# Lesson 1

# Reading Guide

#### Key Concepts 👺 **ESSENTIAL QUESTIONS**

 What are the nonliving parts of an environment?

#### Vocabulary

ecosystem p. 707 biotic factor p. 707 abiotic factor p. 707 climate p. 708

atmosphere p. 709

**3** Multilingual eGlossary

Video BrainPOP®

# (inquity) Why So Blue?

Have you ever seen a picture of a bright blue ocean? The water looks so colorful in part because of nonliving factors such as matter in the water and the gases surrounding Earth. These nonliving things change the way you see light from the Sun, another nonliving part of the environment.

## Is it living or nonliving?

You are surrounded by living and nonliving things, but it is sometimes difficult to tell what is alive. Some nonliving things may appear to be alive at first glance. Others are alive or were once living, but seem nonliving. In this lab, you will explore which items are alive and which are not.

- ① Draw a chart with the headings Living and Nonliving.
- 2 Your teacher will provide you with a list of items. Decide if each item is living or nonliving.

#### **Think About This**

- 1. What are some characteristics that the items in the *Living* column share?
- 2. Key Concept How might the nonliving items be a part of your environment?

Living	Nonliving
	•
,	

## What is an ecosystem?

Have you ever watched a bee fly from flower to flower? Certain flowers and bees depend on each other. Bees help flowering plants reproduce. In return, flowers provide the nectar that bees use to make honey. Flowers also need nonliving things to survive, such as sunlight and water. For example, if plants don't get enough water, they can die. The bees might die, too, because they feed on the plants. All organisms need both living and nonliving things to survive.

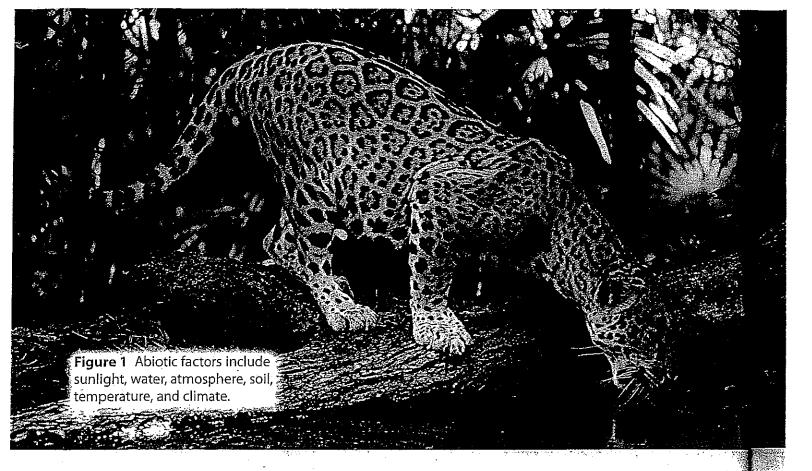
An ecosystem is all the living things and nonliving things in a given area. Ecosystems vary in size. An entire forest can be an ecosystem, and so can a rotting log on the forest floor. Other examples of ecosystems include a pond, a desert, an ocean, and your neighborhood.

Biotic (bi AH tihk) factors are the living things in an ecosystem. Abiotic (ay bi AH tihk) factors are the nonliving things in an ecosystem, such as sunlight and water. Biotic factors and abiotic factors depend on each other. If just one factor—either abiotic or biotic—is disturbed, other parts of the ecosystem are affected. For example, severe droughts, or periods of water shortages, occurred in Australia in 2006. Many fish in rivers and lakes died. Animals that fed on the fish had to find food elsewhere. A lack of water, an abiotic factor, affected biotic factors in this ecosystem, such as the fish and the animals that fed on the fish.

#### WORD ORIGIN ......

biotic

from Greek biotikos, means "fit for life"



## What are the nonliving parts of an ecosystem?

Some abiotic factors in an ecosystem are shown in Figure 1. Think about how these factors might affect you. You need sunlight for warmth and air to breathe. You would have no food without water and soil. These nonliving parts of the environment affect all living things.

#### The Sun

The source of almost all energy on Earth is the Sun. It provides warmth and light. In addition, many plants use sunlight and make food, as you'll read in Lesson 3. The Sun also affects two other abiotic factors—climate and temperature.



**Reading Check** How do living things use the Sun's energy?

#### **Climate**

Polar bears live in the Arctic. The Arctic has a cold, dry climate. Climate describes average weather conditions in an area over time. These weather conditions include temperature, moisture, and wind.

