

Know Your Limits

What environmental factors influence population size?

A tropical rain forest can support large populations of trees. A desert, however, will probably support few or no trees. Each environment has different amounts of the resources that living things need, such as food, water, and space.

Resource Availability

The amount of resources in an area influences the size of a population. If important resources are lost from the environment, a population may shrink. The population may grow if the amount of resources in the environment is increased. But if the population continues to grow, the individuals would eventually run out of resources. The **carrying capacity** is the maximum number of individuals of one species that the environment can support. For example, the carrying capacity, or the number of owls that a forest can support, depends on how many mice are available to eat and how many trees are available for the owls to live in.

Deforestation causes a sudden change in resource availability.



Visualize It!


Identify Make a list of each population in the image that would be affected by drought.

Animals use plants as food and shelter. Plants depend on sunlight and water as resources.

A savanna landscape with a giraffe in the foreground and a herd of wildebeest and zebras in a watering hole.

Changes in the Environment

The carrying capacity can change when the environment changes. For example, after a rainy season, plants may produce a large crop of leaves and seeds. This large amount of food may allow an herbivore population to grow. But what if important resources are destroyed? A population crash occurs when the carrying capacity of the environment suddenly drops. Natural disasters, such as forest fires, and harsh weather, such as droughts, can cause population crashes. The carrying capacity can also be reduced when new competitors enter an area and outcompete existing populations for resources. This would cause existing populations to become smaller or crash.

 **Active Reading** 9 **Describe** What are two ways in which the environment can influence population size?

Drought slowly reduces the amount of water available as a resource to different populations.

Think Outside the Book

10 Apply With a classmate, discuss how the immigration of new herbivores might affect the carrying capacity of the local zebra population.

Teamwork

Animals compete for access to water.

What interactions between organisms can influence population size?

As living things try to gather the resources they need, they often interact with each other. Sometimes interactions help one individual and harm another. At other times, all of the organisms benefit by working together.

Competition


When two or more individuals or populations try to use the same limited resource, such as food, water, shelter, space, or sunlight, it is called **competition**. Competition can happen among individuals within a population. The elk in a forest compete with each other for the same food plants. This competition increases in winter when many plants die. Competition also happens among populations. For example, different species of trees in a forest compete with each other for sunlight and space.

Visualize It!

16 Predict The image above shows individuals from two populations competing for access to water.

What would happen to the size of the lion population if elephants usually won this competition?

What would happen to each population if lions usually won this competition?

A close-up photograph of a colony of ants on a green leaf. The ants are dark brown with white markings on their heads and abdomens. They are clustered together, some appearing to be tending to a central point on the leaf. The background is a soft-focus green.

Active Reading 17 Identify As you read, underline how cooperation can influence population dynamics.

Cooperation

Cooperation occurs when individuals work together. Some animals, such as killer whales, hunt in groups. Emperor penguins in Antarctica stay close together to stay warm. Some populations have a structured social order that determines how the individuals work with each other. For example, ants live in colonies in which the members have different jobs. Some ants find food, others defend the colony, and others take care of the young. Cooperation helps individuals get resources, which can make populations grow.

18 Compare Make an analogy between an ant colony and a sports team. How does each group work together to achieve a goal?

These ants cooperate to protect aphids that produce a substance that ants eat.

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Let the Games Begin!

Why does competition occur in communities?

In a team game, two groups compete against each other with the same goal in mind—to win the game. In a biological community, organisms compete for resources. **Competition** occurs when organisms fight for the same limited resource. Organisms compete for resources such as food, water, sunlight, shelter, and mates. If an organism doesn't get all the resources it needs, it could die.

Sometimes competition happens among individuals of the same species. For example, different groups of lions compete with each other for living space. Males within these groups also compete with each other for mates.

Competition can also happen among individuals of different species. Lions mainly eat large animals, such as zebras. They compete for zebras with leopards and cheetahs. When zebras are scarce, competition increases among animals that eat zebras. As a result, lions may steal food or compete with other predators for smaller animals.

15 Predict In the table below, fill in the missing cause and effect of two examples of competition in a community.

Cause	Effect
A population of lions grows too large to share their current territory.	
	Several male hyenas compete to mate with the females present in their area.

Active Reading

14 Identify Underline each example of competition.

Think Outside the Book

16 Apply With a classmate, discuss how competition might affect the organisms in this photo.

Many organisms rely on the same water source.

