source of the pollution.

ACTIVE READING

17 Claims • Evidence • Reasoning Make a claim about how an increased demand on water can affect the water quality. Provide evidence to support your claim and explain your reasoning.

Digging irrigation canals changes the flow of rivers.

Building dams disrupts water flow and affects the ecology of the land and water.

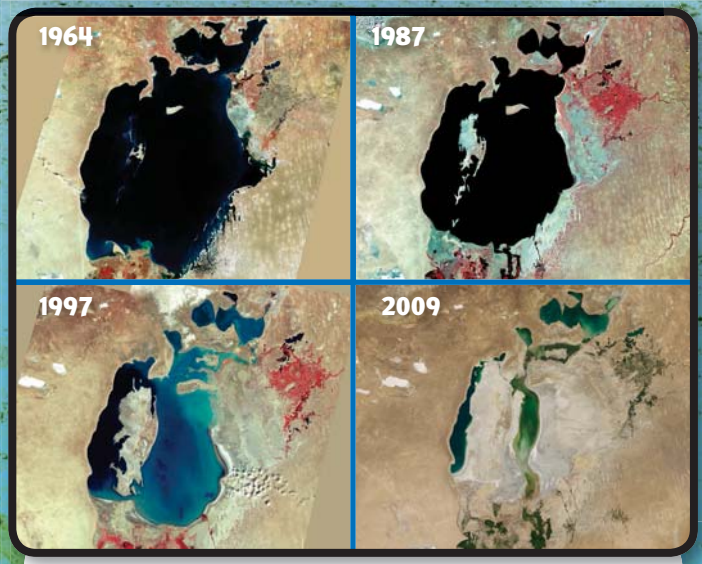
Irrigating arid areas changes the ecology of those areas.

WHY IT **MATTERS**

Death of a Sea

EYE ON THE ENVIRONMENT

The Aral Sea in Central Asia was once the world's fourth-largest inland salty lake. But it has been shrinking since the 1960s. In the 1940s, the courses of the rivers that fed the lake were changed to irrigate the desert, so that crops such as cotton and rice could be grown. By 1997, the lake was down to 20% of its original volume, and down to 10% by 2017. The freshwater flow into the lake was reduced and evaporation caused the lake to become so salty that most of the plants and animals in it died or left the lake.



By 2017, only about 10% of the water originally in the Aral Sea remained and had split into several smaller lakes.

Polluted Land

The Aral Sea is also heavily polluted by industrial wastes, pesticides, and fertilizer runoff. Salty dust that is blown from the dried seabed damages crops and pollutes drinking water. The salt- and dust-laden air cause serious public health problems in the Aral Sea region. One of the more bizarre reminders of how large the lake once was are the boats that lie abandoned on the exposed sea floor.

Extend

18 Identify What human activity has created the situation in the Aral Sea?

19 Apply Research the impact that of one of these two large water projects has had on people and on the environment: The Three Gorges Dam or the Columbia Basin Project.

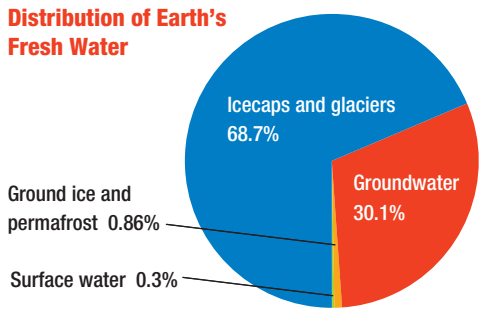
20 Claims • Evidence • Reasoning Research a current or past water project in the area where you live. Make a claim about the benefits of the project for people in the area. Make another claim about what risks there might be to the environment. Summarize evidence to support the claim and explain your reasoning.

Visual Summary

To complete this summary, fill in the blanks with the correct word or phrase. You can use this page to review the main concepts of the lesson.

Human Impact on Water

Organisms need clean water for life and good health.



21 Earth's fresh liquid water is found as surface water and _____

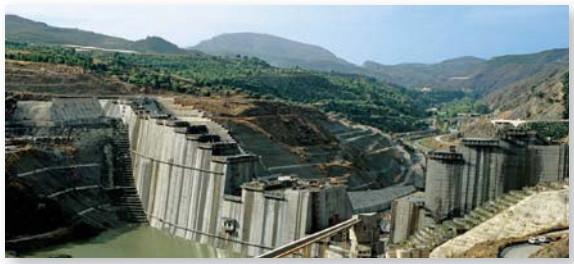
Water pollution can come from many different sources.

22 Runoff from farmland into a river is an example of _____ source pollution.

Federal laws set the standards for potable water quality. Water quality is constantly monitored.

23 Dissolved solids, pH, temperature, and dissolved oxygen are measures of _____.

Ensuring a constant supply of water for people can change the environment.



24 A _____ is a body of water that forms when a dam blocks a river.

25 Claims • Evidence • Reasoning Make a claim about the difference between water quality and water supply. Summarize evidence to support the claim and explain your reasoning.

Lesson Review

LESSON 3

Vocabulary

Fill in the blank with the term that best completes the following sentences.

1 _____ water is a term used to describe water that is safe to drink.

2 The addition of nutrients to water by human activity is called artificial _____.

3 _____ pollution comes from many small sources.

Key Concepts

Complete the table below with the type of pollution described in each example.

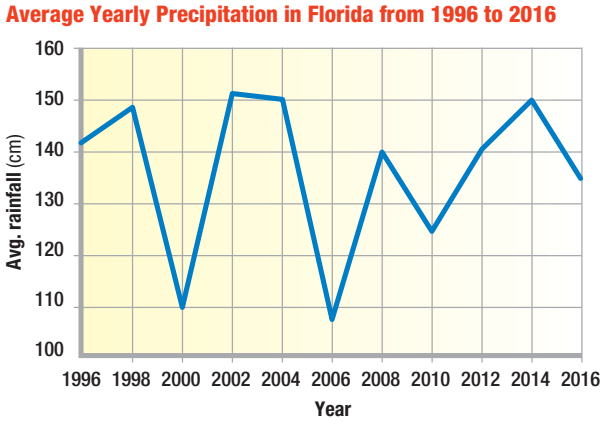
Example	Type of pollution (chemical, thermal, or biological)
4 **Identify** A person empties an oil can into a storm drain.	
5 **Identify** A factory releases warm water into a local river.	
6 **Identify** Untreated sewage is washed into a lake during a rain storm.	

7 **Describe** Name two ways in which humans can affect the flow of fresh water.

8 **Claims • Evidence • Reasoning** Make a claim about why water quality needs to be monitored. Support your claim with evidence and explain your reasoning.

Critical Thinking

Use this graph to answer questions 9 and 10.



Source: National Climatic Data Center

9 **Analyze** Which year had the least precipitation?

10 **Infer** What effect might many years of low precipitation have on water supply?

11 **Claims • Evidence • Reasoning** Make a claim about whether a single person or animal could be a cause of point-source pollution. Use evidence to support your claim and explain your reasoning.

12 **Claims • Evidence • Reasoning** In times of hot, dry, weather, some cities may ban the use of garden sprinklers. Make a claim about why this rule would be made. Summarize evidence to support the claim and explain your reasoning.

SC.7.N.1.5 Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.

S.T.E.M. ENGINEERING & TECHNOLOGY

Analysis—Risk/Benefit

Skills
✔ Identify risks
✔ Identify benefits
Evaluate cost of technology
✔ Evaluate environmental impact
✔ Propose improvements
✔ Propose risk reduction
✔ Compare technologies
✔ Communicate results

Objectives
Research a desalination process.
Conduct a risk/benefit analysis of a desalination process.
Predict actions that may be taken to decrease the risks or improve the benefits of desalination.

Identifying Risks and Benefits of Desalination

Although our planet has a lot of water, vast areas of Earth are dry. Most of the water is too salty to use for drinking or to grow crops. Millions of people struggle to get enough drinking water. Many countries cannot grow enough food because of water shortages. If we could find an inexpensive and safe way to turn salt water into fresh water, people in drier parts of the world could benefit. Fresh water could be used to irrigate crops, and some dry areas could be turned into productive farmland. The removal of salt from salt water is called *desalination*. However, desalination technology is not appropriate for all areas of the world. There are a number of difficulties associated with this technology.

The Sahara Desert

1 Brainstorm What is a benefit of getting fresh water from the sea?

(bg) ©Robert Preston Photography/Alamy

What Methods of Desalination Are Being Tried?

Thousands of desalination facilities exist worldwide. More than a dozen methods of desalination can be used effectively. However, most desalination occurs by the *multistage flash distillation* process. In this method, seawater is boiled so that the water turns to steam, leaving the salt behind. Then the steam is cooled and becomes liquid fresh water. This process must be repeated at different temperatures and pressures to remove as much salt as possible. It takes large amounts of energy to boil the water and run the pressure pumps.

Another desalination method is called *reverse osmosis.* Reverse osmosis uses high pressure to force water through a membrane. This membrane does not allow salt and other substances to pass through. So the liquid on the other side of the membrane is fresh water.

2 Apply What resources does multistage flash distillation require?

3 Claims • Evidence • Reasoning Research two desalination methods. Make a claim about the benefits of each method. Summarize evidence to support the claim and explain your reasoning.

Farmland made possible by irrigation

Desalination facility

(l) ©Jupiterimages/Comstock Images/Getty Images; (r) ©Geof Kirby/Alamy

You Try It!

Now it's your turn to research a method of desalination and perform a risk/benefit analysis.

You Try It!

Now it's your turn to more thoroughly research a method of desalination and perform a risk/benefit analysis. You will be comparing your analysis with the work of other class members.


Reverse osmosis desalination plant

1 Identify Risks

Choose a desalination method to research. As you learn about your chosen desalination method, write down the risks or challenges this method has. They may be financial, social, or anything else that applies. Also, list the web sites you consulted.

2 Identify Benefits

What are the benefits to this method that would make it worth pursuing?

3 Evaluate Environmental Impact

How will this technology affect the land? How will it affect the atmosphere? If salt is returned to the sea, how could it affect marine life?

4 Propose Improvements

What could be done to make this method even better? Can it be combined with another technology or process to enhance its benefits?

5 Propose Risk Reduction

Is there anything that can be done to reduce the risks? Would combining it with another technology or process make it safer?

6 Compare Technology

Discuss your analysis with classmates who chose different technologies. Record the ways in which the method you researched seems better or worse than the methods your classmates researched.

7 Communicate Results

Overall, do you think the desalination method you researched should be used much more than it is? What is its best feature? What recommendations would you make about its use, including where it should be located?

