SECTION 3

Ocean Pollution

Sources of Pollution

How would you feel if someone came into your bedroom; spilled oil on your carpet; littered your room with plastic bags, cans, bottles, and newspapers; then sprayed insect killer and scattered sand all over? Organisms in the ocean experience these things when people pollute seawater.

Pollution is the introduction of harmful waste products, chemicals, and other substances not native to an environment. A pollutant is a substance that causes damage to organisms by interfering with life processes.

Pollutants from land eventually will reach the ocean in one of four main ways. They can be dumped deliberately and directly into the ocean. Material can be lost overboard accidentally during storms or shipwrecks. Some pollutants begin in the air and enter the ocean through rain. Other pollutants will reach the ocean by being carried in rivers that empty into the ocean. **Figure 15** illustrates how pollutants from land enter the oceans.

Reading Check *How do pollutants reach the ocean?*

As You Read

What You'll Learn

- **List** five types of ocean pollution.
- **Explain** how ocean pollution affects the entire world.
- **Describe** how ocean pollution can be controlled.

Vocabulary

pollution

Why It's Important

Earth's health depends on the oceans being unpolluted.

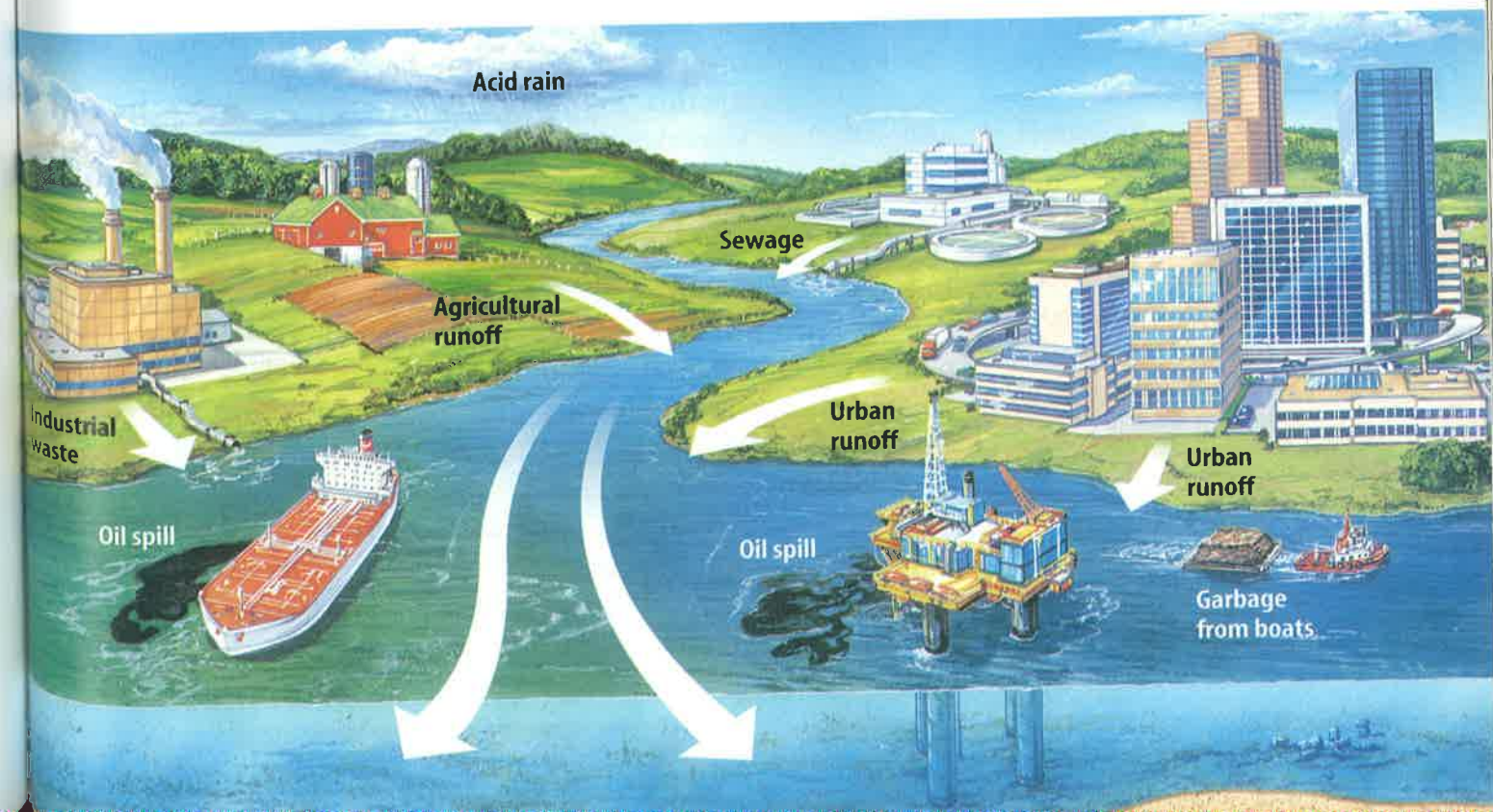


Figure 15
Ocean pollution comes from many sources.

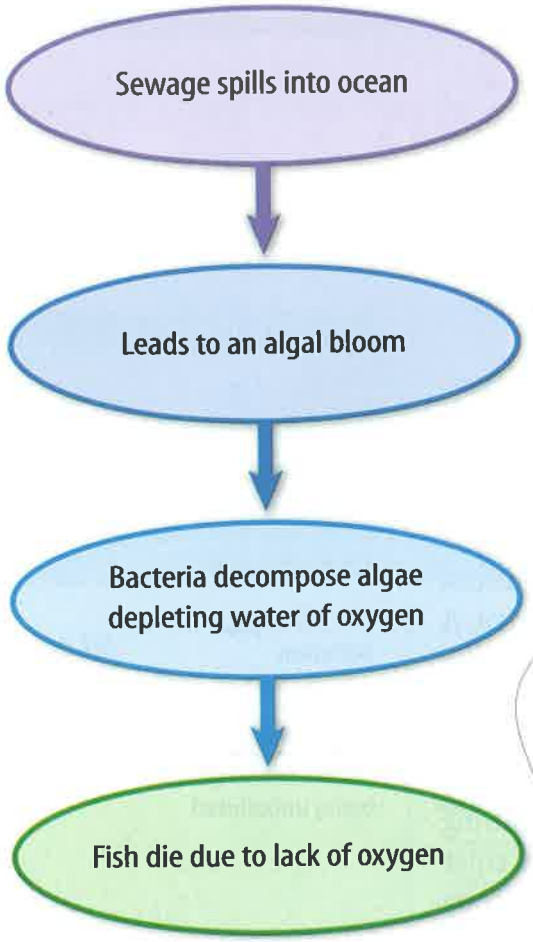


Figure 16
Fish kills occur when the oxygen supply is low. *How does a fish kill affect the food web?*

Sewage In some regions, human sewage leaks from septic tanks or is pumped directly into oceans or into rivers leading to an ocean. The introduction of sewage to an area of the ocean can cause immediate changes in the ecosystem, as shown by the following example. Sewage is a pollutant that acts like fertilizer. It is rich in nutrients that cause some types of algae to reproduce rapidly, creating what is