

## Section 2.1

# Organisms and Their Environment

**North Carolina Objectives** Objective 5.01 Investigate the interrelationships among organisms, populations, communities, and ecosystems: Abiotic and biotic factors

## ► Before You Read

This section discusses organisms and their environment. All of us come into contact with a variety of organisms every day. On the lines below, list all of the organisms you can think of that you come into contact with during a typical week.

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## ► Read to Learn

### STUDY COACH

**Create a Quiz** After you have read this section, create a quiz based on what you have learned. After you have written the questions, be sure to answer them.



### Think it Over

1. **Describe** What animals share your world?

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### ✓ Reading Check

2. What do ecologists study?

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### Sharing the World

Every day you share your environment with many organisms. These can be as small as houseflies or mosquitoes. They can be dust mites that you cannot even see. Larger animals include dogs, raccoons, and deer. You need to know about your environment. The reason is simple: Your environment affects you and every other organism in it.

The study of plants and animals, where they live, what they eat, and what eats them, is called natural history. Natural history tells us about the health of the world we live in.

### What is ecology?

The branch of biology that developed from natural history is known as ecology. **Ecology** is the study of relationships between organisms and their environment.

Ecologists use both qualitative and quantitative research. They gather qualitative information by observing organisms. They gather quantitative data by making measurements and doing experiments. Ecologists study organisms both in the lab and where the organisms naturally live. ☺

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**Organisms and Their Environment, *continued*****The Biosphere**

The **biosphere** (BI uh sfir) is the portion of Earth that supports living things. It includes the air, land, and water where organisms can be found. ☺

The biosphere supports a wide variety of organisms in a wide range of conditions. Climates, soils, plants, and animals can be very different in different parts of the world. All over the world, though, living things are affected by both the physical, nonliving environment and by other living things.

**How is the environment organized?**

The nonliving parts of the environment are called **abiotic** (ay bi AH tihk) **factors**. Some examples are temperature, moisture, light, and soil. Ecology includes the study of abiotic factors because they are part of an organism's life. To truly know about moles, for example, ecologists must learn the type of soil moles dig their tunnels in. To get a complete picture of the lives of trout, it is important to know the type of river bottom where they lay their eggs. ☺

Living things also are affected by biotic factors. **Biotic** (by AH tihk) **factors** are all the living organisms in an environment. Even goldfish in a bowl are affected by fishes, plants, or other organisms that share their bowl. All organisms depend on others directly or indirectly for food, shelter, reproduction, or protection.

**Levels of Organization**

Ecologists study individual organisms. They study relationships among organisms of the same species and connections among organisms of different species. They also study the effects of abiotic factors on species that live together. To make it easier to examine all of these biotic and abiotic interactions, ecologists have organized the living world into levels. The levels are the organism by itself, populations, communities, and ecosystems.

**✓ Reading Check**

3. What is the biosphere?

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**✓ Reading Check**

4. Name four examples of abiotic factors.

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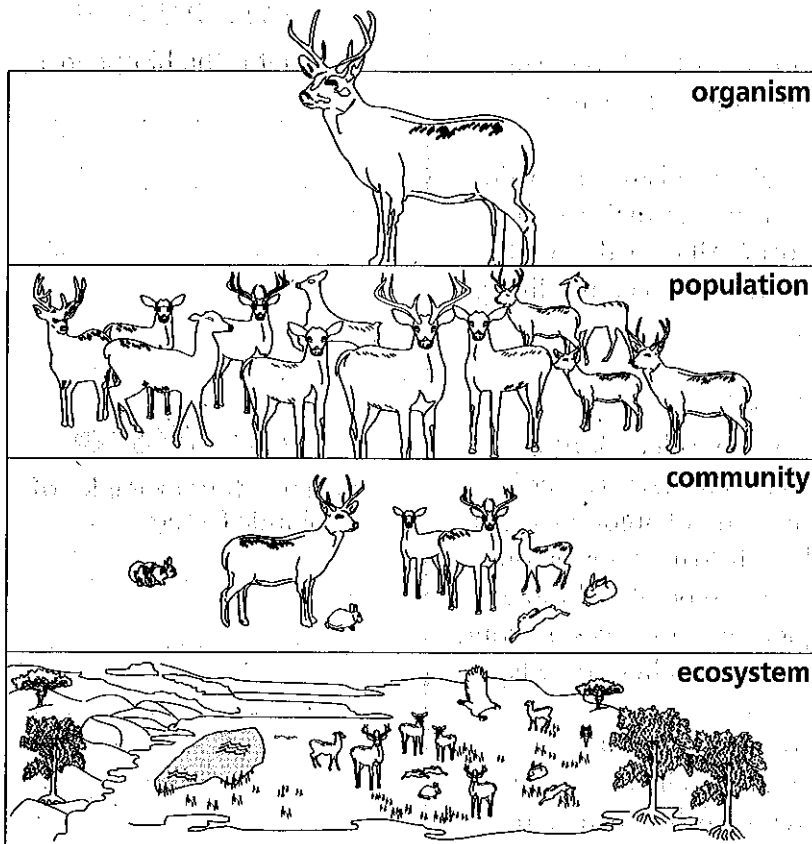
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**Organisms and Their Environment, *continued*****What is a population?**