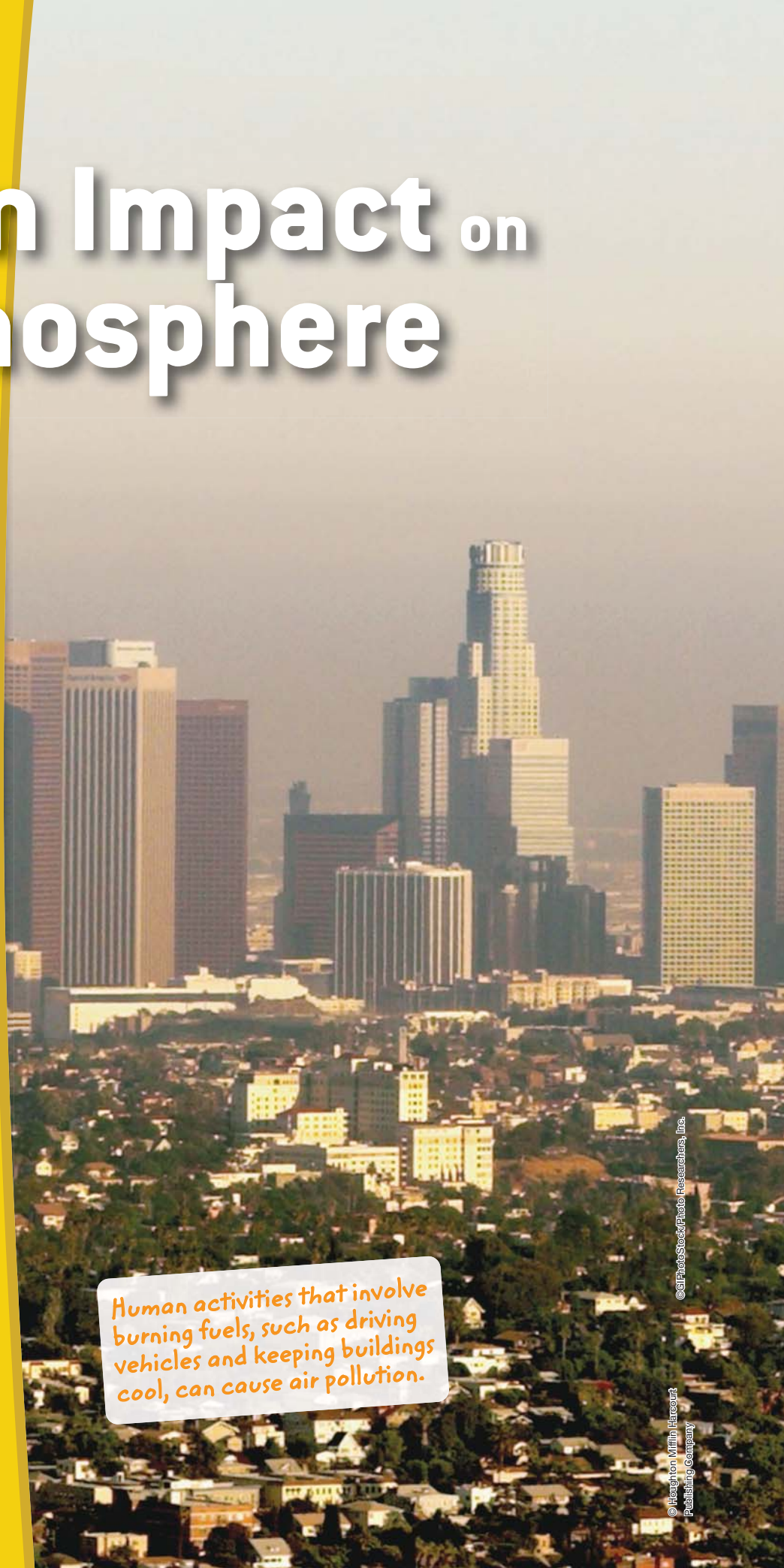
LESSON 4

Human Impact on the Atmosphere

ESSENTIAL **QUESTION**

How do humans impact Earth's atmosphere?

By the end of this lesson, you should be able to identify the impact that humans have had on Earth's atmosphere.



Human activities that involve burning fuels, such as driving vehicles and keeping buildings cool, can cause air pollution.

SC.7.E.6.6 Identify the impact that humans have had on Earth, such as deforestation, urbanization, desertification, erosion, air and water quality, changing the flow of water.

Lesson Labs

Quick Labs

- Collecting Air-Pollution Particles
- Identifying Noise Pollution
- Concrete versus Vegetation

Engage Your Brain

1 Identify Check T or F to show whether you think each statement is true or false.

T	F	
☐	☐	Human activities can cause air pollution.
☐	☐	Air pollution cannot affect you if you stay indoors.
☐	☐	Air pollution does not affect places outside of cities.
☐	☐	Air pollution can cause lung diseases.

2 Analyze The photo above shows the same city as the photo on the left, but on a different day. How are these photos different?

ACTIVE READING

3 Apply Use context clues to write your own definitions for the words *contamination* and *quality*.

Example sentence
You can help prevent food <u>contamination</u> by washing your hands after touching raw meat.

contamination:

Example sentence
The good sound <u>quality</u> coming from the stereo speakers indicated they were expensive.

quality:

Vocabulary Terms

- **greenhouse effect**
- **air pollution**
- **particulate**
- **smog**
- **acid precipitation**
- **air quality**

4 Apply As you learn the definition of each vocabulary term in this lesson, create your own definition or sketch to help you remember the meaning of the term.

AIR
What Is It Good For?

Why is the atmosphere important?

If you were lost in a desert, you could survive a few days without food and water. But you wouldn't last more than a few minutes without air. Air is an important natural resource. The air you breathe forms part of Earth's atmosphere. The *atmosphere* (AT•muh•sfeer) is a mixture of gases that surrounds Earth. Most organisms on Earth have adapted to the natural balance of gases found in the atmosphere.

It Provides Gases That Organisms Need to Survive

Oxygen is one of the gases that make up Earth's atmosphere. It is used by most living cells to get energy from food. Every breath you take brings oxygen into your body. The atmosphere also contains carbon dioxide. Plants need carbon dioxide to make their own food through photosynthesis (foh•toh•SYN•thuh•sys).

It Absorbs Harmful Radiation

High-energy radiation from space would harm life on Earth if it were not blocked by the atmosphere. Fast-moving particles, called *cosmic rays,* enter the atmosphere every second. These particles collide with oxygen, nitrogen, and other gas molecules and are slowed down. A part of the atmosphere called the *stratosphere* contains ozone gas. The ozone layer absorbs most of the high-energy radiation from the sun, called *ultraviolet radiation* (UV), that reaches Earth.

It Keeps Earth Warm

Without the atmosphere, temperatures on Earth would not be stable. It would be too cold for life to exist. The **greenhouse effect** is the way by which certain gases in the atmosphere, such as water vapor and carbon dioxide, absorb and reradiate thermal energy. This slows the loss of energy from Earth into space. The atmosphere acts like a warm blanket that insulates the surface of Earth, preventing the sun's energy from being lost. For this reason, carbon dioxide and water vapor are called *greenhouse gases*.

ACTIVE READING

5 Explain How is Earth's atmosphere similar to a warm blanket?

What is air pollution?

The contamination of the atmosphere by pollutants from human and natural sources is called **air pollution**. Natural sources of air pollution include volcanic eruptions, wildfires, and dust storms. In cities and suburbs, most air pollution comes from the burning of fossil fuels such as oil, gasoline, and coal. Oil refineries, chemical manufacturing plants, dry-cleaning businesses, and auto repair shops are just some potential sources of air pollution. Scientists classify air pollutants as either gases or particulates.

ACTIVE READING

6 Identify As you read, underline sources of air pollution.

Visualize It!

7 Analyze Which one of these images could be both a natural or a human source of air pollution? Explain your reasoning.

Gases

Gas pollutants include carbon monoxide, sulfur dioxide, nitrogen oxide, and ground-level ozone. Some of these gases occur naturally in the atmosphere. These gases are considered pollutants only when they are likely to cause harm. For example, ozone is important in the stratosphere, but at ground level it is harmful to breathe. Carbon monoxide, sulfur dioxide, and nitrogen dioxide are released from burning fossil fuels in vehicles, factories, and homes. They are a major source of air pollution.

Particulates

Particle pollutants can be easier to see than gas pollutants. A **particulate** (per•TIK•yuh•lit) is a tiny particle of solid that is suspended in air or water. Smoke contains ash, which is a particulate. The wind can pick up particulates such as dust, ash, pollen, and tiny bits of salt from the ocean and blow them far from their source. Ash, dust, and pollen are common forms of air pollution. Vehicle exhaust also contains particulates. The particulates in vehicle exhaust are a major cause of air pollution in cities.

It Stinks!

What pollutants can form from vehicle exhaust?

In urban areas, vehicle exhaust is a common source of air pollution. Gases such as carbon monoxide and particulates such as soot and ash are in exhaust fumes. Vehicle exhaust may also react with other substances in the air. When this happens, new pollutants can form. Ground-level ozone and smog are two types of pollutants that form from vehicle exhaust.

ACTIVE READING

8 Identify As you read, underline how ground-level ozone and smog can form.

Ground-Level Ozone

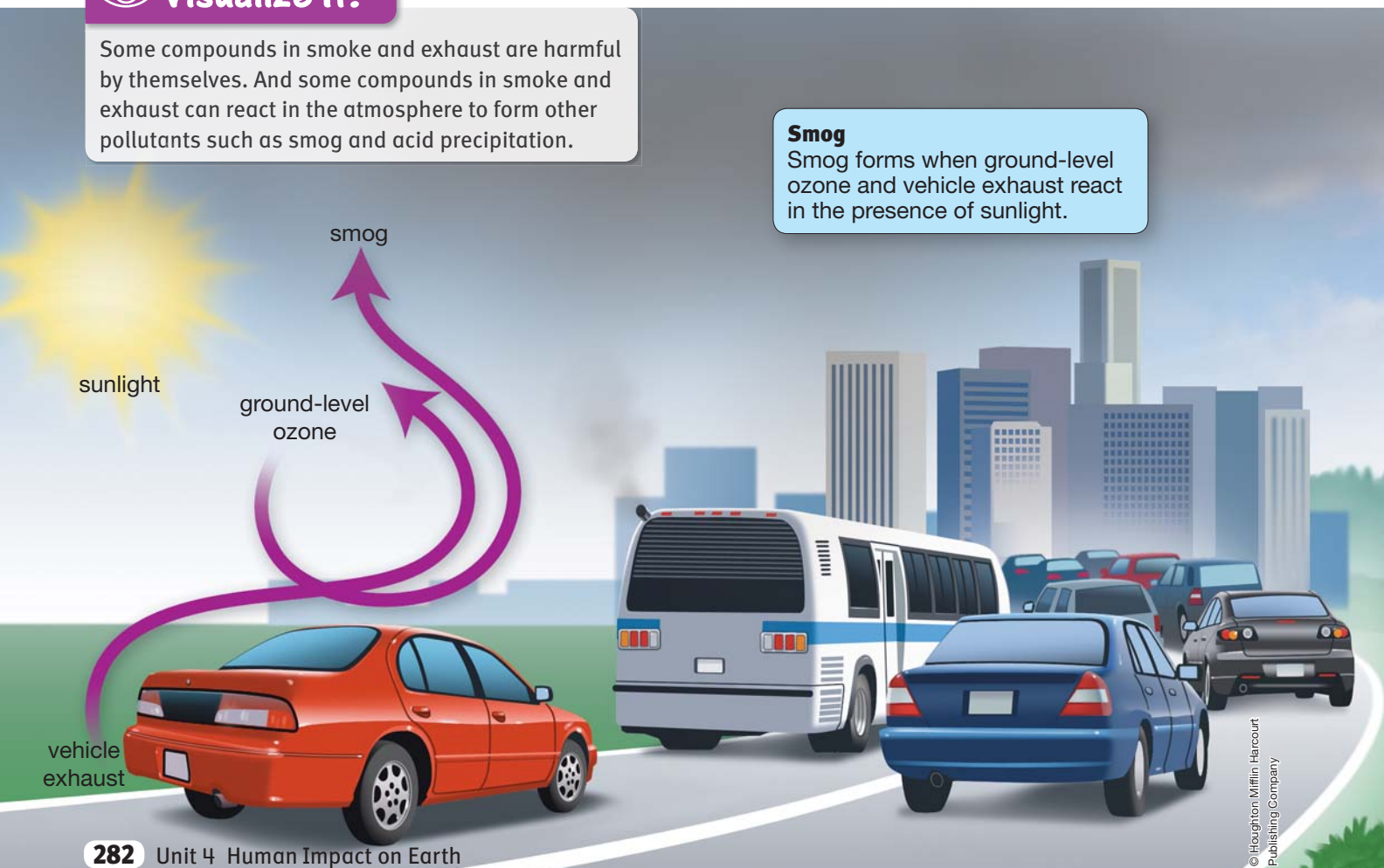
Ozone in the ozone layer is necessary for life, but ground-level ozone is harmful. It is produced when sunlight reacts with vehicle exhaust and oxygen in the air. You may have heard of "Ozone Action Days" in your community. When such a warning is given, people should limit outdoor activities because ozone can damage their lungs.