called a bloom. The problem occurs when the algae die. As huge numbers of bacteria reproduce and decompose the algae, much of the oxygen in the water is used up. Other organisms, such as fish, cannot get enough oxygen. As a result, fish die in a phenomenon called a fish kill, as illustrated in **Figure 16.**

Reading Check ***What is an algal bloom?***

When sewage is dumped routinely into the same area year after year, changes take place. Entire ecosystems have been altered drastically as a result of long-term, repeated exposure to sewage and fertilizer runoff. In some areas of the world, sewage is dumped directly onto coral reefs. When this happens algae can outgrow the coral because the sewage acts like a fertilizer. Eventually, the coral organisms die. If this occurs, other organisms that depend on the reef for food and shelter also can be affected.

Chemical Pollution Industrial wastes from land can harm marine organisms. When it rains, the herbicides (weed killers) and insecticides (insect killers) used in farming and on lawns are carried to streams. Eventually, they can reach the ocean and kill other organisms far from where they were applied originally. Sometimes industrial wastes are released directly into streams that eventually empty into oceans. Other chemicals are released into the air, where they later settle into the ocean. Industrial chemicals include metals like mercury and lead and chemicals like polychlorinated biphenyls (PCBs). In a process called biological amplification (am plah fah KAY shun), harmful chemicals can build up in the tissues of organisms that are at the top of the food chain. Higher consumers like dolphins and seabirds accumulate greater amounts of a toxin as they continue to feed on smaller organisms. At high concentrations, some chemicals can damage an organism's immune and reproductive systems. Explosives and nuclear wastes also have been dumped, by accident and on purpose, into some regions of the oceans.

