Water Pollution

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CHAPTER 1

Water Pollution

Lesson Objectives

- Define point and nonpoint source pollution.
- List sources of water pollution.
- Describe ocean water pollution.
- Identify causes and effects of thermal pollution.

Vocabulary

- point source pollution
- non-point source pollution
- thermal pollution

Introduction

Water pollution is a worldwide problem. Almost anything released into the air or onto the land can end up in Earth's water.

Point and Nonpoint Source Pollution

Pollution that enters water at just one point is called **point source pollution**. For example, chemicals from a factory might empty into a stream through a pipe or set of pipes (see **Figure** 1.1). Pollution that enters in many places is called **non-point source pollution**. This means that the pollution is from multiple sources. With non-point source pollution, runoff may carry the pollution into a body of water. Which type of pollution do you think is harder to control?

Sources of Water Pollution

There are three main sources of water pollution:

1. Agriculture.
2. Industry.
3. Municipal, or community, sources.

FIGURE 1.1

Pollution from a factory enters a stream at a single point.

Water Pollution from Agriculture

Huge amounts of chemicals, such as fertilizers and pesticides, are applied to farm fields (see **Figure** 1.2). Some of the chemicals are picked up by rainwater. Runoff then carries the chemicals to nearby rivers or lakes. Dissolved fertilizer causes too much growth of water plants and algae. This can lead to dead zones where nothing can live in lakes and at the mouths of rivers. Some of the chemicals can infiltrate into groundwater. The contaminated water comes up in water wells. If people drink the polluted water, they may get sick.

FIGURE 1.2

This vehicle is spreading fertilizer on a field before planting.

Waste from livestock can also pollute water. The waste contains bacteria and other organisms that cause disease. In fact, more than 40 human diseases can be caused by water polluted with animal waste. Many farms in the U.S. have thousands of animals. These farms produce millions of gallons of waste. The waste is stored in huge lagoons, like the one in **Figure** 1.3. Unfortunately, many leaks from these lagoons have occurred. Two examples are described below.

- In North Carolina, 25 million gallons of hog manure spilled into a nearby river. The contaminated water killed millions of fish.

- In Wisconsin, cow manure leaked into a city's water supply. Almost half a million people got sick. More than 100 people died.

FIGURE 1.3

From the air, this looks like a pond of water. It's really a pond of hog manure. To get an idea of how big the lagoon is, check out the vehicles at the bottom of the picture.

Water Pollution from Industry

Factories and power plants may pollute water with harmful substances.

- Many industries produce toxic chemicals. Some of the worst are arsenic, lead, and mercury.
- Nuclear power plants produce radioactive chemicals. They cause cancer and other serious health problems.
- Oil tanks and pipelines can leak. Leaks may not be noticed until a lot of oil has soaked into the ground. The oil may pollute groundwater so it is no longer fit to drink.

Municipal Water Pollution

"Municipal" refers to the community. Households and businesses in a community are also responsible for polluting the water supply. For example:

- People apply chemicals to their lawns. The chemicals may be picked up by rainwater. The contaminated runoff enters storm sewers and ends up in nearby rivers or lakes.
- Underground septic tanks can develop leaks. This lets household sewage seep into groundwater.
- Municipal sewage treatment plants dump treated wastewater into rivers or lakes. Sometimes the wastewater is not treated enough and contains bacteria or toxic chemicals.

Ocean Water Pollution

The oceans are vast. You might think they are too big to be harmed by pollution. But that's not the case. Ocean water is becoming seriously polluted.

Coastal Pollution

The oceans are most polluted along coasts. Why do you think that's the case? Of course, it's because most pollution enters the oceans from the land. Runoff and rivers carry the majority of pollution into the ocean. Many cities dump their wastewater directly into coastal waters. In some parts of the world, raw sewage and trash may be thrown into the water (see **Figure** 1.4). Coastal water may become so polluted that people get sick if they swim in it or eat seafood from it. The polluted water may also kill fish and other ocean life.

FIGURE 1.4

This coastal ocean water is full of trash and sewage.

Oil Spills

Oil spills are another source of ocean pollution. To get at oil buried beneath the seafloor, oil rigs are built in the oceans. These rigs pump oil from beneath the ocean floor. Huge ocean tankers carry oil around the world. If something goes wrong with a rig on a tanker, millions of barrels of oil may end up in the water. The oil may coat and kill ocean animals. Some of the oil will wash ashore. This oil may destroy coastal wetlands and ruin beaches. **Figure** 1.5 shows workers trying to clean up oil on a Louisiana beach. The oil washed ashore after a deadly oil rig explosion in the Gulf of Mexico in 2010.

Thermal Pollution

Thermal pollution is pollution that raises the temperature of water. This is caused by power plants and factories that use the water to cool their machines. The plants pump cold water from a lake or coastal area through giant cooling towers, like those in **Figure** 1.6. As it flows through the towers, the cold water absorbs heat. This warmed water is returned to the lake or sea. Thermal pollution can kill fish and other water life. It's not just the warm temperature that kills them. Warm water can't hold as much oxygen as cool water. If the water gets too warm, there may not be enough oxygen for living things.

FIGURE 1.5

After an oil rig explosion, hundreds of miles of beaches looked like this one. Cleaning them up was a huge task.

FIGURE 1.6

Nuclear power plants need huge amounts of water for cooling, so they are built close to water. The water that's returned to the lake may be warm enough to kill fish.

Lesson Summary

- Point source pollution enters water at just one place. For example, it might enter a stream through a pipe. Non-point source pollution enters water everywhere. It is carried by runoff.
- Major sources of pollution are agriculture, industry, and communities. Pollution from agriculture includes chemicals and animal waste. Industry produces toxic chemicals. Communities produce sewage.
- Ocean water is most polluted along coasts. That's because pollution usually enters the water from land. Oil

spills also pollute ocean water.
- Thermal pollution raises the temperature of water. It is commonly caused by power plants and factories. The change in temperature can kill fish and other water organisms.

Lesson Review Questions

Recall

1. Describe two major ways that agriculture can pollute water.
2. List harmful substances that industry may add to water.
3. What are some municipal sources of water pollution?
4. State why ocean water is most polluted near coasts.
5. How can oil end up in ocean water?
6. What is thermal pollution? Why is it harmful for fish and other water life?

Apply Concepts

7. The nuclear power plant below is located near the ocean. The plant uses ocean water for cooling. Describe two types of water pollution this plant might produce.

FIGURE 1.7

Diablo Canyon nuclear power plant in San Luis Obispo County, California.

Think Critically

8. Compare and contrast point and nonpoint source pollution. Give an example of each.

Points to Consider

People can't live without water. They need it for life itself. More than almost any other resource, water must be protected.

- How can water pollution be prevented?
- How can we use less water?

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