TWELFTH EDITION

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BIOLOGY

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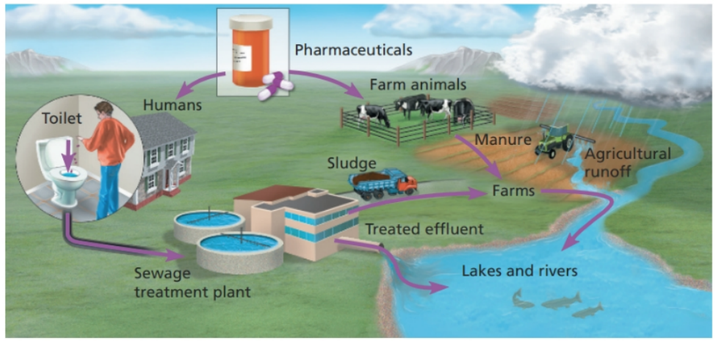
56 Conservation Biology and Global Change

▼ **Figure 56.26** **Sources and movements of pharmaceuticals in the environment.**



Plastic Waste

Plastics are synthetic compounds that typically are made from petroleum products, such as oil or natural gas. An estimated 4.8 to 12.7 million metric tons (11 to 28 billion pounds) of plastic waste enters the ocean each year, making plastics the most common type of marine debris.

Over time, larger pieces of plastic waste are broken into successively smaller pieces by the actions of waves and by UV light, which breaks the bonds that hold plastic compounds together. As a result, the oceans are contaminated by large pieces of plastic and by **microplastics**, plastic particles less than 5 mm in size. Data suggest that plastic waste can persist in the environment for hundreds to thousands of years.

The enormous quantities of plastic waste in the oceans have wide-ranging effects. For example, birds, marine mammals, turtles, and fish can die after mistaking plastic debris for food **(Figure 56.27)**. A 2018 study documented another effect: Coral reefs contaminated by plastic waste had much higher rates of disease than did reefs without plastic waste **(Figure 56.28)**. What causes this dramatic rise in disease levels? Bacterial pathogens can "hitchhike" on plastic waste—so pieces of plastic waste may introduce new pathogens to a reef or increase the abundance of pathogens already present. In addition, plastic waste that becomes entangled on a reef can damage corals or deprive them of light and oxygen, making them more susceptible to pathogens.

As for microplastics, these small particles now contaminate all of the world's oceans. Microplastics have been found in organisms from every type of marine food chain, and harmful effects of microplastics have been documented in some fish and invertebrates. Microplastics also may pose a threat to human health. Recent studies have found that 25% of supermarket fish in Indonesia and the United States contained microplastics in their guts. Shellfish sold in supermarkets also contained microplastics. While less is known about the extent to which microplastics contaminate terrestrial and freshwater ecosystems, current evidence indicates they are widespread there as well—they have been found in lakes, streams, soils, invertebrates, birds, and freshwater fish. Some evidence indicates that microplastics can be transported in the atmosphere, enabling them to be deposited in remote locations.

Research into the extent and effects of plastic waste is still in the early stages. Even so, it is clear that plastic waste is a major and growing environmental problem—one that will require new and innovative ways to reduce both the amount of plastic waste we generate and how much of that waste is mismanaged, thereby contaminating natural ecosystems.

Mastering Biology **Interview with Chelsea Rochman: Studying the ecological effects of plastic waste (see the interview before Chapter 52)**

▶ **Figure 56.27**
A victim of plastic waste. Found in a wildlife refuge in Hawaii, this Laysan albatross (*Phoebastria immutabilis*) chick died after consuming large amounts of plastic debris.

▶ **Figure 56.28**
Plastic waste and disease in corals. A 2018 study found that the percentage of diseased corals increases 20-fold in reefs contaminated by plastic waste. The photo shows plastic waste on coral at one of the study sites.