



**Figure 22** ▶ The accumulation of pollutants at successive levels of the food chain is called biomagnification.

**Figure 23** ▶ The Cuyahoga River was so polluted with petroleum and petroleum byproducts that it caught on fire and burned in 1969.



## Water Pollution and Ecosystems

Water pollution can cause immediate damage to an ecosystem. For example, toxic chemicals spilled directly into a river can kill nearly all living things for miles downstream. But the effects of water pollution can be even more far reaching. Many pollutants accumulate in the environment because they do not decompose quickly. As the pollutant levels increase, they can threaten an entire ecosystem.

Consider a river ecosystem. Soil tainted with pesticides washes into the river and settles to the river bottom. Some of the pesticides enter the bodies of tiny, bottom-dwelling organisms, such as insect larvae and crustaceans. A hundred of these organisms are eaten by one small fish. A hundred of these small fish are eaten by one big fish. A predatory bird, such as an eagle, eats 10 big fish. Each organism stores the pesticide in its tissues, so at each step along the food chain, the amount of the pesticide passed on to the next organism increases. This accumulation of pollutants at successive levels of the food chain is called **biomagnification**. Biomagnification, which is illustrated in **Figure 22**, has alarming consequences for organisms at the top of the food chain. Biomagnification is one reason why many U.S. states limit the amount of fish that people can eat from certain bodies of water.

## Cleaning Up Water Pollution

In 1969, the Cuyahoga River in Cleveland, Ohio, was so polluted that the river caught on fire and burned for several days, as shown in **Figure 23**. This shocking event was a major factor in the passage of the Clean Water Act of 1972. The stated purpose of the act was to “restore and maintain the chemical, physical, and biological integrity of the nation’s waters.” The goal of the act was to make all surface water clean enough for fishing and

swimming by 1983. This goal was not achieved; however, much progress has been made since the act was passed. The percentage of lakes and rivers that are fit for swimming and fishing has increased by about 30 percent, and many states have passed stricter water-quality standards of their own. Many toxic metals are now removed from wastewater before the water is discharged.

The Clean Water Act opened the door for other water-quality legislation, some of which is described in **Table 6**. For example, the Marine Protection, Research, and Sanctuaries Act of 1972 strengthened the laws against ocean dumping.

The Oil Pollution Act of 1990 requires all oil tankers traveling in U.S. waters to

Table 6 ▼

Federal Laws Designed to Improve Water Quality in the United States
<b>1972 Clean Water Act (CWA)</b> The CWA set a national goal of making all natural surface water fit for fishing and swimming by 1983 and banned pollutant discharge into surface water after 1985. The act also required that metals be removed from wastewater.
<b>1972 Marine Protection, Research, and Sanctuaries Act, amended 1988</b> This act empowered the EPA to control the dumping of sewage wastes and toxic chemicals in U.S. waters.
<b>1975 Safe Drinking Water Act (SDWA), amended 1996</b> This act introduced programs to protect groundwater and surface water from pollution. The act emphasized sound science and risk-based standards for water quality. The act also empowered communities in the protection of source water, strengthened public right-to-know laws, and provided water system infrastructure assistance.
<b>1980 Comprehensive Environmental Response Compensation and Liability Act (CERCLA)</b> This act is also known as the Superfund Act. The act makes owners, operators, and customers of hazardous waste sites responsible for the cleanup of the sites. The act has reduced the pollution of groundwater by toxic substances leached from hazardous waste dumps.
<b>1987 Water Quality Act</b> This act was written to support state and local efforts to clean polluted runoff. It also established loan funds to pay for new wastewater treatment plants and created programs to protect major estuaries.
<b>1990 Oil Pollution Act</b> This act attempts to protect U.S. waterways from oil pollution by requiring that oil tankers in U.S. waters be double-hulled by 2015.



## FIELD ACTIVITY

**Coastal Cleanups** You can be a part of a coastal cleanup. Every September, people from all over the world set aside one day to help clean up debris from beaches. You can join this international effort by writing to The Center for Marine Conservation.

If you do participate in a coastal cleanup, keep a record of the types of trash you find in your **EcoLog**.

have double hulls by 2015 as an added protection against oil spills. Legislation has improved water quality in the United States, but the cooperation of individuals, businesses, and the government will be essential to maintaining a clean water supply in the future.

## SECTION 3 Review

- 1. Explain** why point-source pollution is easier to control than nonpoint-source pollution.
- 2. List** the major types of water pollutants. Suggest ways to reduce the levels of each type of pollutant in a water supply.
- 3. Describe** the unique problems of cleaning up groundwater pollution.
- 4. Describe** the source of most ocean pollution. Is it point-source pollution or nonpoint-source pollution?

### CRITICAL THINKING

- 5. Interpreting Graphics** Read the description of biomagnification. Draw a diagram that shows the biomagnification of a pollutant in an ecosystem.

#### READING SKILLS

- 6. Applying Ideas** What can individuals do to decrease ocean pollution? Write and illustrate a guide that gives at least three examples.

#### WRITING SKILLS