Smog

Smog is another type of pollutant formed from vehicle exhaust. **Smog** forms when ground-level ozone and vehicle exhaust react in the presence of sunlight. Smog is a problem in large cities because there are more vehicles on the roads. It can cause lung damage and irritate the eyes and nose. In some cities, there can be enough smog to make a brownish haze over the city.

Visualize It!

Some compounds in smoke and exhaust are harmful by themselves. And some compounds in smoke and exhaust can react in the atmosphere to form other pollutants such as smog and acid precipitation.



How does pollution from human activities produce acid precipitation?

ACTIVE READING

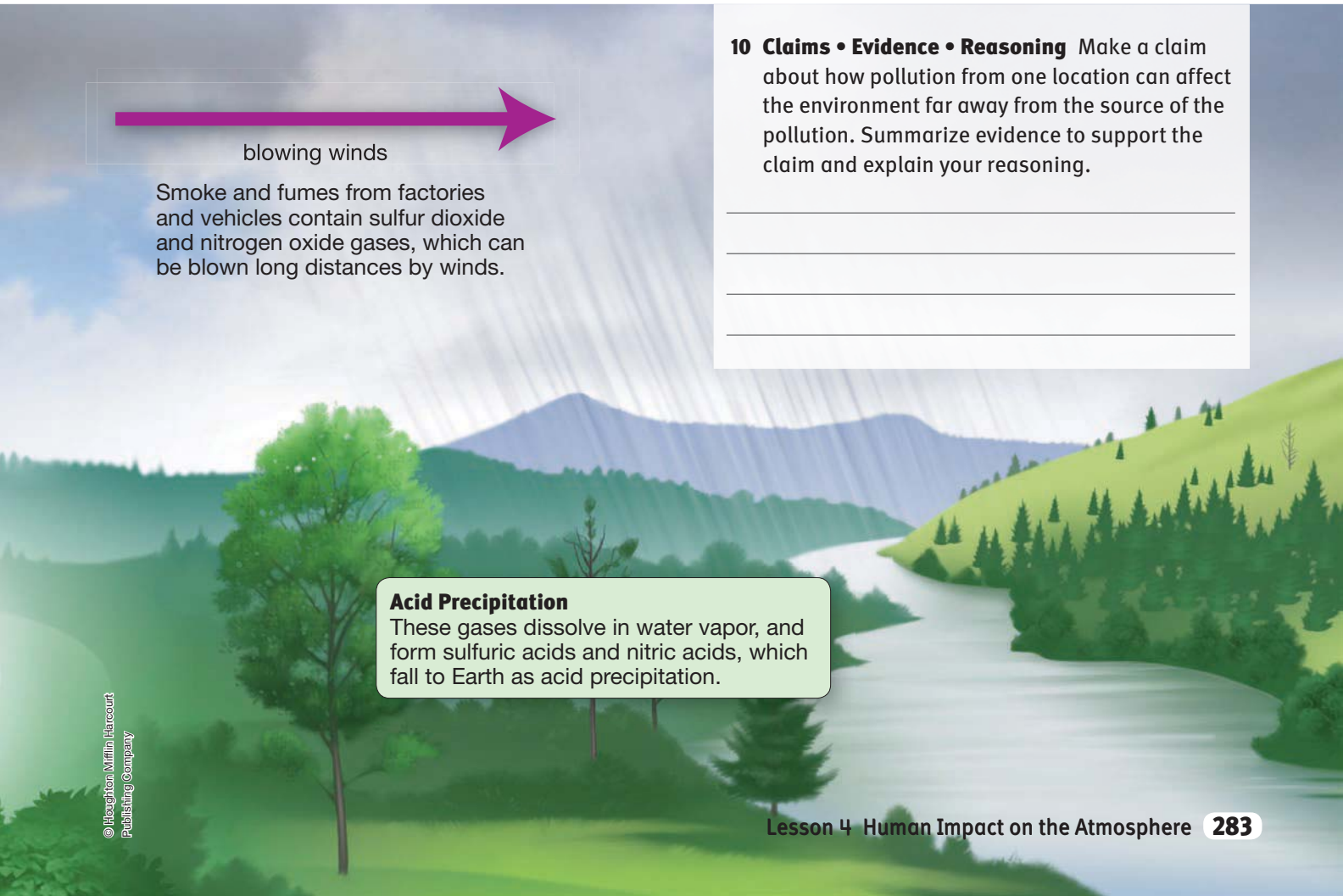
9 Identify As you read, underline how acid precipitation forms.

Precipitation (prih•sip•ih•TAY•shuhn) such as rain, sleet, or snow that contains acids from air pollution is called **acid precipitation**. Burning fossil fuels releases sulfur dioxide and nitrogen oxides into the air. When these gases mix with water in the atmosphere, they form sulfuric acid and nitric acid. Precipitation is naturally slightly acidic. When carbon dioxide in the air and water mix, they form carbonic acid. Carbonic acid is a weak acid. Sulfuric acid and nitric acid are strong acids. They can make precipitation so acidic that it is harmful to the environment.

What are some effects of acid precipitation?

Acid precipitation can cause soil and water to become more acidic than normal. Plants have adapted over long periods of time to the natural acidity of the soils in which they live. When soil acidity rises, some nutrients that plants need are dissolved. These nutrients get washed away by rainwater. Bacteria and fungi that live in the soil are also harmed by acidic conditions.

Acid precipitation may increase the acidity of lakes or streams. It also releases toxic metals from soils. The increased acidity and high levels of metals in water can sicken or kill aquatic organisms. This can disrupt habitats and result in decreased biodiversity in an ecosystem. Acid precipitation can also erode the stonework on buildings and statues.



10 Claims • Evidence • Reasoning Make a claim about how pollution from one location can affect the environment far away from the source of the pollution. Summarize evidence to support the claim and explain your reasoning.

How's the AIR?

What are measures of air quality?

Measuring how clean or polluted the air is tells us about **air quality**. Pollutants reduce air quality. Two major threats to air quality are vehicle exhausts and industrial pollutants. The air quality in cities can be poor. As more people move into cities, the cities get bigger. This leads to increased amounts of human-made pollution. Poor air circulation, such as a lack of wind, allows air pollution to stay in one area where it can build up. As pollution increases, air quality decreases.

Air Quality Index

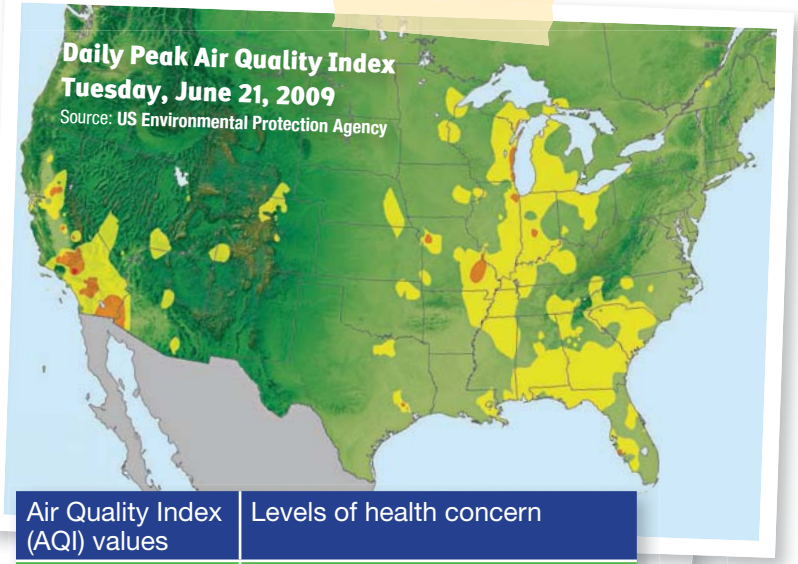
The Air Quality Index (AQI) is a number used to describe the air quality of a location such as a city. The higher the AQI number, the more people are likely to have health problems that are linked to air pollution. Air quality is measured and given a value based on the level of pollution detected. The AQI values are divided into ranges. Each range is given a color code and a description. The Environmental Protection Agency (EPA) has AQIs for the pollutants that pose the greatest risk to public health, including ozone and particulates. The EPA can then issue advisories to avoid exposure to pollution that may harm health.

Visualize It!

11 Recommend If you were a weather reporter using this map, what would you recommend for people living in areas that are colored orange? Explain your reasoning.

Indoor Air Pollution

The air inside a building can become more polluted than the air outside. This is because buildings are insulated to prevent outside air from entering the building. Some sources of indoor air pollution include chlorine and ammonia from household cleaners and formaldehyde from furniture. Harmful chemicals can be released from some paints and glues. Radon is a radioactive gas released when uranium decays. Radon can seep into buildings through gaps in their foundations. It can build up inside well-insulated buildings. *Ventilation,* or the mixing of indoor and outside air, can reduce indoor air pollution. Another way to reduce indoor air pollution is to limit the use of items that create the pollution.



