

# SECTION 1

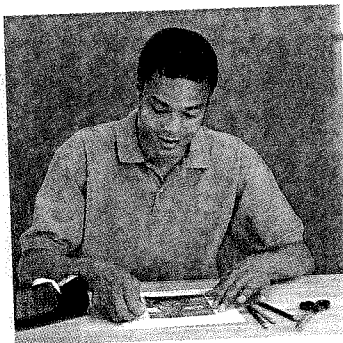
# Living Things and the Environment



## DISCOVER

### What's in the Scene?

1. Choose a magazine picture of a nature scene. Paste the picture onto a sheet of paper, leaving space all around the picture.
2. Identify all the things in the picture that are alive. Use a colored pencil to draw a line from each living thing, or organism. Label the organism if you know its name.



## ACTIVITY

3. Use a different colored pencil to draw a line from each nonliving thing and label it.

### Think It Over

**Inferring** How do the organisms in the picture depend on the nonliving things? Using a third color, draw lines connecting organisms to the nonliving things they need.

## GUIDE FOR READING

- ◆ What needs are met by an organism's surroundings?
- ◆ What are the levels of organization within an ecosystem?

**Reading Tip** Write the section headings in your notebook. As you read, make a list of main ideas and supporting details under each heading.

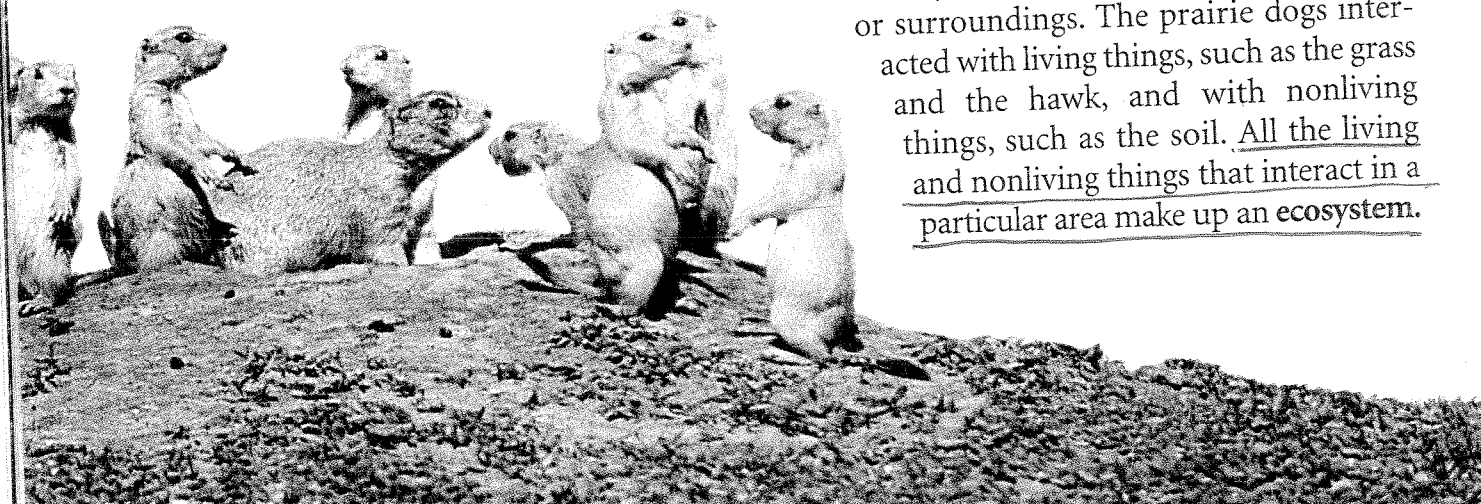
As the sun rises on a warm summer morning, the Nebraska town is already bustling with activity. Some residents are hard at work building homes for their families. They are building underground, where it is dark and cool. Other inhabitants are collecting seeds for breakfast. Some of the town's younger residents are at play, chasing each other through the grass.

Suddenly, an adult spots a threatening shadow approaching—an enemy has appeared in the sky! The adult cries out several times, warning the others. Within moments, the town's residents disappear into their underground homes. The town is silent and still, except for a single hawk circling overhead.

Have you guessed what kind of town this is? It is a prairie dog town on the Nebraska plains. As these prairie dogs dig their burrows, searched for food, and hid from the hawk, they interacted with their environment,

or surroundings. The prairie dogs interacted with living things, such as the grass and the hawk, and with nonliving things, such as the soil. All the living and nonliving things that interact in a particular area make up an ecosystem.

