Types of Interactions

BEFORE YOU READ

After you read this section, you should be able to answer these questions:

- What determines an area's carrying capacity?
- Why does competition occur?
- How do organisms avoid being eaten?
- What are three kinds of symbiotic relationships?

National Science Education Standards LS 3a, 3c, 4b, 4d

How Does the Environment Control Population Sizes?

Most living things have more offspring than will survive. A female frog, for example, may lay hundreds of eggs in a small pond. If all of the eggs became frogs, the pond would soon become very crowded. There would not be enough food for the frogs or other organisms in the pond. But in nature, this usually does not happen. The biotic and abiotic factors in the pond control the frog population so that it does not get too large.

Populations cannot grow without stopping because the environment has only a certain amount of food, water, space, and other resources. A resource that keeps a population from growing forever is called a *limiting factor*. Food is often a limiting factor in an ecosystem.



All plants need sunlight. In this forest, sunlight may be a limiting factor. Not all plants can get the same amount of light.



Make a List As you read this section, write down any questions you may have. Work with a partner to find the answers to your questions.

STANDARDS CHECK

LS 4d The number of organisms an ecosystem can support depends on the <u>resources</u> available and abiotic factors, such as quantity of light and water, range of temperatures, and soil composition. Given adequate biotic and abiotic resources and no disease or predators, populations (including humans) increase at rapid rates. Lack of resources and other factors, such as predation and climate, limit the growth of populations in specific niches in the ecosystem.

Word Help: <u>resource</u> anything that can be used to take care of a need

1. Define What is a limiting factor?

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What Is Carrying Capacity?

The largest number of organisms that can live in an environment is called the carrying capacity. When a population grows beyond the carrying capacity, limiting factors will cause some individuals to leave the area or to die. As individuals die or leave, the population decreases.

The carrying capacity of an area can change if the amount of the limiting factor changes. For example, the carrying capacity of an area will be higher in seasons when more food is available. \square



How Do Organisms Interact in an Ecosystem?

Populations are made of individuals of the same species. Communities are made of different populations that interact. There are four main ways that individuals and populations affect one another in an ecosystem: in competition, as predator and prey, through symbiosis, and coevolution.

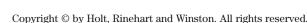


READING CHECK

2. Explain Why can the carrying capacity of an area change?



3. List What are four ways that organisms in an ecosystem interact?



Why Do Organisms Compete?

Competition happens when more than one individual or population tries to use the same resource. There may not be enough resources, such as food, water, shelter, or sunlight, for all the organisms in an environment. When one individual or population uses a resource, there is less for others to use.

Competition can happen between organisms in the same population. For example, in Yellowstone National Park, elk compete with one another for the same plants. In the winter, when there are not many plants, competition is much higher. Some elk will die because there is not enough food. In spring, when many plants grow, there is more food for the elk, and competition is lower.

Competition can also happen between populations. In a forest, different types of trees compete to grow in the same area. All of the plant populations must compete for the same resources: sunlight, space, water, and nutrients.

How Do Predators and Prey Interact?

Another way organisms interact is when one organism eats another to get energy. The organism that is eaten is called the **prey**. The organism that eats the prey is called the **predator**. When a bird eats a worm, for example, the bird is the predator, and the worm is the prey.

PREDATORS

Predators have traits or skills that help them catch and kill their prey. Different types of predators have different skills and traits. For example, a cheetah uses its speed to catch prey. On the other hand, tigers have colors that let them blend with the environment so that prey cannot see them easily.



Critical Thinking

4. Predict In a prairie ecosystem, which two of the following organisms most likely compete for the same food source: elk, coyotes, prairie dogs, vultures?

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5. Identify What are two traits different predators may have to help them catch prey?

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Say It

Discuss In small groups, talk about other animals that escape predators in the four ways described in the text.

PREY

Prey generally have some way to protect themselves from being eaten. Different types of organisms protect themselves in different ways:

1. Run Away When a rabbit is in danger, it runs.



2. Travel in Groups Some animals, such as musk oxen, travel in herds, or groups. Many fishes, such as anchovies, travel in schools. All the animals in these groups can help one another by watching for predators.

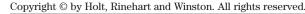


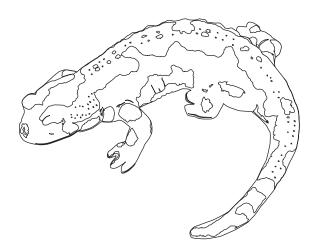
When musk oxen sense danger, they move close together to protect their young.

3. Show Warning Colors Some organisms have bright colors that act as a warning. The colors warn predators that the prey might be poisonous. A brightly colored fire salamander, for example, sprays a poison that burns.