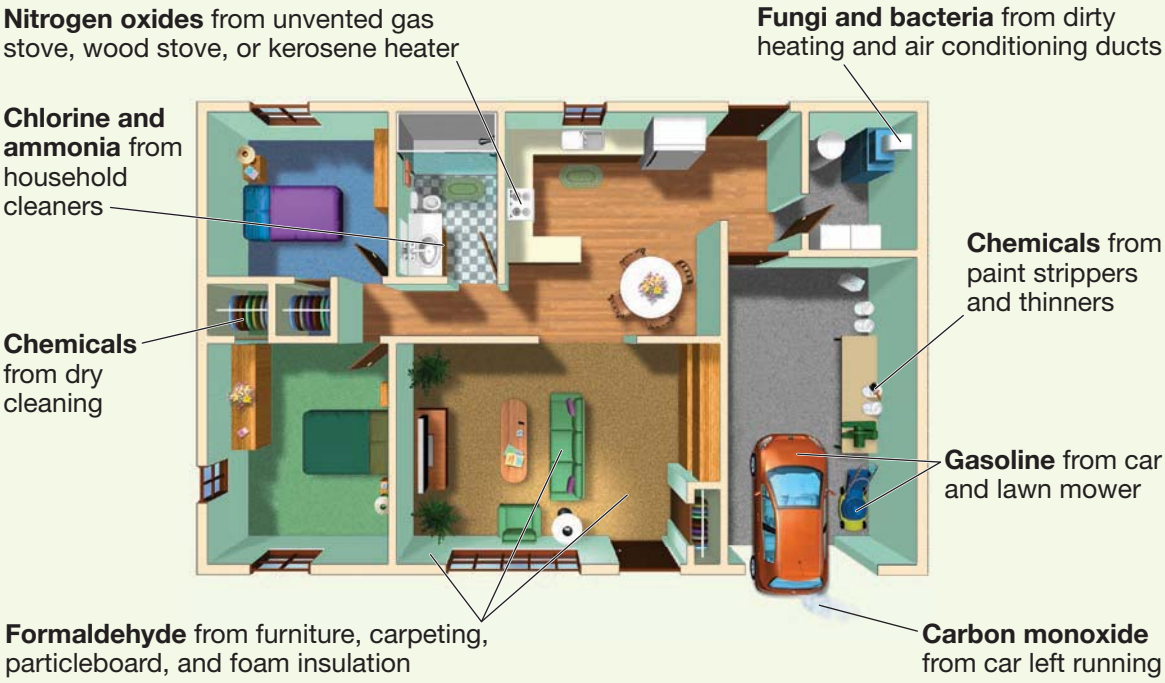
Air Quality Index (AQI) values	Levels of health concern
0–50	Good
51–100	Moderate
101–150	Unhealthy for sensitive groups
151–200	Unhealthy
201–300	Very unhealthy

Source: **US Environmental Protection Agency**

Color codes based on the Air Quality Index show the air quality in different areas.

Visualize It!

12 State Your Claim If this were your house, make a claim about three actions you could take to decrease the sources of indoor air pollution.



How can air quality affect health?

Daily exposure to small amounts of air pollution can cause serious health problems. Children, elderly people, and people with asthma, allergies, lung problems, and heart problems are especially vulnerable to the effects of air pollution. The short-term effects of air pollution include coughing, headaches, and wheezing. Long-term effects, such as lung cancer and emphysema, are dangerous because they can cause death.

Think Outside the Book

13 Claims • Evidence • Reasoning Think about the community in which you live. Make a claim about different things in your community and the surrounding areas that might affect the air quality where you live. Summarize evidence to support the claim and explain your reasoning.

Air Pollution and Your Health

Short-term effects	Long-term effects
coughing	asthma
headaches	emphysema
difficulty breathing	allergies
burning/itchy eyes	lung cancer
	chronic bronchitis

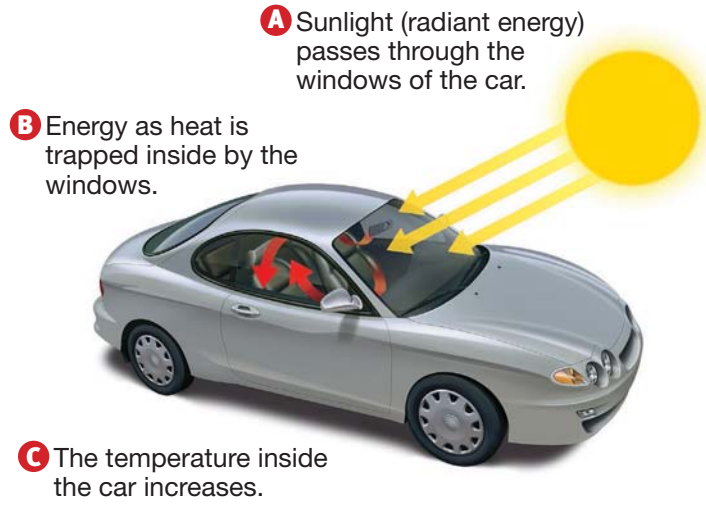
14 Identify Imagine you are walking next to a busy road where there are a lot of exhaust fumes. Circle the effects listed in the table that you are most likely to have while walking.

Things Are CHANGING

How are humans changing Earth's climate?

The burning of fossil fuels releases greenhouse gases, such as carbon dioxide, into the atmosphere. The atmosphere today contains about 43% more carbon dioxide than it did in the mid-1700s, and that level continues to increase. Average global temperatures have also risen in recent decades.

Many people are concerned about how the greenhouse gases from human activities add to the observed trend of increasing global temperatures. Earth's atmosphere and other systems work together in complex ways, so it is hard to know exactly how much the extra greenhouse gases change the temperature. Climate scientists make computer models to understand the effects of climate change. Models predict that average global temperatures are likely to rise another 4.5 °C (8.0 °F) by the year 2100.



Visualize It!

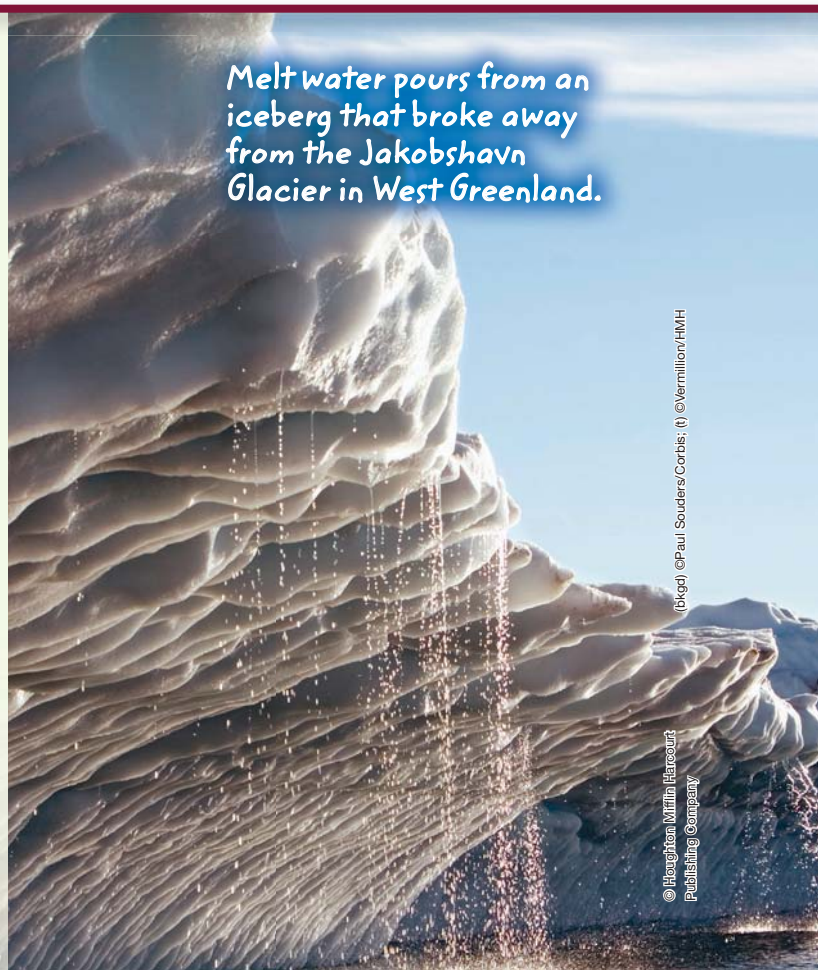
15 Synthesize How is a car with closed windows a good analogy of the atmosphere's greenhouse effect?

What are some predicted effects of climate change?

ACTIVE READING

16 Identify As you read, underline some effects of an increasing average global temperature.

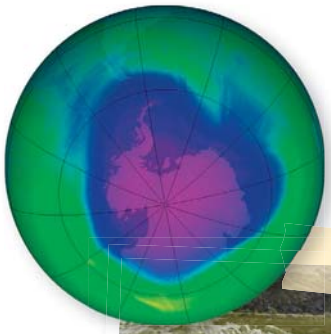
Scientists have already noticed many changes linked to warmer temperatures. For example, some glaciers and the Arctic sea ice are melting at the fastest rates ever recorded. A warmer Earth will lead to changes in rainfall patterns, rising sea levels, and possibly more severe storms. These changes will have many negative impacts for life on Earth. Other predicted effects include drought in some regions and increased precipitation in others. Farming practices and the availability of food is also expected to be impacted by increased global temperatures. Such changes will likely have political and economic effects on the world, especially in developing countries.



How is the ozone layer affected by air pollution?

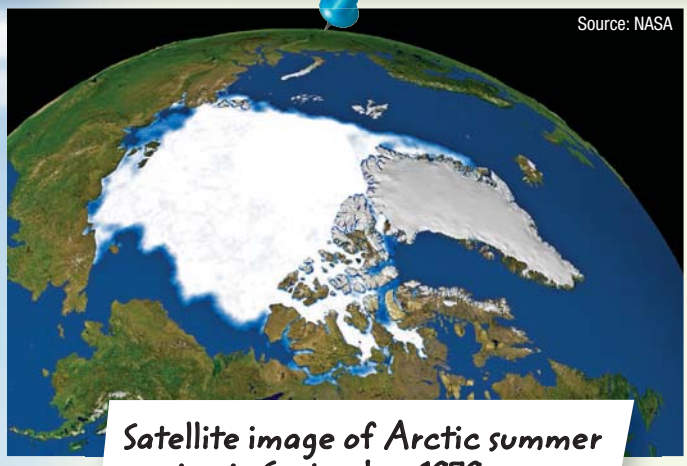
In the 1980s, scientists reported an alarming discovery about Earth's protective ozone layer. Over the polar regions, the ozone layer was thinning. Chemicals called *chlorofluorocarbons* (klor•oh•flur•oh•kar•buhns) (CFCs) were causing ozone to break down into oxygen, which does not block harmful ultraviolet (UV) rays. The thinning of the ozone layer allows more UV radiation to reach Earth's surface. UV radiation is dangerous to organisms, including humans, as it causes sunburn, damages DNA (which can lead to cancer), and causes eye damage.