Black-tailed prairie dogs ▼



A prairie is just one of the many different ecosystems found on Earth. Other ecosystems in which living things make their homes include mountain streams, deep oceans, and dense forests.

## Habitats


A prairie dog is one type of organism, or living thing. Organisms live in a specific place within an ecosystem. An organism obtains food, water, shelter, and other things it needs to live, grow, and reproduce from its surroundings. The place where an organism lives and that provides the things the organism needs is called its **habitat**.

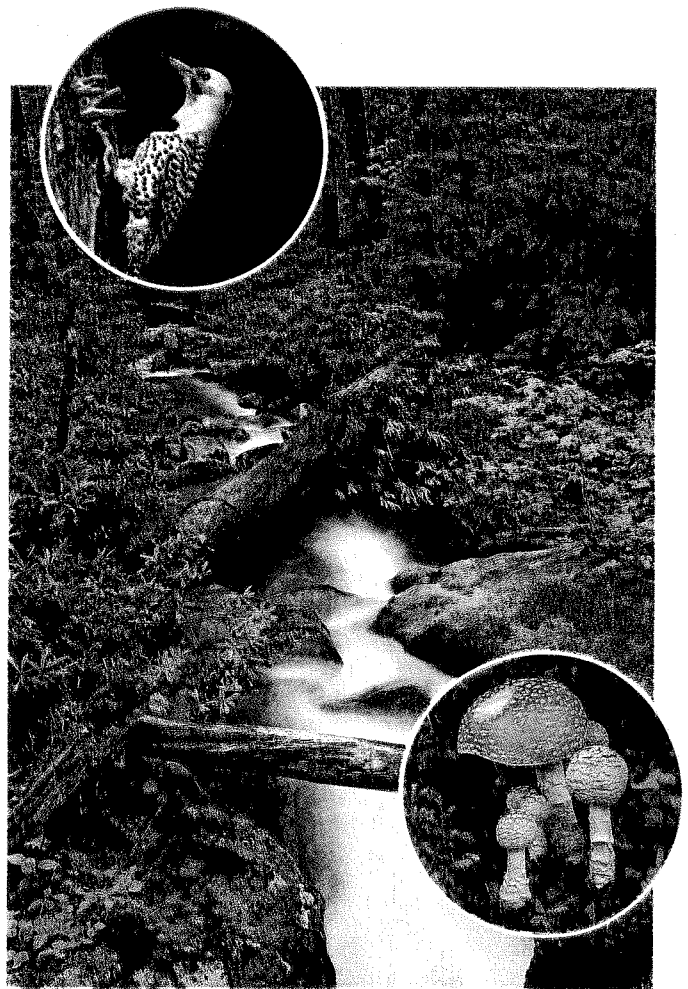
A single ecosystem may contain many habitats. For example, in a forest ecosystem, mushrooms grow in the damp soil, rabbits live on the forest floor, termites live under the bark of tree trunks, and flickers build nests in the trunks.

Organisms live in different habitats because they have different requirements for survival. A prairie dog obtains the food and shelter it needs from its habitat. It could not survive in a tropical rain forest or on the rocky ocean shore. Likewise, the prairie would not meet the needs of a gorilla, a penguin, or a hermit crab.

## Biotic Factors

An organism interacts with both the living and nonliving things in its environment. The living parts of an ecosystem are called **biotic factors** (by AHT ik factors). Biotic factors in the prairie dogs' ecosystem include the grass and plants that provide seeds and berries. The hawks, ferrets, badgers, and eagles that hunt the prairie dogs are also biotic factors. In addition, worms, fungi, and bacteria are biotic factors that live in the soil underneath the prairie grass. These organisms keep the soil rich in nutrients as they break down the remains of other living things.

 **Checkpoint** Name a biotic factor in your environment.



**Figure 1** A stream tumbles over mossy rocks in a lush Tennessee forest. This ecosystem contains many different habitats. *Comparing and Contrasting* How is the mushrooms' habitat in the forest different from the flicker's habitat?



**Figure 2** This eastern banjo frog is burrowing in the sand to stay cool in the hot Australian desert. *Interpreting Photographs With which abiotic factors is the frog interacting in this scene?*



## TRY THIS

### With or Without Salt?

In this activity you will explore salt as an abiotic factor.

#### ACTIVITY

1. Label four 600-mL beakers A, B, C, and D. Fill each with 500 mL of room-temperature spring water.
2. Set beaker A aside. It will contain fresh water. To beaker B, add 2.5 grams of noniodized salt. Add 7.5 grams of salt to beaker C and 15 grams of salt to beaker D. Stir beakers B, C, and D.
3. Add  $\frac{1}{8}$  teaspoon of brine shrimp eggs to each beaker.
4. Cover each beaker with a square of paper. Keep them away from direct light or heat. Wash your hands.
5. Observe the beakers daily for three days.

