

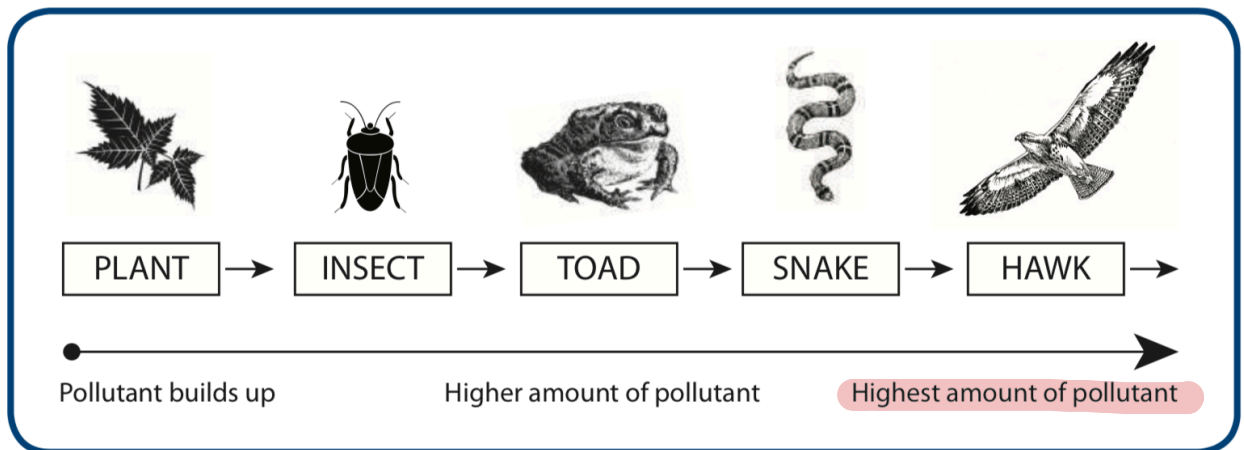
Reading 11.1 – When more is too much

Getting Ready

Have you ever seen worms on the sidewalk after a heavy rain? In class, you saw how an abiotic factor (water) can affect a biotic factor such as a worm. You saw the worms move to the moist environment. They need moisture to stay alive. But, in a heavy rain, there is too much water, and the worms move away from the water under the ground. In a healthy ecosystem, biotic and abiotic elements interact in a way that keeps the ecosystem stable. That means life goes on in the ecosystem as usual. Sometimes though, an abiotic factor, like a pollutant, enters an ecosystem. At first, a pollutant may not harm the organisms, but as it builds up, it begins to have an effect on them. This happens because of a process called bioaccumulation.

Think about what the word accumulate means. Also, think about what bio means. **What do you think bioaccumulation means?**

In this reading, you will learn about bioaccumulation and its effects on organisms.



How Does Bioaccumulation Affect an Ecosystem?

Bioaccumulation is the term scientists use when they talk about how some pollutants enter and build up, or accumulate, in an organism at the beginning of a food chain. The pollutant becomes even more dangerous as it is passed through the food chain from prey to predator. Look at this example:

In this example, imagine that the plants have taken in a harmful pollutant in the water. One insect will eat from many plants that contain the pollutant. The amount of the pollutant from each plant will now go into the insect. Now there is a greater amount of pollutant in the predator than there was in the prey. One toad eats many insects. One snake eats many toads. Finally, one hawk eats

many snakes. The hawk will have a lot of the pollutant in its body because it will have small amounts from many snakes. The snake got it from the toads, which got it from the insects that ate a lot of plants. So, although there may be only a small amount of a pollutant in each plant, it can build up to a much greater level in a hawk.

In the food chain example you just read about, who is going to have the highest amount of pollutant in their bodies, insects or snakes? Explain your answer.

Can All Pollutants Move Up the Food Chain?

In order for a pollutant to move up the food chain, it needs to be dissolved in the body fat of an animal. If the pollutant does not dissolve in body fat, it will not move up the food chain. There are many pollutants in the environment that do not move up.

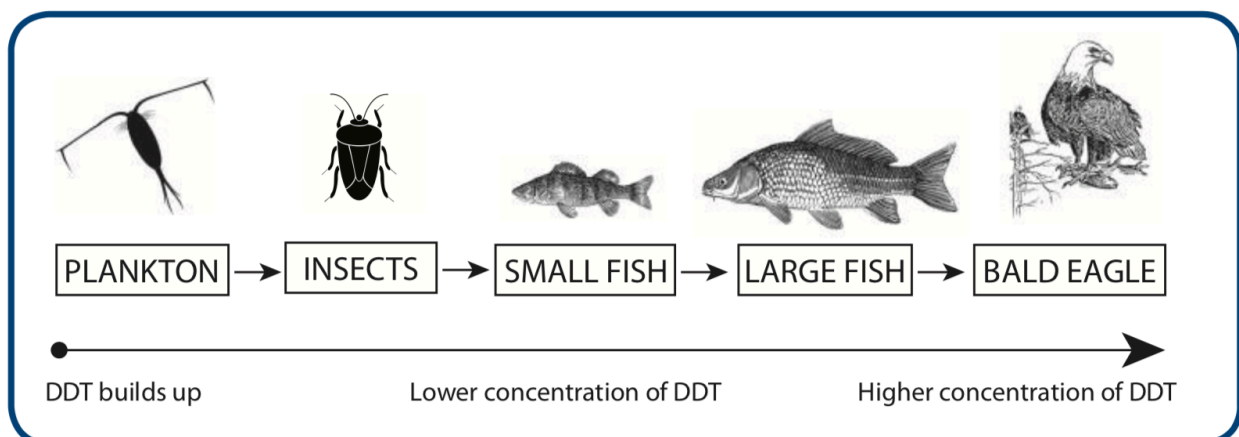
What does this look like in the real world? The next section tells about an actual case of bioaccumulation that caused a major problem for a very important bird.

A Specific Example of Bioaccumulation: The Bald Eagle and DDT

The bald eagle is the national bird of the U.S. The country almost lost its national bird due to the effects of bioaccumulation. In the 1950's, many farmers sprayed a chemical called DDT on plants to kill insects that ate the plants and ruined their crops. DDT (dichloro diphenyl trichloroethane) is a chemical made to kill insects (an insecticide), but it is also a pollutant. When DDT is sprayed on plants, it stays in the environment for a long time. Insects and animals eat the plants, and the DDT gets into their body fat. DDT can also be washed off the plants by rain. The DDT then goes into lakes where it affects aquatic plants and animals. The DDT also soaks into the ground and becomes part of the ground water

Highlight the answer in the text:

Where does DDT go when it is sprayed on plants? Hint: there's more than one answer!



Highlight the answer in the text:

How does DDT affect bald eagles?

where it can affect the plants that grow in the soil. A predator, such as the bald eagle, will eat the animals and many other animals that have DDT in them. This causes the bald eagle to have a lot more DDT in its fat. What people did not know at the time they were using DDT, is that it caused eagles to make weak eggshells. When the eagles would sit on their eggs, they would break the shells and kill the baby birds before they were born. Because of this, fewer bald eagles were being born. Bald eagles were put on the endangered species list because they were in danger of becoming extinct if young eagles could not survive.

Are Bald Eagles Still in Trouble?

The U.S. banned DDT once scientists figured out the problem. The bald eagles started to have more offspring because the DDT was not moving through the ecosystem's food web into the eagles anymore. On July 4, 2000, the bald eagle was removed from the endangered species list. There are now enough bald eagles for them to be out of danger of becoming extinct.

Why do you think the bald eagle was able to hatch more eggs and have more offspring once the spraying of DDT was banned?