CFCs once had many industrial uses, such as coolants in refrigerators and air-conditioning units. CFC use has now been banned, but CFC molecules can stay in the atmosphere for about 100 years. So, CFCs released from a spray can 30 years ago are still harming the ozone layer today.

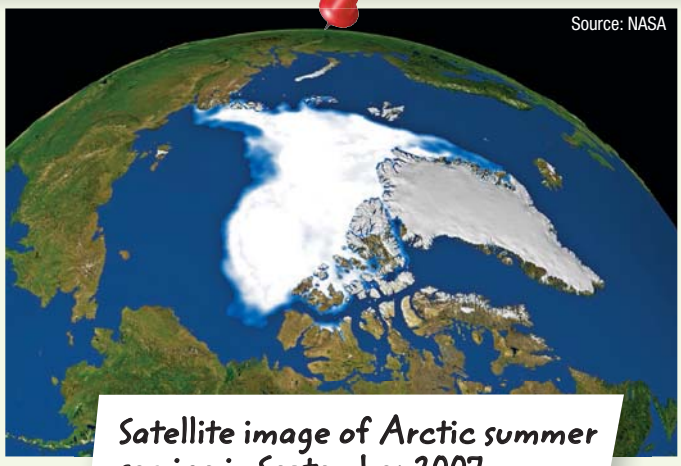


The dark blue area on this map shows the size of the ozone hole over the South Pole.

17 Infer How might these penguins near the South Pole be affected by the ozone hole?



Satellite image of Arctic summer sea ice in September 1979.



Satellite image of Arctic summer sea ice in September 2007.

18 Claims • Evidence • Reasoning Make a claim about how melting sea ice effects people living in coastal areas. Summarize evidence to support the claim and explain your reasoning.

Visual Summary

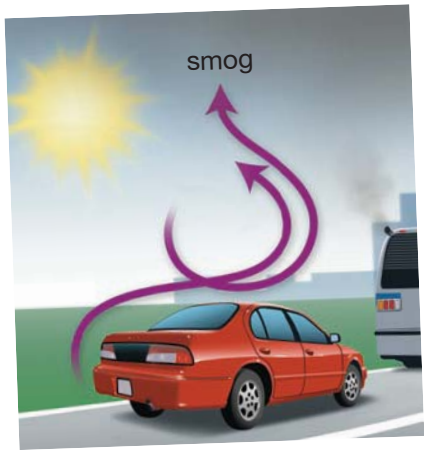
To complete this summary, fill in the blanks with the correct word or phrase. You can use this page to review the main concepts of the lesson.

Human Impact on the Atmosphere

Human activities are a major cause of air pollution.

19 Two types of air pollutants are gases and _____.

Car exhaust is a major source of air pollution in cities.



20 _____ is formed when exhausts and ozone react in the presence of sunlight.

Air quality and levels of pollution can be measured.

Air Quality Index (AQI) values	Levels of health concern
0–50	Good
51–100	Moderate
101–150	Unhealthy for sensitive groups
151–200	Unhealthy
201–300	Very unhealthy

21 As pollution increases, _____ decreases.

Climate change may lead to dramatic changes in global weather patterns.

22 The melting of polar ice is one effect of _____.

23 Claims • Evidence • Reasoning Make a claim about the following statement: Each of your breaths, every tree that is planted, and every vehicle on the road affects the composition of the atmosphere. Use evidence to support your claim and explain your reasoning.

_____

_____

Lesson Review

LESSON 4

Vocabulary

Draw a line to connect the following terms to their definitions.

1 Air pollution	**A** tiny particle of solid that is suspended in air or water
2 Greenhouse effect	**B** the contamination of the atmosphere by the introduction of pollutants from human and natural sources
3 Air quality	**C** pollutant that forms when ozone and vehicle exhaust react with sunlight
4 Particulate	**D** a measure of how clean or polluted the air is
5 Smog	**E** the process by which gases in the atmosphere, such as water vapor and carbon dioxide, absorb and release energy as heat

Key Concepts

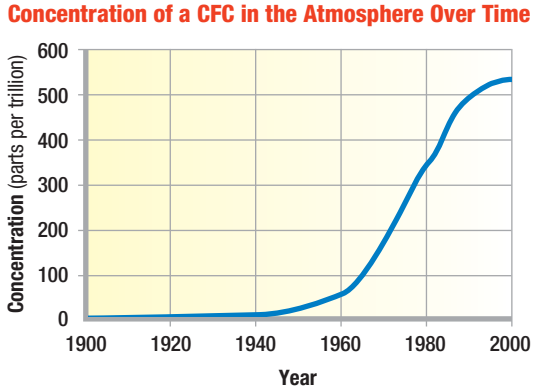
6 Identify List three effects that an increase in urbanization can have on air quality.

7 Relate How are ground-level ozone and smog related?

8 Claims • Evidence • Reasoning Make a claim about how human health is affected by changes in air quality. Provide evidence to support the claim, and explain your reasoning.

Critical Thinking

Use this graph to answer the following questions.



9 Analyze At what time in the graph did CFCs begin building up in the atmosphere?

10 Synthesize Since the late 1970s, the use of CFCs has been reduced, with a total ban in 2010. But CFCs can stay in the atmosphere for up to 100 years. In the space below, draw a graph showing the concentration of CFCs in the atmosphere over the next 100 years.

11 Claims • Evidence • Reasoning Make a claim about the importance of humans controlling the amount of human-made pollution. Summarize evidence to support the claim, and explain your reasoning.

LESSON 5

Protecting Earth's Water, Land, and Air

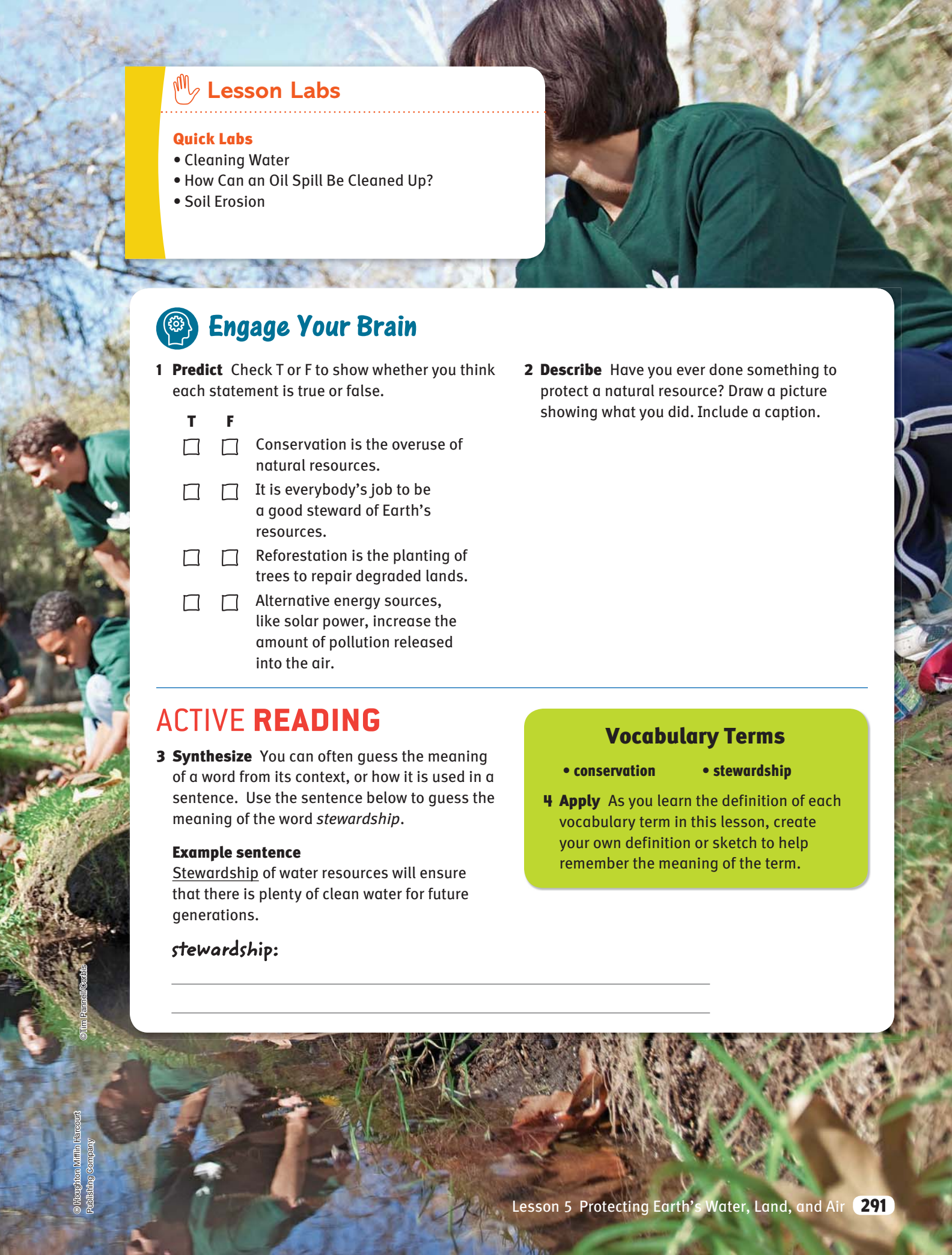
ESSENTIAL **QUESTION**

How can Earth's resources be used wisely?

By the end of this lesson, you should be able to summarize the value of conserving Earth's resources and the effect that wise stewardship has on land, water, and air resources.

Picking up litter to clean streams or rivers is one way we can help preserve Earth's natural resources.

SC.7.E.6.6 Identify the impact that humans have had on Earth, such as deforestation, urbanization, desertification, erosion, air and water quality, changing the flow of water.



Lesson Labs

Quick Labs

- Cleaning Water
- How Can an Oil Spill Be Cleaned Up?
- Soil Erosion

Engage Your Brain

1 Predict Check T or F to show whether you think each statement is true or false.

T	F	
☐	☐	Conservation is the overuse of natural resources.
☐	☐	It is everybody's job to be a good steward of Earth's resources.
☐	☐	Reforestation is the planting of trees to repair degraded lands.
☐	☐	Alternative energy sources, like solar power, increase the amount of pollution released into the air.

2 Describe Have you ever done something to protect a natural resource? Draw a picture showing what you did. Include a caption.

ACTIVE READING

3 Synthesize You can often guess the meaning of a word from its context, or how it is used in a sentence. Use the sentence below to guess the meaning of the word *stewardship*.

Example sentence

Stewardship of water resources will ensure that there is plenty of clean water for future generations.

stewardship:

_____

_____

Vocabulary Terms

- **conservation**
- **stewardship**

4 Apply As you learn the definition of each vocabulary term in this lesson, create your own definition or sketch to help remember the meaning of the term.

Keeping It Clean

What are conservation and stewardship?