**Drawing Conclusions** In which beakers did the eggs hatch? What can you conclude about the amount of salt in the shrimps' natural habitat?

### Abiotic Factors

The nonliving parts of an ecosystem are called **abiotic factors** (ay by AHT ik factors). Abiotic factors that affect living things in the prairie are similar to those found in most ecosystems. They include water, sunlight, oxygen, temperature, and soil.

**Water** All living things require water to carry out their life processes. Water also makes up a large part of the bodies of most organisms. Your body, for example, is about 65 percent water. A watermelon consists of more than 95 percent water! Water is particularly important to plants and algae. These organisms use water, along with sunlight and carbon dioxide, to make food in a process called **photosynthesis** (foh toh SIN thuh sis). Other living things eat the plants and algae to obtain energy.

**Sunlight** Because sunlight is necessary for photosynthesis, it is an important abiotic factor for plants, algae, and other living things. In places that do not receive sunlight, such as dark caves, plants cannot grow. Without plants or algae to provide a source of food, few other organisms can live.

**Oxygen** Most living things require oxygen to carry out their life processes. Oxygen is so important to the functioning of the human body that you can live only a few minutes without it. Organisms that live on land obtain oxygen from the air, which is about 20 percent oxygen. Fish and other water organisms obtain dissolved oxygen from the water around them.

**Temperature** The temperatures that are typical of an area determine the types of organisms that can live there. For example, if you took a trip to a warm tropical island, you would see palm trees, bright hibiscus flowers, and tiny lizards. These organisms could not survive on the frozen plains of Siberia. But the thick, warm fur of wolves and short, strong branches of dwarf willows are suited to the blustery winters there.

Some animals alter their environments to overcome very hot or very cold temperatures. For example, prairie dogs dig underground dens to find shelter from the blazing summer sun. They line the dens with grass. The grass keeps the prairie dogs warm during the cold and windy winters.

**Soil** Soil is a mixture of rock fragments, nutrients, air, water, and the decaying remains of living things. Soil in different areas consists of varying amounts of these materials. The type of soil in an area influences the kinds of plants that can grow there. Many animals, such as the prairie dogs, use the soil itself as a home. Billions of microscopic organisms such as bacteria also live in the soil. These tiny organisms play an important role in the ecosystem by breaking down the remains of other living things.

✓ **Checkpoint** How do biotic factors differ from abiotic factors?

