

Using Natural Resources

Pollution

..... Before You Read

What do you think? Read the two statements below and decide whether you agree or disagree with them. Place an A in the Before column if you agree with the statement or a D if you disagree. After you've read this lesson, reread the statements to see if you have changed your mind.		
Before	Statement	After
	3. Global warming causes acid rain.	
	4. Smog can affect human health.	

..... Read to Learn

What is pollution?

What happens when smoke gets in the air or toxic chemicals leak into soil? Smoke is a mixture of gases and tiny particles that make breathing difficult, especially for people who have health problems. Toxic chemicals that leak into soil can kill plants and soil organisms. These substances cause pollution. **Pollution** is the contamination of the environment with substances that are harmful to life.

Most pollution occurs because of human actions, such as burning fossil fuels or spilling toxic materials. However, pollution also can come from natural disasters. Wildfires create smoke. Volcanic eruptions send ash and toxic gases into the atmosphere. Regardless of its source, pollution affects air, water, and land resources.

Air Pollution

Many large cities issue alerts about air quality when air pollution levels are high. On such days, people are asked to avoid activities that contribute to air pollution, such as driving, using gasoline-powered lawn mowers, or cooking on charcoal grills. To avoid breathing problems, people also are advised to exercise in the early morning when the air is cleaner. Air pollution that can affect human health and recreational activities can be caused by ozone loss, photochemical smog, global warming, and acid precipitation.

Key Concepts

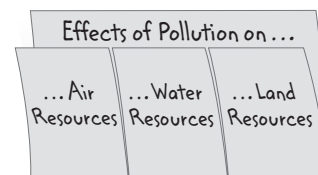
- How does pollution affect air resources?
- How does pollution affect water resources?
- How does pollution affect land resources?

Mark the Text

Main Ideas and Details

Highlight the main idea of each paragraph. Highlight two details that support each main idea with a different color. Use your highlighted copy to review what you studied in this lesson.

Make a horizontal three-tab book and use it to explain the effects of pollution.



✓ Reading Check

1. Define What is ozone?

✓ Reading Check

2. Explain Why have many countries banned the use of CFCs?

✓ Visual Check

3. Identify What activities contribute to the formation of smog?

Ozone Loss

Ozone is a molecule comprised of three oxygen atoms. In the upper atmosphere, it forms a protective layer around Earth. *The **ozone layer** prevents most harmful ultraviolet (UV) radiation from reaching Earth.* UV radiation from the Sun can cause cancer and cataracts. It can also damage crops. ✓

In the 1980s, scientists warned that Earth's protective ozone layer was getting thinner. The problem was caused mainly by chlorofluorocarbons (CFCs). CFCs are compounds used in refrigerators, air conditioners, and aerosol sprays.

Governments around the world have phased out the use of CFCs and other ozone-depleting gases. Because compounds such as CFCs are no longer widely used, the ozone layer is expected to recover within several decades. ✓

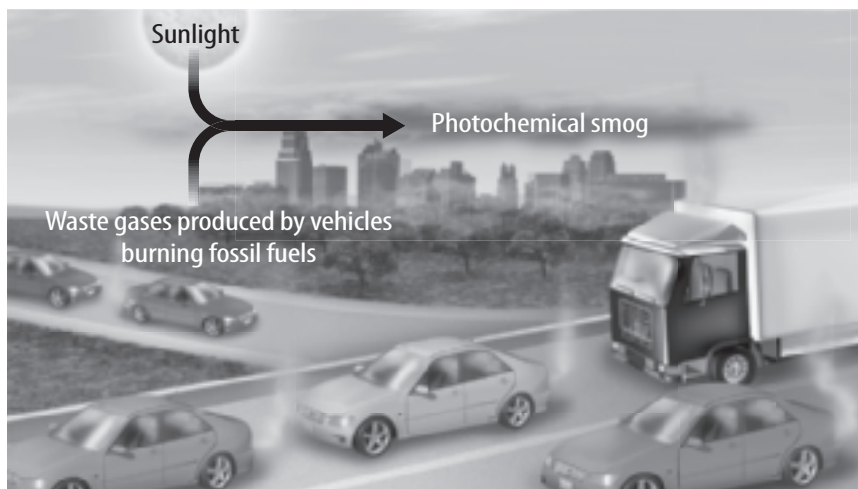
Photochemical Smog

*Sunlight reacts with waste gases from the burning of fossil fuels and forms a type of air pollution called **photochemical smog**.* As shown in the figure below, smog makes the air dark. It also can smell bad.

Photochemical smog is formed of particles and gases that irritate the respiratory system, making it hard for people to breathe. Smog can worsen throughout the day as chemicals react with sunlight.

One of the gases in smog is ozone. In the upper atmosphere, ozone is helpful. But in the lower atmosphere, it is a pollutant that can harm plants and animals and cause lung damage.