Oil Pollution Although oil spills from tankers that have collided or are leaking are usually highly publicized, they are not the biggest source of oil pollution in the ocean. As much as 44 percent of oil that reaches the ocean comes from land. Oil that washes from cars and streets, or that is poured down drains or into soil, flows into streams. Eventually, this oil reaches the ocean. Other sources of oil pollution are leaks at offshore oil wells and oil mixed with wastewater that is pumped out of ships. **Figure 17** shows the percentage of different sources of oil entering the oceans each year.

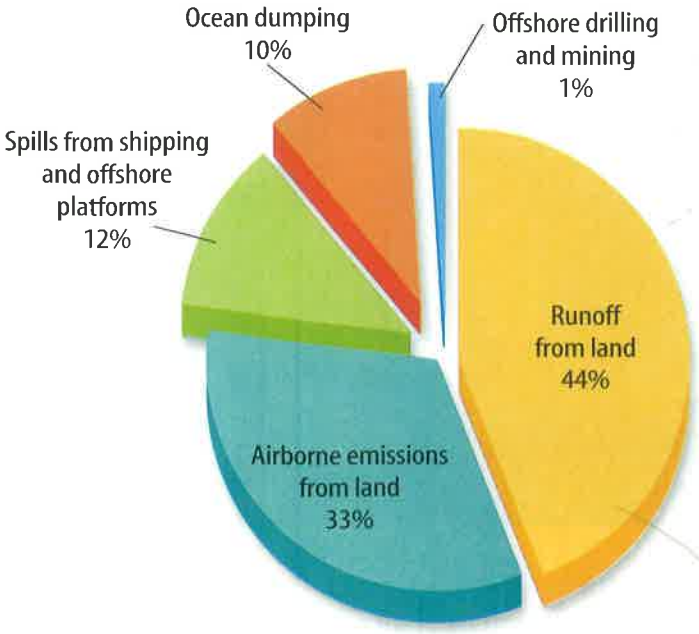


Figure 17
Although oil spills are highly publicized and tragic, the same harmful oil enters the ocean every day from many other sources. *What can be done to reduce the amount of oil entering the oceans?*

Solid-Waste Pollution Even in the most remote areas of the world, such as uninhabited islands that are thousands of miles from any major city, large amounts of trash wash up on the beach. **Figure 18** shows the amount of debris collected by a scientist on an island in the Pacific Ocean, 8,000 km east of Australia in just one day. The presence of trash ruins a beautiful beach, and solid wastes, such as plastic bags and fishing line, can entangle animals. Animals such as sea turtles mistakenly eat plastic bags, because they look so much like their normal prey, floating jellyfish. Illegally dumped medical waste such as needles, plastic tubing, and bags also are a threat to humans and other animals.


6 Lightbulbs


7 Aerosol cans


25 Shoes


71 Plastic bottles


171 Glass bottles


268 Plastic pieces

Figure 18
These items are like the ones found washed ashore on one of the Pitcairn Islands in the South Pacific. The number of each item found is shown below the figure. Also among the rubble were broken toys, two pairs of gloves, and an asthma inhaler.

Figure 19
When large amounts of silt enter seawater, the filter-feeding systems of animals such as oysters and clams can be clogged.