A **population** is a group of organisms that belongs to the same species. Population members breed with each other and live in the same area at the same time. How organisms in a population share the things that they need in their environment is important. It may determine how far apart the organisms live and how large the population becomes. Members of the same population may compete with each other for food, water, mates, or other resources.

Some species have adaptations that reduce competition within a population. For instance, frogs have a life cycle in which the young tadpoles and adult frogs look very different and have different diets. Tadpoles eat algae and frogs eat insects; therefore, they are not competing with each other for food.

**How do communities interact?**

No species lives entirely alone. Every population shares its environment with other populations. This creates what is called a biological community. A **biological community** is made up of different populations in a certain area at a certain time.

In a biological community, changes in one population may cause changes in other populations. For instance, if the number of mouse-eating hawks in a community increases slightly, the number of mice in that community will decrease slightly. Other changes can be more extreme. For example, one population may grow so large that it threatens the food supply of another population.

In a healthy forest community, there are many populations that depend on each other. These might include birds eating insects, squirrels eating nuts from trees, mushrooms growing from decaying leaves or bark, and raccoons fishing in a stream. While these populations are connected to each other, they are all affected by abiotic factors. These relationships between different populations

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**Organisms and Their Environment, *continued***

and their surroundings create an ecosystem. An **ecosystem** is made of all of the different populations in a biological community and the community's abiotic factors. ✓

There are two major kinds of ecosystems—terrestrial and aquatic. Terrestrial ecosystems are those located on land. Examples include forests, fields, and a rotting log. Aquatic ecosystems are found in both freshwater and salt water. Freshwater ecosystems include ponds, lakes, and streams. Oceans are a type of saltwater, or marine, ecosystem.

## Organisms in Ecosystems

Different types of organisms make their homes in different places. Some species of birds live in only one type of forest. In these areas, they find food, avoid enemies, and reproduce. Prairie dogs make their homes underground in grasslands. The place where an organism lives out its life is known as a **habitat**. ✓

### What place does a species have in its habitat?

Though several species may share a habitat, the food, shelter, and other needed items in that habitat are often used in different ways by each species. For example, if you turn over a log, you may find a community of millipedes, centipedes, insects, slugs, and earthworms. At first it might seem that the members of this community are competing for the same food because they all live in the same habitat, but each population feeds in different ways, on different things, and at different times. Each species has its own niche. A **niche** (neesh) is all strategies and adaptations a species uses in its environment. It is how the species meets its specific needs for food and shelter. It is how and where the species survives and reproduces. A species' niche includes all its interactions with the biotic and abiotic parts of its habitat.

Two species cannot exist for long in the same community if they both have the same niche. There is too much competition. In the end, one species will gain control over the resources in the community. The other species will either die out in that area, move somewhere else, or change in some way to fill another niche.

#### ✓ Reading Check

5. What is an ecosystem made of?

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#### ✓ Reading Check

6. What is a habitat?

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### Think it Over

7. **Infer** Which of the following does a polar bear use to survive in its habitat? (Circle your choice.)
- burrowing instinct to dig deep in the soil
  - thick coat to protect it from the cold

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**Organisms and Their Environment, *continued*** **Reading Check**

8. What is the name of the relationship in which both species benefit?

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**Symbiosis**

People once thought that animals in the same environment fought each other for survival. In reality, most species survive because of the relationships they have with other species. A relationship in which there is a close and permanent association between organisms of different species is called **symbiosis** (sihm bee OH sus). Symbiosis means living together. There are three major kinds of symbiosis—mutualism, commensalism, and parasitism.