In the past, some people have used Earth's resources however they wanted, without thinking about the consequences. They thought it didn't matter if they cut down hundreds of thousands of trees or caught millions of fish. They also thought it didn't matter if they dumped trash into bodies of water. Now we know that it does matter how we use resources. Humans greatly affect the land, water, and air. If we wish to keep using our resources in the future, we need to conserve and care for them.

ACTIVE READING

5 Identify As you read, underline the definitions of *conservation* and *stewardship*.

Conservation: Wise Use of Resources

Conservation (kahn•sur•VAY•shuhn) is the wise use of natural resources. By practicing conservation, we can help make sure that resources will still be around for future generations. It is up to everybody to conserve and protect resources. When we use energy or create waste, we can harm the environment. If we conserve whenever we can, we reduce the harm we do to the environment. We can use less energy by turning off lights, computers, and appliances. We can reuse shopping bags, as in the picture below. We can recycle whenever possible, instead of just throwing things away. By doing these things, we take fewer resources from Earth and put less pollution into the water, land, and air.

Visualize It!

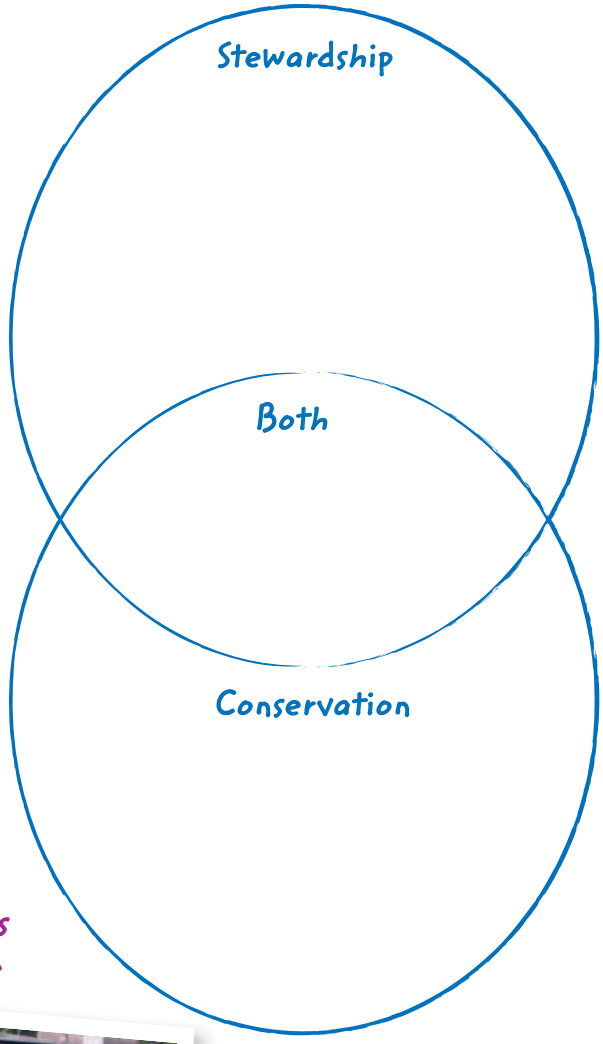
6 Describe How are the people in the picture below practicing conservation?

This old tire is being used as a planter instead of being thrown away.

Stewardship: Managing Resources

Stewardship (stoo•urd•SHIP) is the careful and responsible management of a resource. If we are not good stewards, we will use up a resource or pollute it. Stewardship of Earth's resources will ensure that the environment stays clean enough to help keep people and other living things healthy. Stewardship is everybody's job. Governments pass laws that protect water, land, and air. These laws determine how resources can be used and what materials can be released into the environment. Individuals can also act as stewards. For example, you can plant trees or help clean up a habitat in your community. Any action that helps to maintain or improve the environment is an act of stewardship.

7 Compare Fill in the Venn diagram to compare and contrast conservation and stewardship.



Turning empty lots into gardens improves the environment and provides people with healthy food.

Sea turtles are endangered. Scientists help sea turtles that have just hatched find their way to the sea.

Visualize It!

8 Identify How is the person in the picture to the right practicing stewardship?

_____

_____

_____

Water Wise!

How can we preserve water resources?

Most of the Earth's surface is covered by water, so you might think there is lots of water for humans to use. However, there is actually very little fresh water on Earth, so people should use freshwater resources very carefully. People should also be careful to avoid polluting water because the quality of water is important to the health of both humans and ecosystems. Because water is so important to our health, we need to keep it clean!

By Conserving Water

If we want to make sure there is enough water for future generations, we need to reduce the amount of water we use. In some places, if people aren't careful about using water wisely, there soon won't be enough water for everyone. There are many ways to reduce water usage. We can use low-flow toilets and showerheads. We can take shorter showers. In agriculture and landscaping, we can reduce water use by installing efficient irrigation systems. We can also use plants that don't need much water. Only watering lawns the amount they need and following watering schedules saves water. The photo below shows a simple way to use less water—just turn off the tap while brushing your teeth!

Do the Math

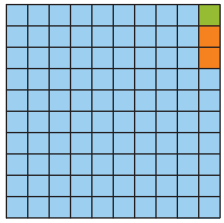
You Try It

9 Calculate How much fresh water is on Earth?

Solve

Each square on the grid equals 1%. Use the grid to fill in the percentage of each type of water found on Earth.

Earth's Water



Salt water _____

Ice (fresh water) _____

Fresh liquid water _____

10 State Your Claim Make a claim about some ways you can reduce the amount of water you use.

- Turn off the tap when brushing my teeth.
- _____
- _____
- _____

With Water Stewardship

Humans and ecosystems need clean water. The diagram below shows how a community keeps its drinking water clean. The main way to protect drinking water is to keep pollution from entering streams, lakes, and other water sources. Laws like the Clean Water Act and Safe Drinking Water Act were passed to protect water sources. These laws indicate how clean drinking water must be and limit the types of chemicals that businesses and private citizens can release into water. These laws also help finance water treatment facilities. We can help protect water by not throwing chemicals in the trash or dumping them down the drain. We can also use nontoxic chemicals whenever possible. Reducing the amount of fertilizer we use on our gardens also reduces water pollution.

For healthy ecosystems and safe drinking water, communities need to protect water sources. The first step to protecting water sources is keeping them from becoming polluted.

Protecting Water Resources

Water testing makes sure water is safe for people to drink. It also helps us find out if there is a pollution problem that needs to be fixed.

Water treatment plants remove pollution from wastewater before it is reused or put back into the environment.

Without clean water to drink, people can get sick. Clean water is also important for agriculture and natural ecosystems.

Visualize It!

11 Claims • Evidence • Reasoning
Make a claim about what steps a community should take to manage its water resources. Use evidence to support your claim and explain your reasoning.

This Land Is Your Land

How can we preserve land resources?

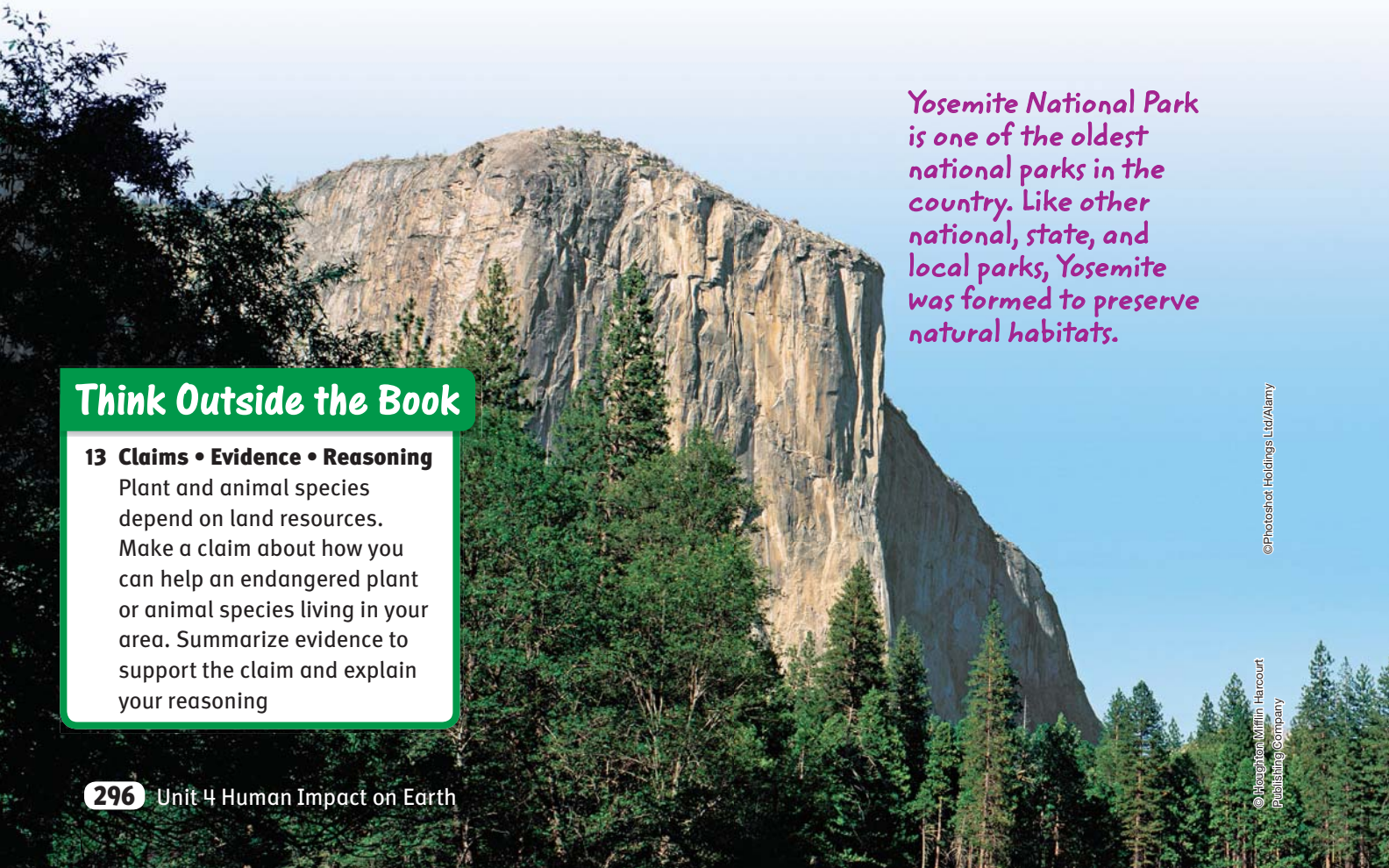
People rely on land resources for recreation, agriculture, transportation, commerce, industry, and housing. If we manage land resources carefully, we can make sure that these resources will be around for generations and continue to provide resources for humans to use. We also need to make sure that there are habitats for wild animals. To do all these things, we must protect land resources from overuse and pollution. Sometimes we need to repair damage that is already done.