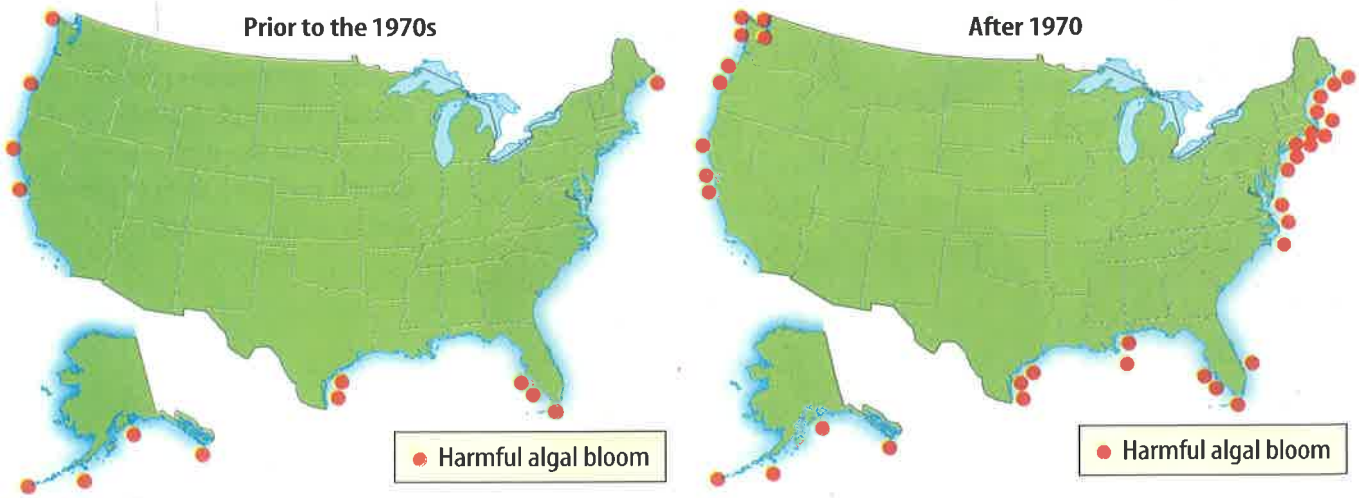
Sediment Silt also can pollute the ocean. Human activities such as agriculture, deforestation, and construction tear up the soil. Rain washes soil into streams and eventually into an ocean nearby, as shown in **Figure 19.** This causes huge amounts of silt to accumulate in many coastal areas. Coral reefs and saltwater marshes are safe, protected places where young marine organisms grow to adults. When large amounts of silt cover coral reefs and fill marshes, these habitats are destroyed. Without a safe place to grow larger, many organisms will not survive.

Effects of Pollution

You already have learned some examples of how pollution affects the ocean and the organisms that live there. Today, there is not a single area of the ocean that is not polluted in some way. As pollution from land continues to reach the ocean, scientists are recording dramatic changes in this environment.

Estuaries and the rivers that feed into them from Delaware to North Carolina have suffered from toxic blooms of *Pfiesteria* since the late 1980s. These blooms have killed billions of fish. *Pfiesteria,* a type of plankton, also has caused rashes, nausea, memory loss, and the weakening of the immune system in humans. The cause of these blooms is thought to be runoff contaminated by fertilizers and other waste materials. In Florida, toxic red tides kill fish and manatees. Some people also blame these red tides on sewage releases and fertilizer runoff. **Figure 20** shows an increase in the number of harmful algal blooms since the early 1970s.

Figure 20
Some scientists hypothesize that a relationship exists between increased pollution in the ocean and the number of harmful algal blooms in the last 30 years.



Controlling Pollution

Some people believe that oceans take care of themselves because they are large. However, other people view ocean pollution as a serious problem. Many international organizations have met to develop ways of reducing ocean pollution. Treaties prohibit the dumping of some kinds of hazardous wastes from vessels, aircraft, and platforms. One treaty requires that some ships and operators of offshore platforms have oil pollution emergency plans. This includes having the proper equipment to combat oil spills and practicing what to do if a spill takes place. Recall that a large amount of pollution enters the ocean from land. Although the idea of reducing land pollution to better protect the ocean has been discussed, no international agreement exists to prevent and control land-based activities that affect the oceans.

Reading Check ***What has been done to help control ocean pollution?***

What You Can Do Current international and U.S. laws aren't effective enough. Further cooperation is needed to reduce ocean pollution. You can help by disposing of wastes properly and volunteering for beach or community cleanups, like the one shown in **Figure 21.** You can recycle materials such as newspapers, glass, and plastics and never dump chemicals like oil or paint onto soil or into water. One of the best things you can do is continue to learn about marine pollution and how people affect the oceans. What other things will help reduce ocean pollution?

Figure 21
Under careful supervision, picking up trash is an easy way to help reduce ocean pollution.

Section 3 Assessment

1. List five human activities that pollute the oceans. Suggest a solution to each.
2. How does pollution of the oceans affect the entire world?
3. In what ways have international treaties helped reduce pollution?
4. What can you do to help prevent ocean pollution?
5. **Think Critically** To widen beaches, some cities pump offshore sediment onto them. How might this affect organisms that live in coastal waters?

Skill Builder Activities

6. **Concept Mapping** Make an events-chain concept map that describes how runoff from land can reach the ocean. Include examples of pollution that could be in the runoff. **For more help, refer to the Science Skill Handbook.**
7. **Communicating** Submit a letter to the editor of a newspaper. In your letter, explain why ocean pollution is a problem that people can help prevent. List examples of things people can do to help. **For more help, refer to the Science Skill Handbook.**