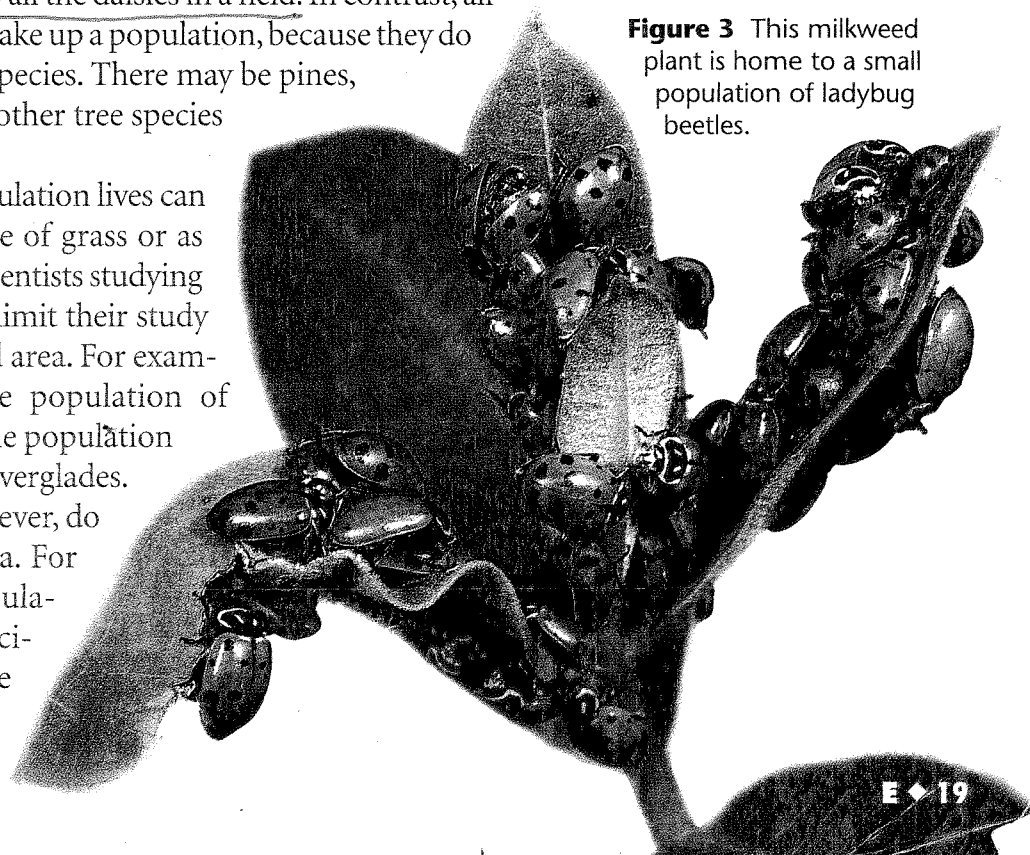
## Populations

In 1900, travelers saw a prairie dog town in Texas covering an area twice the size of the city of Dallas. The sprawling town contained more than 400 million prairie dogs! These prairie dogs were all members of one species, or single kind, of organism. A **species** (SPEE sheez) is a group of organisms that are physically similar and can reproduce with each other to produce fertile offspring.

All the members of one species in a particular area are referred to as a **population**. The 400 million prairie dogs in the Texas town are one example of a population. All the pigeons in New York City make up a population, as do all the daisies in a field. In contrast, all the trees in a forest do not make up a population, because they do not all belong to the same species. There may be pines, maples, birches, and many other tree species in the forest.

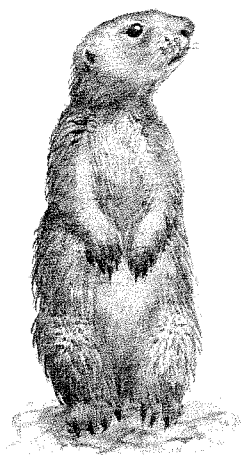
The area in which a population lives can be as small as a single blade of grass or as large as the whole planet. Scientists studying a type of organism usually limit their study to a population in a defined area. For example, they might study the population of bluegill fish in a pond, or the population of alligators in the Florida Everglades.

Some populations, however, do not stay in a contained area. For example, to study the population of finback whales, a scientist might need to use the entire ocean.

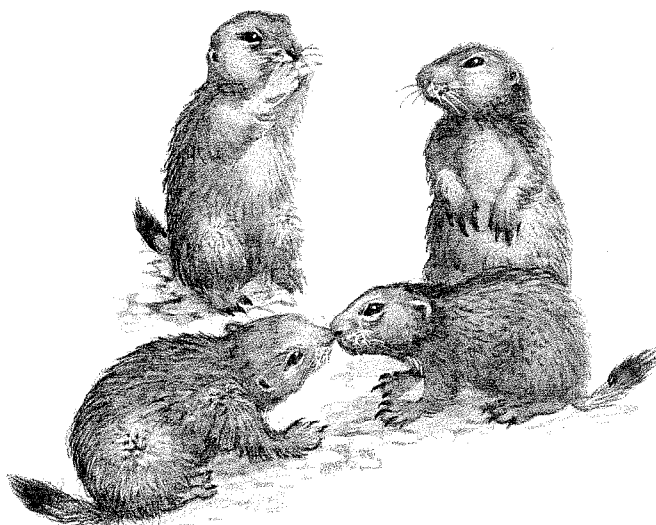


**Figure 3** This milkweed plant is home to a small population of ladybug beetles.





**Organism**



**Population**



## Language Arts CONNECTION

The word *ecology* comes from two Greek root words: *oikos*, which means house or place to live, and *logos*, which means *study*. Put together, these root words create a term for studying organisms in the place where they live. Many science terms are derived from Greek and Latin root words.

### *In Your Journal*

Use a dictionary to find root words for the following terms from this section: *habitat*, *biotic*, *community*, and *population*. For each root word, list its meaning, original language, and other English words containing the root.

## Communities

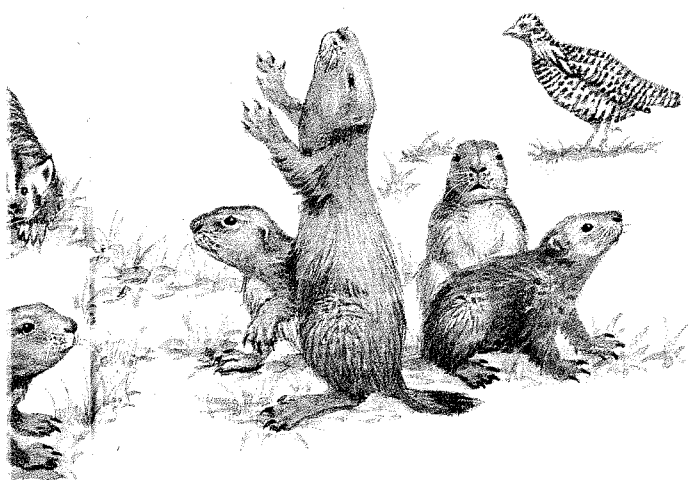
Of course, most ecosystems contain more than one type of organism. The prairie, for instance, includes prairie dogs, hawks, grasses, badgers, and snakes, along with many other organisms. All the different populations that live together in an area make up a **community**.