Smog



Global Warming

You might have heard news reports about the melting of glaciers and sea ice. Earth is getting warmer. **Global warming** is the scientific observation that Earth's average surface temperature is increasing. Global warming can change Earth's climate in many ways. It can

- change weather conditions;
- change ecosystems and food webs;
- increase the number and severity of floods and droughts; and
- increase coastal flooding as sea ice melts and sea levels rise. ✓

Data indicate that Earth's average surface temperature and increases in atmospheric carbon dioxide (CO₂) follow the same general trend. CO₂ is a greenhouse gas. This means it traps thermal energy, helping to keep Earth warm. Greenhouse gases occur naturally. Without them, Earth would be too cold to support life. But human activities add greenhouse gases to the atmosphere, especially CO₂ from the burning of fossil fuels. Most scientists, including those on the United Nations Intergovernmental Panel on Climate Change, agree that increases in atmospheric CO₂ are contributing to global warming.

Acid Precipitation

Gases produced by the burning of fossil fuels also create other forms of air pollution, including acid precipitation.

Acid precipitation is acidic rain or snow that forms when waste gases from automobiles and power plants combine with moisture in the air. Coal-burning power plants produce sulfur dioxide gas that combines with moisture to form sulfuric acid. Cars and trucks produce nitrous oxide gases that form nitric acid. Acid precipitation pollutes soil and can kill plants, including trees. It also contributes to water pollution and can damage buildings. ✓

Water Pollution

Have you ever seen a stream covered with thick green algae? The stream might have been polluted with fertilizers from nearby lawns or farms. It might contain chemicals from nearby factories. Water pollution can come from chemical runoff and other agricultural, residential, and industrial sources.

✓ Reading Check

4. Describe four possible effects of global warming.

ACADEMIC VOCABULARY

occur

(verb) to appear or happen

✓ Key Concept Check

5. Summarize How does pollution affect air resources?

**Reading Check**

6. Consider Why is household wastewater treated in sewage-treatment plants?

**Reading Check**

7. Name three sources of wastewater.

**Key Concept Check**

8. Summarize How does pollution affect water resources?

Wastewater

You probably already know that you should not pour paint or used motor oil into storm drains. In most cities, rainwater that flows into storm drains goes directly into nearby waterways. Materials that go in the storm drain, including grease and oil washed from the street, can contribute to water pollution.

The wastewater that drains from showers, sinks, and toilets contains harmful viruses and bacteria. To safeguard health, this wastewater usually is purified in a sewage-treatment plant before it is released into streams or used to irrigate crops. In some parts of the world, little or no sewage treatment occurs. People who live in these places might have to use polluted water. ✓

Wastewater that comes from industries and mining operations also contains pollutants. It requires treatment before it can be returned to the environment. Even after treatment, some harmful substances might remain and impact water quality. ✓

Runoff and Sediments

When it rains, water can flow over the land. This water, called runoff, flows across lawns and farmland. Along the way, it picks up pesticides, herbicides, and fertilizers.

Runoff carries these pollutants into streams, where they can harm insects, fish, and other organisms. Runoff also carries sediment particles into streams. Too much sediment can damage stream habitats, clog waterways, and cause flooding. ✓

Land Pollution

Have you ever helped clean up litter? Foam containers, plastic bags, bottles, cans, and even furniture and appliances get dumped along roadsides. Litter is more than an eyesore. It can pollute soil and water and disturb wildlife. Sources of land pollution include homes, farms, industry, and mines.


Agriculture

Farmers use pesticides and other agricultural chemicals to help plants grow. But these chemicals become pollutants if they are used in excess or disposed of improperly.

Herbicides kill weeds. But if they flow into streams, they can kill algae and plants and harm fish and amphibians. Some farming practices contaminate soil. Irrigation water contains salts that can build up in soil that is irrigated on a regular basis.

Industry and Mining

Many industrial facilities, including oil refineries and ore processors, produce toxic wastes. For example, power plants that burn coal produce coal ash sludge as waste. The sludge contains mercury, lead, arsenic, and other potentially harmful metals. If toxic wastes like these are incorrectly stored or disposed of, they can contaminate soil and water. The health of people, plants, and wildlife can be affected.

The mining of fossil fuels and minerals can disturb or destroy entire ecosystems. Some coal-mining techniques can release toxic substances that were buried in rock. After the coal has been removed, the area can be restored. But it is difficult or impossible to replace the original ecosystem. 

Key Concept Check

9. Summarize How does pollution affect land resources?

After You Read

Mini Glossary

acid precipitation: acidic rain or snow that forms when waste gases from automobiles and power plants combine with moisture in the air

global warming: the scientific observation that Earth's average surface temperature is increasing

ozone layer: a protective layer around Earth that prevents most harmful ultraviolet (UV) radiation from reaching Earth

photochemical smog: a type of air pollution formed when sunlight reacts with waste gases from the burning of fossil fuels

pollution: the contamination of the environment with substances that are harmful to life

1. Review the terms and their definitions in the Mini Glossary. Write a sentence comparing and contrasting acid precipitation and photochemical smog.

2. Use the graphic organizer below to identify at least two sources of water pollution and two sources of land pollution.

<ul style="list-style-type: none"> • • 	<ul style="list-style-type: none"> • •
↓	↓
Water Pollution	Land Pollution

3. What do you think would happen to Earth's surface temperature if atmospheric CO₂ levels decreased? Why?

What do you think **NOW?**

Reread the statements at the beginning of the lesson. Fill in the After column with an A if you agree with the statement or a D if you disagree. Did you change your mind?



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END OF LESSON