

## 1.2 Ecosystems



**Figure 1.4** This beaver dam is part of an ecosystem that includes biotic and abiotic factors.

A community is filled with groups of organisms that interact with each other, but it does not exist on its own. It has boundaries, and it is affected by external conditions, such as the average amount of sun and rain, and the average temperature. Look at the photograph of the beaver dam in Figure 1.4. Imagine the community that lives there. What non-living, or abiotic, features can you think of that interact with the organisms in the community? Your list may include air, sunlight, rocks, rain, and soil. An **ecosystem** is the interactions between abiotic features of an area and the biotic community that lives in the area. An ecosystem includes individuals, populations, and communities (see Figure 1.5). and in this case, the ecosystem is the beaver dam.

An ecosystem can be large or small, but it must contain all the abiotic and biotic features of the area. For example, a rotting log is an ecosystem, as long as all the organisms living in or on the log and all the abiotic factors affecting the log are included. In the same way, a forest is an ecosystem, as long as it includes all the biotic organisms living in it, as well as the abiotic features affecting it. Usually the environment is the same across an ecosystem, so that it gets the same amount of rain or sunshine. An ecosystem also has fairly clear physical or environmental boundaries. For example, the edge of a ploughed field would physically mark the edge of a field ecosystem. The edge of a pond would physically mark the edge of a pond ecosystem. An environmental boundary could be the edge of an area that gets more sunshine or rain, or a change in altitude along the side of a mountain.

### Pause & Reflect

Select an area that you think makes up an ecosystem. For example, is there a pond surrounded by fields, a school lawn surrounded by streets, or a park surrounded by houses? Identify the area in your Science Log, and explain why you consider it to be an ecosystem.



**Level 1:** individual



**Level 2:** population

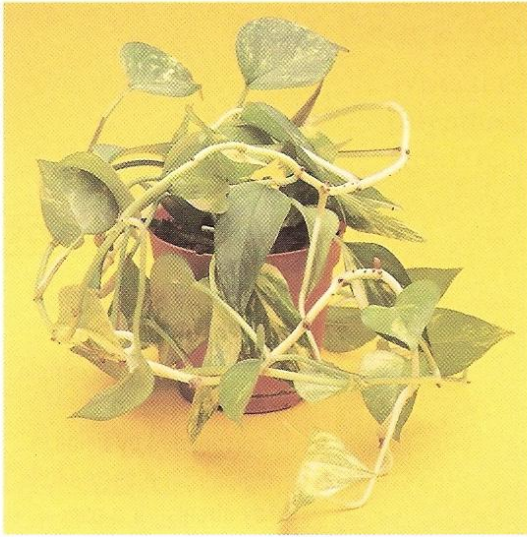


**Level 3:** community



**Level 4:** ecosystem

**Figure 1.5** The ecosystem is the fourth level of biological organization.

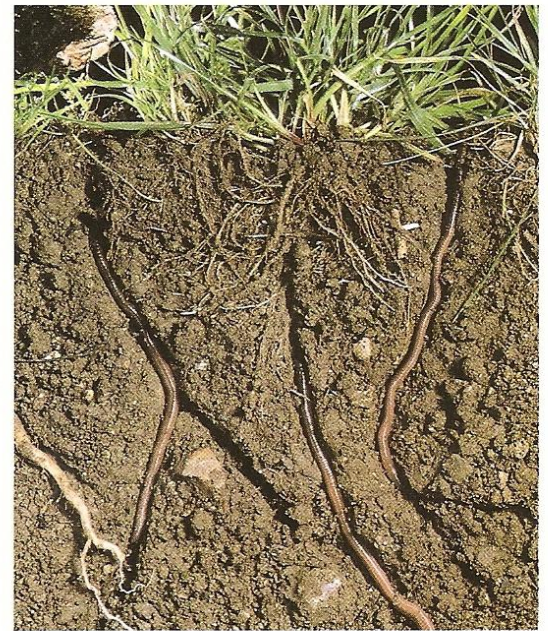


**Figure 1.6** Plants interact with sunlight and air to make their own food, and they use water and nutrients in the soil to grow.

## Abiotic-Biotic Interactions in an Ecosystem

In an ecosystem, the non-living and living parts interact and affect each other. Think about the following four abiotic factors as you consider an ecosystem.

- *Sun* The Sun provides energy that gives warmth to spiders, and other organisms, enabling them to survive. It provides light, which green plants like the one in Figure 1.6 use to make their own food. (You will learn more about this process in Chapter 3.) The number of hours of daylight triggers seasonal events, such as plants flowering and the migration of birds.
- *Air* The air contains oxygen, which animals breathe. It provides carbon dioxide, which plants use to make their own food.
- *Water* Plants need water to grow. Water is important to all organisms for life processes. These include distributing food particles through their bodies, breathing, and digesting food. The bodies of most organisms are 50 to 95 percent water. Some organisms, such as trout, whales, and algae, live in water not air. (Can you think how they obtain their oxygen?)
- *Soil* Soil contains both abiotic parts, such as minerals, and biotic parts, such as decaying bodies of dead organisms. Soil provides a home for many animals that live underground. For example, earthworms burrow in and overturn soil, allowing air and water to go down into the soil. They also eat organic material in the soil and pass the remains out behind them, often on the surface. In this way, they bring valuable nutrients to the topsoil (see Figure 1.7). Soil also provides minerals and other nutrients for plants. Plants, in turn, hold soil in place, helping to keep it from being blown or washed away. (In Chapter 10, you will learn more about soil.)



**Figure 1.7** Earthworms are an important part of an ecosystem.

### DidYouKnow?

Earthworms stay underground during the day. They breathe directly through their thin skin. They cannot survive the drying heat of the Sun because their skin must stay moist to breathe properly. When rain falls, it floods their burrows, and earthworms must come to the surface to breathe. If they stay underground, they will drown. If they are away from soil when the rain stops, however, they cannot dig back into their burrows, and they dry out and die. This is why there are so many dead earthworms on the pavement after a rain shower.