Figure 4 shows the levels of organization in the prairie ecosystem. The **smallest unit of organization is a single organism, which belongs to a population of other members of its species. The population belongs to a community of different species. The community and abiotic factors together form an ecosystem.**

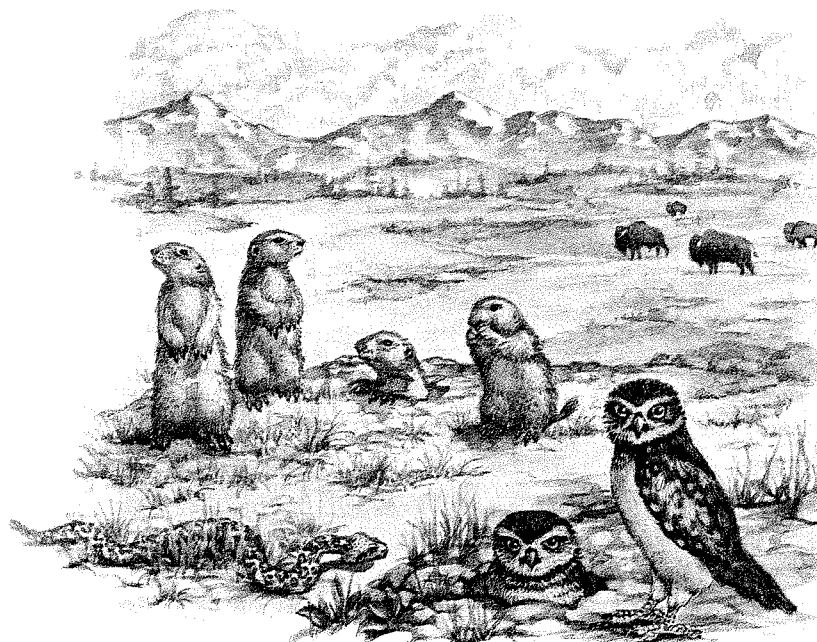
To be considered a community, the different populations must live close enough together to interact. One way the populations in a community may interact is by using the same resources, such as food and shelter. For example, the tunnels dug by the prairie dogs also serve as homes for burrowing owls and black-footed ferrets. The prairie dogs share the grass with other animals. Meanwhile, prairie dogs themselves serve as food for many species.

## What Is Ecology?

Because the populations in the prairie ecosystem interact with one another, any changes in a community affect all the different populations that live there. The study of how living things interact with each other and with their environment is called **ecology**. Ecologists, scientists who study ecology, look at how all the biotic and abiotic factors in an ecosystem are related.



**Community**



**Ecosystem**

**Figure 4** The smallest level of ecological organization is an individual organism. The largest is the entire ecosystem.

As part of their work, ecologists study how organisms react to changes in their environment. Living things constantly interact with their surroundings, responding to changes in the conditions around them. Some responses are very quick. When a prairie dog sees a hawk overhead, it gives a warning bark. The other prairie dogs hear the bark and respond by returning to their burrows to hide. Other responses to change in the environment occur more slowly. For example, after a fire on the prairie, it takes some time for the grass to reach its former height and for all the animals to return to the area.



## Section 1 Review

1. What basic needs are provided by an organism's habitat?
2. List these terms in order from the smallest unit to the largest: population, organism, ecosystem, community.
3. Explain how water and sunlight are two abiotic factors that are important to all organisms.
4. Why do ecologists study both biotic and abiotic factors in an ecosystem?
5. **Thinking Critically Applying Concepts**  
Would all the insects in a forest be considered a population? Why or why not?

### Check Your Progress

After your teacher has reviewed your plan, prepare the containers and plant the seeds. Design a data table to record the information you will use to compare the growth in the different containers. When the plants begin to grow, examine them daily and record your observations. Be sure to continue caring for your plants according to your plan. (*Hint: Use a metric ruler to measure your growing plants. Besides size, look for differences in leaf color and the number of buds among the plants.*)

**CHAPTER PROJECT**  
**1**