ACTIVE READING

12 Identify As you read this page and the next, underline ways that we can protect land resources.

Through Preservation

Preservation of land resources is very important. *Preservation* means protecting land from being damaged or changed. Local, state, and national parks protect many natural areas. These parks help ensure that many species survive. Small parks can protect some species. Other species, such as predators, need larger areas. For example, wolves roam over hundreds of miles and would not be protected by small parks. By protecting areas big enough for large predators, we also protect habitats for many other species.



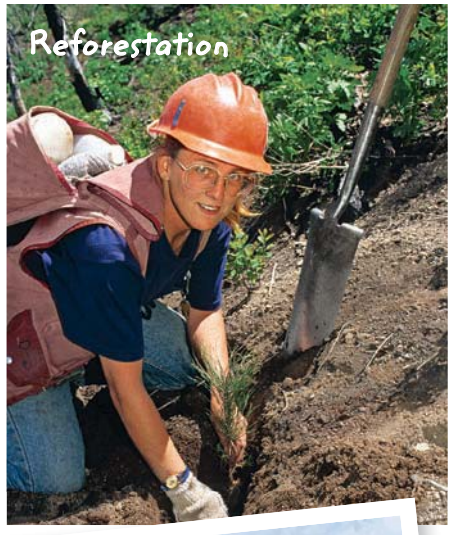
Yosemite National Park is one of the oldest national parks in the country. Like other national, state, and local parks, Yosemite was formed to preserve natural habitats.

Think Outside the Book

13 Claims • Evidence • Reasoning Plant and animal species depend on land resources. Make a claim about how you can help an endangered plant or animal species living in your area. Summarize evidence to support the claim and explain your reasoning

Through Reforestation

People use the wood from trees for many things. We use it to make paper and to build houses. We also use wood to heat homes and cook food. In many places, huge areas of forest were cut down to use the wood and nothing was done to replant the forests. Now when we cut trees down, they are often replanted, as in the picture at right. We also plant trees in areas where forests disappeared many years ago in order to help bring the forests back. The process of planting trees to reestablish forestland is called *reforestation*. Reforestation is important, but we can't cut down all forests and replant them. It is important to keep some old forests intact for the animals that need them to survive.


Reforestation

Through Reclamation

In order to use some resources, such as coal, metal, and minerals, the resources first have to be dug out of the ground. In the process, the land is damaged. Sometimes, large areas of land are cleared and pits are dug to reach the resource. Land can also be damaged in other ways, including by development and agriculture. *Reclamation* is the process by which a damaged land area is returned to nearly the condition it was in before people used it. Land reclamation, shown in the lower right photo, is required for mines in many states once the mines are no longer in use. Many national and state laws, such as the Surface Mining and Reclamation Act and the Resource Conservation and Recovery Act, guide land reclamation.


A mine being reclaimed

Visualize It!

14 Claims • Evidence • Reasoning Make claims about the similarities between reforestation and reclamation. Summarize evidence to support your claims and explain your reasoning

One way to reduce urban sprawl is to locate homes and businesses close together.

Through Reducing Urban Sprawl

Urban sprawl is the outward spread of suburban areas around cities. As we build more houses and businesses across a wider area, there is less land for native plants and animals. Reducing urban sprawl helps to protect land resources. One way to reduce sprawl is to locate more people and businesses in a smaller area. A good way to do this is with vertical development—that means constructing taller buildings. Homes, businesses, and even recreational facilities can be placed within high-rise buildings. We also can reduce sprawl using mixed-use development. This development creates communities with businesses and houses very close to one another. Mixed-use communities are also better for the environment, because people can walk to work instead of driving.

Through Recycling

Recycling is one of the most important things we can do to preserve land resources. *Recycling* is the process of recovering valuable materials from waste or scrap. We can recycle many of the materials that we use. By recycling materials like metal, plastic, paper, and glass, we use fewer raw materials. Recycling aluminum cans reduces the amount of bauxite that is mined. We use bauxite in aluminum smelting. Everyone can help protect land resources by recycling. Lots of people throw away materials that can be recycled. Find out what items you can recycle!

Bauxite mine

15 Apply Aluminum is mined from the ground. Recycling aluminum cans decreases the need for mining bauxite. Paper can also be recycled. How does recycling paper preserve trees?

Through Using Soil Conservation Methods

Soil conservation protects soil from erosion or degradation by overuse or pollution. For example, farmers change the way they plow in order to conserve soil. Contour plowing creates ridges of soil across slopes. The small ridges keep water from eroding soils. In strip cropping, two types of crops are planted in rows next to each other to reduce erosion. Terracing is used on steep hills to prevent erosion. Areas of the hill are flattened to grow crops. This creates steps down the side of the hill. *Crop rotation* means that crops with different needs are planted in alternating seasons. This reduces the prevalence of plant diseases and makes sure there are nutrients for each crop. It also ensures that plants are growing in the soil almost year-round. In no-till farming, soils are not plowed between crop plantings. Stalks and cover crops keep water in the soils and reduce erosion by stopping soil from being blown away.

ACTIVE READING

16 Identify As you read this page, underline five methods of soil conservation.

Visualize It!

Terracing involves building leveled areas, or steps, to grow crops on.

In contour plowing, crop rows are planted in curved lines along land's natural contours.

Strip cropping prevents erosion by creating natural dams that stop water from rushing over a field.

17 Analyze Which two soil conservation techniques would be best to use on gentle slopes?

- ☐ contour plowing
- ☐ crop terracing
- ☐ strip cropping

18 Analyze Which soil conservation technique would be best to use on very steep slopes?

- ☐ contour plowing
- ☐ crop terracing
- ☐ strip cropping

Into Thin Air

How can we reduce air pollution?

Polluted air can make people sick and harm organisms. Air pollution can cause the atmosphere to change in ways that are harmful to the environment and to people. There are many ways that we can reduce air pollution. We can use less energy. Also, we can develop new ways to get energy that produces less pollution. Everybody can help reduce air pollution in many different ways.

Through Energy Conservation

Energy conservation is one of the most important ways to reduce air pollution. Fossil fuels are currently the most commonly used energy resource. When they are burned, they release pollution into the air. If we use less energy, we burn fewer fossil fuels.

There are lots of ways to conserve energy. We can turn off lights when we don't need them. We can use energy-efficient lightbulbs and appliances. We can use air conditioners less in the summer and heaters less in the winter. We can unplug electronics when they are not in use. Instead of driving ourselves to places, we can use public transportation. We can also develop alternative energy sources that create less air pollution. Using wind, solar, and geothermal energy will help us burn less fossil fuel.

ACTIVE READING

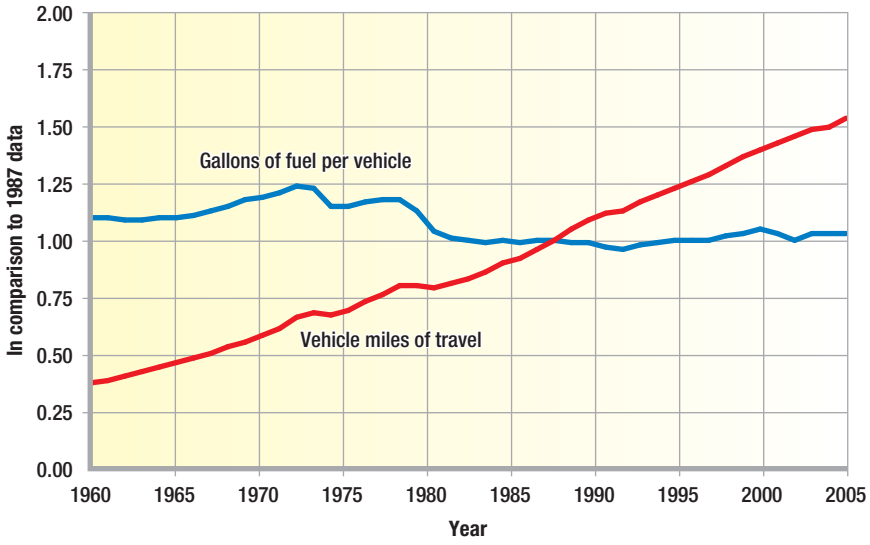
19 Identify Underline the sentences that explain the relationship between burning fossil fuels and air pollution.

Using public transportation, riding a bike, sharing rides, and walking reduce the amount of air pollution produced by cars.

Many cities, such as Los Angeles, California, have air pollution problems.

Energy can be produced with very little pollution. These solar panels help us use energy from the sun and replace the use of fossil fuels.

Vehicle Fuel Consumption and Miles Traveled, 1960–2005



Source: U.S. Department of Transportation

Visualize It!

20 Claims • Evidence • Reasoning Make a claim about how vehicle fuel consumption in comparison to miles traveled has changed since 1960. Use evidence to support your claim and explain your reasoning.

Through Technology

There are lots of ways to generate energy without creating much air pollution. By developing these alternative energy sources, we can reduce the amount of pollution created by burning fossil fuels. Wind turbines generate clean power. So do solar panels that use energy from the sun. We also can use power created by water flowing through rivers or moving with the tides. Geothermal energy from heat in Earth's crust can be used to generate electricity. Hybrid cars get energy from their brakes and store it in batteries. They burn less gas and release less pollution. Driving smaller cars that can go farther on a gallon of gas also reduces air pollution.

New technologies, such as this compact fluorescent lightbulb (CFL), help limit air pollution. CFL bulbs use less energy to make the same amount of light.

Through Laws

Governments in many countries work independently and together to reduce air pollution. They monitor air quality and set limits on what can be released into the air. In the United States, the Clean Air Act limits the amount of toxic chemicals and other pollutants that can be released into the atmosphere by factories and vehicles. It is up to the Environmental Protection Agency to make sure that these limits are enforced. Because air isn't contained by borders, some solutions must be international. The Kyoto Protocol is a worldwide effort to limit the release of greenhouse gases—pollution that can warm the atmosphere.

21 Summarize List three ways air pollution can be reduced.

- _____
- _____
- _____

Visual Summary

To complete this summary, fill in the blanks with the correct word or phrase. You can use this page to review the main concepts of the lesson.

Protecting Water, Land, and Air

Water resources are important to our health.

22 A community's water supply can be protected by:

- conserving water
- preventing pollution
- _____
- treating wastewater

Land resources are used to grow food and make products.

23 Land resources can be protected by:

- preservation
- reclamation and reforestation
- reducing urban sprawl
- _____
- soil conservation

Everybody needs clean air to breathe.

24 The main way to reduce air pollution is to:

_____

_____

_____

_____

_____

_____

25 Claims • Evidence • Reasoning Make claims about how you personally act as a steward of water, land, and air resources. Summarize evidence to support your claims and explain your reasoning

Lesson Review

LESSON 5

Vocabulary

Fill in the blank with the term that best completes the following sentences.

1 _____ is the wise use of natural resources.

2 _____ is the careful and responsible management of a resource.

Key Concepts

3 **Claims • Evidence • Reasoning** How can water pollution be prevented? Use evidence to support your claims and explain your reasoning.

Fill in the table below.