**Mutualism** **Mutualism** (MYEW chuh wuh lih zum) is a relationship between two species that live together in which both species benefit. The relationship between ants and an acacia (uh KAY shuh) tree is a good example of mutualism. The ants protect the tree by attacking any animal that tries to feed on the tree. The tree provides nectar as a food for the ants. The tree also provides a home for the ants. In an experiment, ecologists removed the ants from some acacia trees. Results showed that the trees with ants grew faster and lived longer than the trees with no ants.

**Commensalism** **Commensalism** (kuh MEN suh lih zum) is a relationship in which only one species benefits and the other species is not harmed or helped. For example, mosses sometimes grow on the branches of trees. This does not help or hurt the trees, but the mosses get a good habitat.

**Parasitism** **Parasitism** (PER uh suh tih zum) is a relationship in which a member of one species benefits at the expense of another species. For instance, when a tick lives on a dog, it is good for the tick but bad for the dog. The tick gets food and a home, but the dog could get sick. The tick is a parasite. A parasite is the organism that benefits from the relationship. The dog is a host. The host is the organism that is harmed by the relationship.

**What relationship do predators and prey have?**

Another type of relationship is that between a predator and its prey. Predators are organisms that seek out and eat other organisms. The organisms that are eaten are called prey. Predators are found in all ecosystems. Some eat animals and plants. Some eat only animals. Lions and birds that eat insects are predators.

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Organisms and Their Environment, *continued*► **After You Read****Mini Glossary**

**abiotic (ay bi AH tihk) factors:** nonliving parts of an organism's environment; air currents, temperature, moisture, light, and soil are examples

**biological community:** a community made up of interacting populations in a certain area at a certain time

**biosphere (Bi uh sfih):** portion of Earth that supports life; extends from high in the atmosphere to the bottom of the oceans

**biotic (by AH tihk) factors:** all the living organisms that inhabit an environment

**commensalism (kuh MEN suh lih zum):** symbiotic relationship in which one species benefits and the other species is neither harmed nor benefits

**ecology:** scientific study of interactions between organisms and their environments

**ecosystem:** interactions among populations in a community and the community's physical surroundings, or abiotic factors

**habitat:** place where an organism lives out its life

**mutualism (MYEW chuh wuh lih zum):** symbiotic relationship in which both species benefit

**niche (neesh):** all strategies and adaptations a species uses in its environment; includes all biotic and abiotic interactions as an organism meets its needs for survival and reproduction

**parasitism (PER uh suh tih zum):** symbiotic relationship in which one organism benefits at the expense of another

**population:** group of organisms of the same species that interbreeds and lives in the same place at the same time

**symbiosis (sihm bee OH sus):** permanent, close association between two or more organisms of different species

1. Review the terms and their definitions in the Mini Glossary above. Circle the three terms that identify specific types of relationships between organisms that live in the same ecosystem. On the lines below, give an example of each type of relationship.

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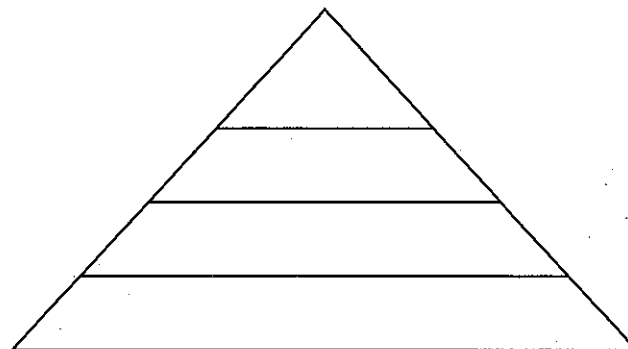


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2. Use the pyramid diagram below to help you review what you have read. List the four levels that ecologists have organized the living world into. Start with the least complex level at the bottom and work your way up.



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**Organisms and Their Environment, *continued***

3. In Column 1 are some new concepts you learned about in this section, Column 2 gives one example of each concept. Use the line next to each concept to put the letter of the example that matches it.

New Concept Column 1	Example Column 2
_____ 1. abiotic factor	a. an owl eating a mouse
_____ 2. habitat	b. a rain forest
_____ 3. predator-prey relationship	c. rain
_____ 4. biological community	d. a tick on a cat
_____ 5. parasitism	e. millipedes, centipedes, insects, slugs, and earthworms under a log



Visit the Glencoe Science Web site at **science.glencoe.com** to find your biology book and learn more about organisms and their environment.