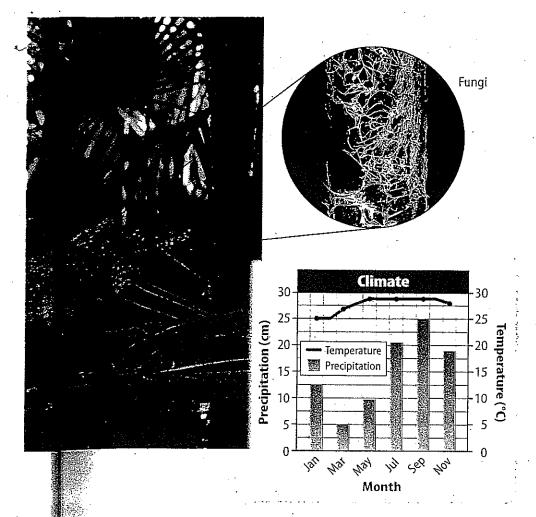
Climate influences where organisms can live. A desert climate, for example, is dry and often hot. A plant that needs a lot of water could not survive in a desert. In contrast, a cactus is well adapted to a dry climate because it can survive with little water.

#### **Temperature**

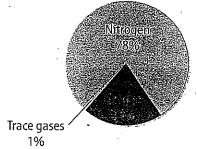
Is it hot or cold where you live? Temperatures on Earth vary greatly. Temperature is another abiotic factor that influences where organisms can survive. Some organisms, such as tropical birds, thrive in hot conditions. Others, such as polar bears, are well adapted to the cold. Tropical birds don't live in cold ecosystems, and polar bears don't live in warm ecosystems.

#### Water

All life on Earth requires water. In fact, most organisms are made mostly of water. All organisms need water for important life processes, such as growing and reproducing. Every ecosystem must contain some water to support life.



#### Gases in Atmosphere



Wisual Check How does the jaquar interact with the abiotic factors in its ecosystem?

#### Atmosphere

Every time you take a breath you are interacting with another abiotic factor that is necessary for life—the atmosphere. The atmosphere (AT muh sfir) is the layer of gases that surrounds Earth. The atmosphere is mostly nitrogen and oxygen with trace amounts of other gases, also shown in Figure 1. Besides providing living things with oxygen, the atmosphere also protects them from certain harmful rays from the Sun.

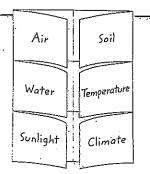
#### Soil

Bits of rocks, water, air, minerals, and the remains of onceliving things make up soil. When you think about soil, you might picture a farmer growing crops. Soil provides water and nutrients for the plants we eat. However, it is also a home for many organisms, such as insects, bacteria, and fungi.

Factors such as water, soil texture, and the amount of available nutrients affect the types of organisms that can live in soil. Bacteria break down dead plants and animals, returning nutrients to the soil. Earthworms and insects make small tunnels in the soil, allowing air and water to move through it. Even very dry soil, like that in the desert, is home to living things.

**Key Concept Check** List the nonliving things in ecosystems.

Fold and cut a sheet of paper to make a sixdoor book. Label it as shown. Use it to organize information about the abiotic parts of an ecosystem.



Lesson 1

**EXPLAIN** 



# Lesson 1 Review



Online Quiz

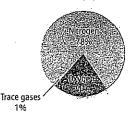
## **Visual Summary**



Ecosystems include all the biotic and abiotic factors in an area.



Biotic factors are the living things in ecosystems.



Abiotic factors are the nonliving things in ecosystems, including water, sunlight, temperature, climate, air, and soil.

# OLDABLES

Use your lesson Foldable to review the lesson. Save your Foldable for the project at the end of the chapter.

# What do you think (NOW)



You first read the statements below at the beginning of the chapter.

- **1.** The air you breathe is mostly oxygen.
- 2. Living things are made mostly of water.

Did you change your mind about whether you agree or disagree with the statements? Rewrite any false statements to make them true.

#### **Use Vocabulary**

- Distinguish between biotic and abiotic factors.
- **2** Define *ecosystem* in your own words.
- Use the term climate in a complete sentence.

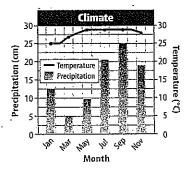
#### Understand Key Concepts



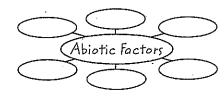
- What role do bacteria play in soil ecosystems?
  - A. They add air to soil.
  - B. They break down rocks.
  - **c.** They return nutrients to soil.
  - **D.** They tunnel through soil.
- **Explain** How would a forest ecosystem change if no sunlight were available to it?

#### **Interpret Graphics**

6 Analyze The graph below shows climate data for an area. How would you describe this climate?



Organize Copy the graphic organizer below and fill in each oval with an abiotic factor.



#### **Critical Thinking**

**8** Predict Imagine that the soil in an area is carried away by wind and water, leaving only rocks behind. How would this affect the living things in that area?

# Taralormine Mars



The we dividite actives.

erraforming is the process of transforming an environment that cannot support life into one that can. Making Mars like Earth would take more than just growing plants and adding water. You would need to consider how every abiotic factor needed to support life would be included in the new environment.