Example	Type of land resource conservation
4 **Identify** A county creates a park to protect a forest.	
5 **Identify** A mining company puts soil back in the hole and plants grass seeds on top of it.	
6 **Identify** A logging company plants new trees after it has cut some down.	
7 **Identify** A plastic milk bottle is turned into planks for a boardwalk to the beach.	
8 **Identify** Instead of building lots of single houses, a city builds an apartment building with a grocery store.	

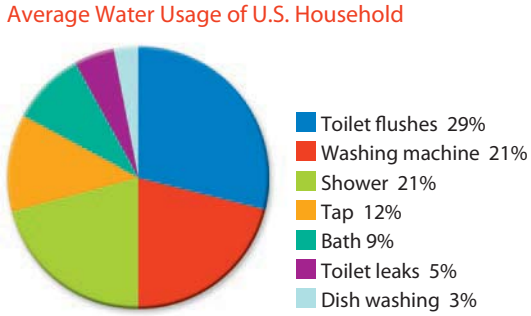
9 **Gather Evidence** Technology has helped decrease air pollution in recent years. Summarize evidence to support this claim.

10 **State Your Claim** Make a claim about why it is important to protect Earth's water, land, and air resources.

Critical Thinking

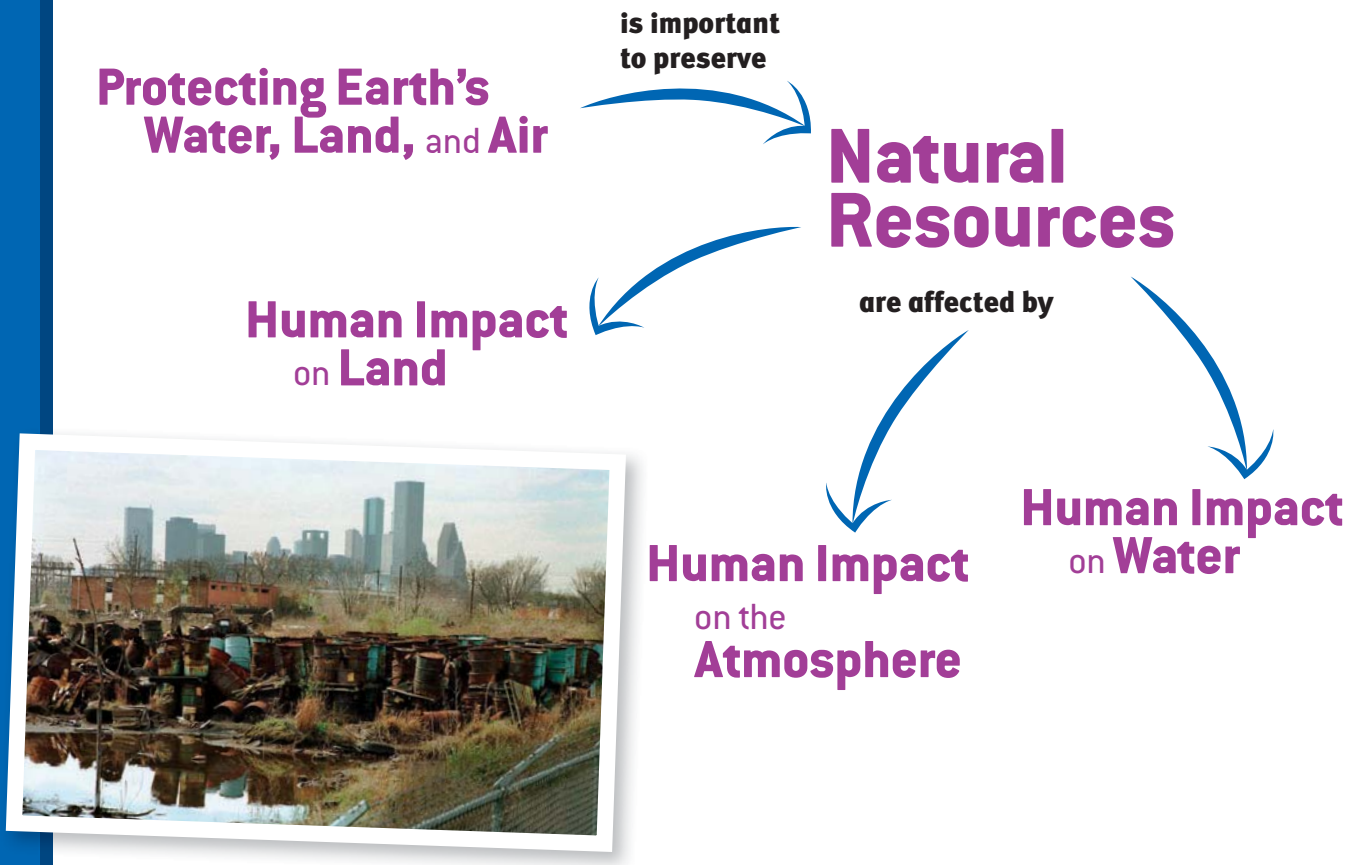
11 **Claims • Evidence • Reasoning** Land reclamation can be expensive. Make a claim about how recycling materials can lead to spending less money on reclamation. Summarize evidence to explain your reasoning.

Use the graph to answer the following question.



12 **Analyze** The graph above shows water use in the average U.S. household. Using the graph, identify three effective ways a household could conserve water.

UNIT 4 Summary



1 Interpret The Graphic Organizer above shows that humans can have an impact on Earth's natural resources. List two examples of ways in which humans can have an impact on natural resources.

2 Integrate How can erosion on land impact water quality?

3 Claims • Evidence • Reasoning Make a claim about how increasing human population affects land resources, water resources, and the atmosphere. Summarize evidence to support your claim and explain your reasoning.

Benchmark Review

Name _____

Vocabulary

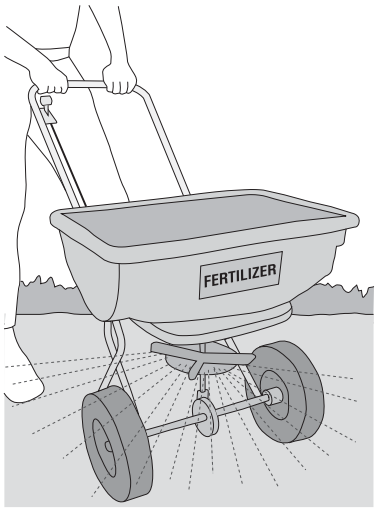
Check the box to show whether each statement is true or false.

T	F	
☐	☐	**1** Air quality is a measure of how clean or polluted the air is.
☐	☐	**2** Potable water is suitable for drinking.
☐	☐	**3** Conservation is the wise use of natural resources.
☐	☐	**4** Land degradation is the process by which humans restore damaged land so that it can support the local ecosystem.
☐	☐	**5** Stewardship of Earth's resources helps make sure that the environment remains healthy.

Key Concepts

Identify the choice that best completes the statement or answers the question.

6 Ms. Chan drew the picture below, which shows a common landscaping practice.



How can this practice cause pollution?

A It pollutes nearby soil when animals track mud from one place to another.

B It pollutes drinking water in the home when chemicals seep into underground pipes.

C It pollutes water when runoff carries chemicals from the soil to local streams and lakes.

D It pollutes the air above the location when chemicals break down and produce gases.

7 Andrea would like to start an environmental conservation club at her school. She is making a poster to describe what the club will do. Which activity could she list that would be part of conservation?

F Learn how to save water.

G Learn how to nurse a sick pet.

H Learn how to build a campfire.

I Learn how to balance a budget.

8 The atmosphere helps regulate Earth's temperature so that life can exist. It also provides the oxygen and carbon dioxide that organisms need to live. Air is an important natural resource that forms part of the atmosphere. Which of these statements provides a **main** reason that air is an important natural resource?

A Air affects surface currents in the oceans.

B Air gives animals and humans a means of transportation.

C Air protects organisms from harmful radiation from the sun.

D Air provides a way for harmful pollutants to move away from Earth.

9 Erosion is the process by which soil and sediment are moved from one place to another. Erosion takes place naturally, but it can be accelerated by human activity. Which of these human activities **least** contributes to land erosion?

F urban sprawl

G planting trees

H surface mining

I improper plowing of furrows

10 The town of Winchester recently built a reservoir that will store drinking water for the town. Which of the following could cause contamination of the water and lead to health-related problems?

A water stewardship

B a water treatment facility

C increase in fertilizer use

D use of nontoxic chemicals

Name _____

11 Air pollution makes it difficult for some people to breathe. It can also cause serious health problems like asthma and allergies. Which of these choices gives the **best** description of air pollution?

F the circulating of pollutants in enclosed spaces

G the long-term health issues related to the quality of the air in cities

H the contamination of the atmosphere by pollutants from human and natural sources

I the pollution that results from changes in the atmosphere, such as the rate of global warming

12 The ozone hole is an area of depleted ozone in Earth's atmosphere. It forms over the Antarctic at the beginning of spring in the Southern Hemisphere, which is August. Which of the following human activities has the **greatest** effect on the ozone in Earth's atmosphere?

A the use of oil in automobile engines

B the use of airplanes in the atmosphere

C the use of satellites in orbit around Earth

D the use of chlorofluorocarbons in refrigeration

13 Ignacio plans to start a recycling program in his neighborhood. He wants to begin by collecting waste materials, such as glass bottles and metal cans. To convince people to help out, he makes a poster explaining how recycling benefits his community. How could recycling waste materials benefit a community?

F It reduces the amount of work that people must do to get rid of wastes.

G It reduces the amount of land area that would be mined for new materials.

H It reduces the amount of land used for storing and recycling waste materials.

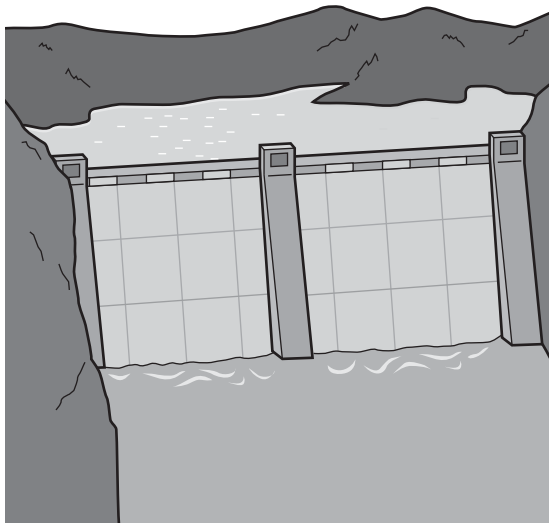
I It reduces the amount of energy used because no energy is needed to recycle materials.

Critical Thinking

Answer the following questions in the space provide.

14 The atmosphere is important to life on Earth. Could it be considered a natural resource? Use at least two examples as evidence to support your claim and explain your reasoning.

15 The picture below is of a dam built on a river.



How does a dam affect the surrounding landscape behind and in front of the dam? Explain your reasoning.

How does a dam affect the fish that live breed in that river? Explain your reasoning.