Critical Thinking

6. Infer Why do you think it would be difficult for predators to attack animals in a herd?





4. Use Camouflage Some organisms can hide from predators by blending in with the background. This is called *camouflage*. A rabbit's natural colors, for example, may help it blend in with dead leaves or shrubs so that it cannot be seen. Some animals may look like twigs, stone, or bark.



What Is Symbiosis?

Some species have very close interactions with other species. A close association between two or more species is called **symbiosis**. Each individual in a symbiotic relationship may be helped, hurt, or not affected by another individual. Often, one species lives on or in another species. Most symbiotic relationships can be divided into three types: mutualism, commensalism, and parasitism.

MUTUALISM

When both individuals in a symbiotic relationship are helped, it is called **mutualism**. You can see mutualism in the relationship between a bee and a flower.

Organism hurt?	Organism helped?	Example
No one		A bee transfers pollen for a flower; a flower provides nectar to a bee.

TAKE A LOOK

7. Color A fire salamander has a black body with bright orange or yellow spots. Use colored pencils to give this salamander its warning colors.

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8. List List the three types of symbiotic relationships.



In a mutualistic relationship, both species benefit.

Critical Thinking

3. Compare How does
mutualism differ from
commensalism?

COMMENSALISM

When one individual in a symbiotic relationship is helped but the other is not affected, this is called commensalism.

Organism hurt?	Organism helped?	Example
No one	one of the organisms	A fish called a remora attaches to a shark and eats the shark's leftovers.



The remoras get a free meal, but the shark is not harmed.

PARASITISM

A symbiotic relationship in which one individual is hurt and the other is helped is called **parasitism**. The organism that is helped is called the parasite. The organism that is hurt is called the *host*.

Organism hurt?	Organism helped?	Example
Host	parasite	A flea is a parasite on a dog.



10. Define In parasitism, is the host helped or hurt?

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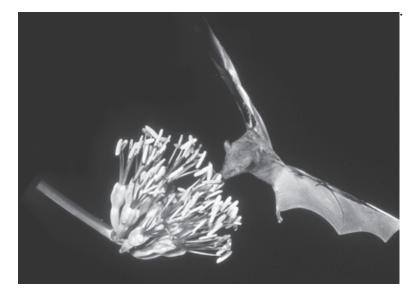
This tomato hornworm is being parasitized by young wasps. Their cocoons are on the caterpillar's back.

What Is Coevolution?

Relationships between organisms change over time. Interactions can even be one reason that organisms change. When a long-term change happens in two species because of their close interactions, the change is called coevolution.

One example of coevolution can be seen in some flowers and the organisms that pollinate them. A pollinator is an organism, such as a bird, insect, or bat, that carries pollen from one flower to another. Flowers need to attract pollinators to help them reproduce. Different flowers have evolved different ways to attract pollinators. Some use colors or odors. Others use nectar as a food reward for the pollinator.

Some plants can use a variety of pollinators. Others have coevolved with certain pollinators. For example, the bat in the picture below has a long sticky tongue. It uses its tongue to get nectar from deep inside the flower. Only an organism with a way to reach the nectar could be a pollinator for this flower.



TAKE A LOOK

11. Infer How do you think the caterpillar helps the wasps?



Investigate With a partner, look up the meaning of the suffix co-. Discuss how the meaning of this suffix can help you remember what coevolution means. Think of some other words that have co-.

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Section 3 Review

NSES LS 3a, 3c, 4b, 4d

SECTION VOCABULARY

carrying capacity the largest population that an environment can support at any given time

coevolution the evolution of two species that is due to mutual influence, often in a way that makes the relationship more beneficial to both species

commensalism a relationship between two organisms in which one organism benefits and the other is unaffected

mutualism a relationship between two species in which both species benefit

parasitism a relationship between two species in which one species, the parasite, benefits from the other species, the host, which is harmed

predator an organism that kills and eats all or part of another organism

prey an organism that is killed and eaten by another organism

symbiosis a relationship in which two different organisms live in close association with each other

1.	Identify What are two resources for which organisms are likely to compete?
2.	Explain What happens to a population when it grows larger than its carrying capacity?
	Infer Do you think the carrying capacity is the same for all species in an ecosystem? Explain your answer.

4. Summarize Complete the chart below to describe the different kinds of symbiotic relationships.

Example organisms	Type of symbiosis	Organism(s) helped	Organism(s) hurt
Flea and dog			host (dog)
Bee and flower	mutualism		
Remora and shark			none

5. Apply Concepts	The flowers of many plants provide a food reward, such as nectar	r,
to pollinators. S	Some plants, however, attract pollinators but provide no reward.	
What type of sy	ymbiosis best describes this relationship? Explain your answer.	