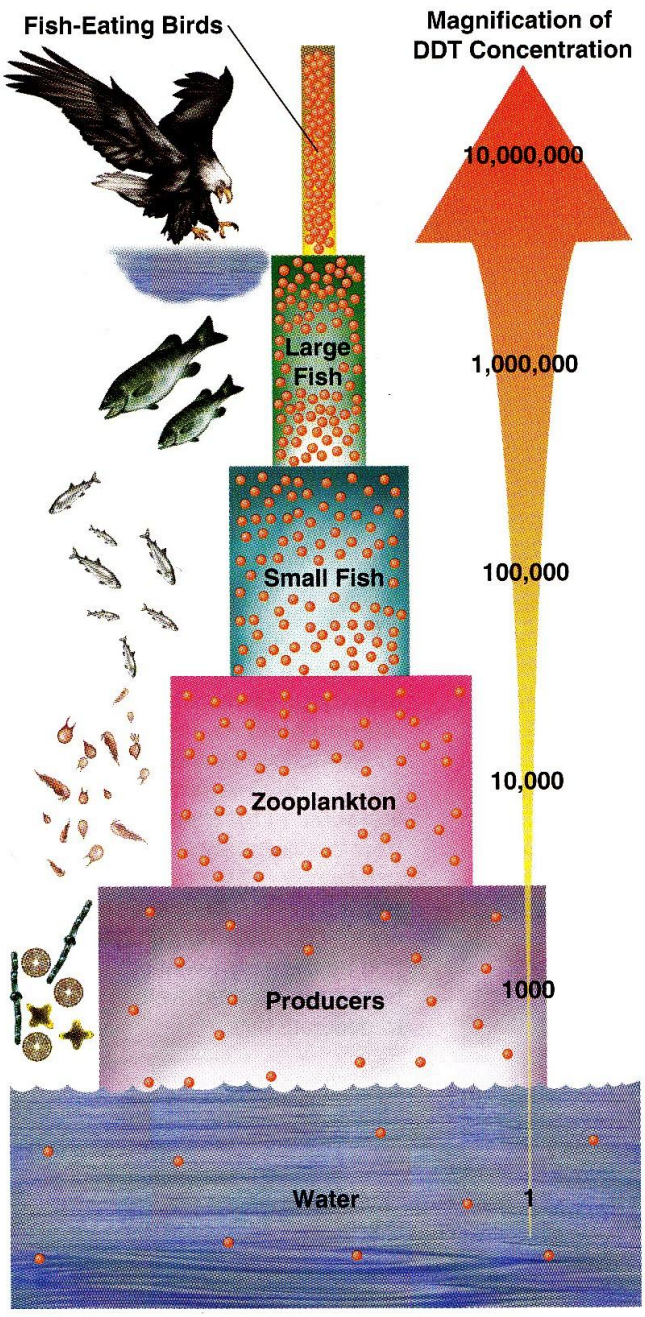

▲ **Figure 6–16** In the process of biological magnification, the concentration of a pollutant such as DDT—represented here by orange dots—is multiplied as it passes up the food chain from producers to consumers. By the time it reaches the top-level consumers, shown here as fish-eating birds, the amount of DDT in biological tissues can be magnified nearly 10 million times. **Calculating** *By what number is the concentration of DDT multiplied at each successive trophic level?*

Pollution

Many forms of pollution can threaten biodiversity, but one of the most serious problems occurs when toxic compounds accumulate in the tissues of organisms. The history of DDT, one of the first widely used pesticides, explains the situation well. At first, DDT seemed to be a perfect pesticide. It remains active for a long time, kills many different insects, and is cheap enough to be sprayed widely to control agricultural pests and disease-carrying mosquitoes.

When DDT was sprayed, it drained into rivers and streams at low concentrations that seemed harmless. But DDT has two properties that make it hazardous. First, DDT is nonbiodegradable, which means that it is not broken down by metabolic processes in bacteria, plants, or animals. Second, when DDT is picked up by organisms, they do not eliminate it from their bodies. As a result, something unexpected happens. DDT is picked up, concentrated, and stored by aquatic plants and algae. When herbivores eat those plants, they concentrate DDT to levels ten times higher than levels found in plants! When carnivores eat herbivores, the toxic substance is concentrated further, as shown in **Figure 6–16.** In this process, called **biological magnification,** concentrations of a harmful substance increase in organisms at higher trophic levels in a food chain or food web. Biological magnification affects the entire food web, although top-level carnivores are at highest risk.

In 1962, biologist Rachel Carson wrote a book called *Silent Spring* that alerted people to the dangers of biological magnification. The widespread spraying of DDT over many years had threatened populations of many animals—especially fish-eating birds like the osprey, brown pelican, and bald eagle—with extinction. One effect of DDT was to make eggs of these birds so fragile that the eggs could not survive intact. By the early 1970s, DDT was banned in the United States and in most other industrialized countries. In the years since, scientists have noted a marked recovery in the populations of birds that had been affected. Bald eagles, for example, can once again be seen around rivers, lakes, and estuaries in the lower 48 states.

CHECKPOINT *What is biological magnification?*