First, consider Mars's temperature. Although Mars gets plenty of sunlight, it is farther from the Sun than Earth is. Air temperatures go no higher than 0°C on a midsummer Martian day. Don't even think about trying to survive a winter night on Mars, as temperatures fall below –89°C.

How could you change the temperature on Mars? Releasing greenhouse gases such as chlorofluorocarbons (CFCs) into the atmosphere can cause the planet to get warmer. Raising the average temperature by only 4°C would melt the polar ice caps, releasing frozen CO<sub>2</sub>, another greenhouse gas. This also would cause bodies of water to form. As temperatures rise, liquid water trapped in the soil would turn into a gas, providing the planet with water vapor, an important abiotic factor.

With water and warmer temperatures, plant life could be introduced. While turning light energy into food, plants would introduce another abiotic factor—oxygen. With all the needed abiotic factors accounted for, NASA scientists think that in a few centuries Mars could support life similar to that on Earth.

Mars is cold and dry, with no sign of life on its dusty, red surface.

Life as it is on Earth does not exist on Mars. However, when you compare all the planets in our solar system, Mars is the most like Earth.

Your Turn

**DEBATE** Why would people want to move to Mars? Would this be the right choice? Research these questions and then debate the issues.

# essons

# leading Guide

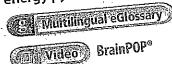
# ley Concepts SSENTIAL QUESTIONS

- How does energy move in ecosystems?
- How is the movement of energy in an ecosystem modeled?

# Vocabulary

photosynthesis p. 724 chemosynthesis p. 724 food chain p. 726 food web p. 727

energy pyramid p. 728



# Energy in Ecosysiems

# Inquiry) Time for a snadte

All organisms need energy, and many get it from eating other organisms. Can you guess how each of the living things in this picture gets the energy it needs?

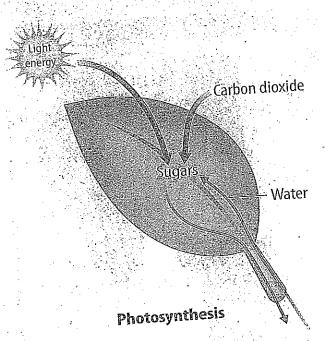
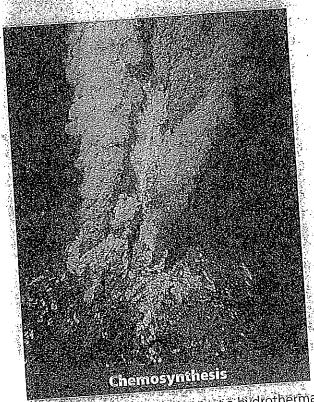


Figure 10, Most producers make their food through the process of photosynthesis.

## Word Origin

from Greek photo, meaning "light", and synthese. meaning "synthesis"



A Figure 11 The producers at a hydrothermal vent make their food using chemosynthesis.

#### Producers

People who make things or products are often called producers. In a similar way, living things that make their own food are called producers. Producers make their food from materials found in their environments. Most producers are photosynthetic (foh toh sihn THEH tihk). They use the process of photosynthesis (foh toh SIHN thuh sus), which is described below. Grasses, trees, and other plants, algae and some other protists, and certain bacteria are photosynthetic. Other producers, including some bacteria, are chemosynthetic (kee moh sihn THEH tihk). They make their food using chemosynthesis (kee moh SIHN thuh sus).

Photosynthesis Recall that in the carbon cycle, carbon in the atmosphere cycles through producers such as plants, into other organisms, and then back into the atmosphere. This and other matter cycles involve photosynthesis, as shown in Figure 10. Photosynthesis is a series of chemical reactions that convert light energy, water, and carbon dioxide into the foodenergy molecule glucose and give off oxygen.

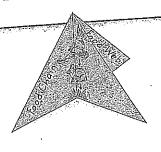
Chemosynthesis As you read earlier, some producers make food using chemosynthesis. Chemosynthesis is the process during which producers use chemical energy in matter rather than light energy and make food. One place where chemosynthesis can occur is on the deep ocean floor. There, inorganic compounds that contain hydrogen and sulfur, along with thermal energy from Earth's interior, flow out from cracks in the ocean floor. These cracks are called hydrothermal vents. These vents, such as the one shown in Figure 11, are home to chemosynthetic bacteria. These bacteria use the chemical energy contained in inorganic compounds in the hot water and produce food.



Reading Check What materials do producers use to make food during chemosynthesis?

# ZEE: ACE OF

Make a pyramid book from a sheet of paper. Use each side to organize information about one of the ways energy flows in an ecosystem. You can add additional information on the inside of your pyramid book.



# Modeling Energy in Ecosystems

Unlike matter, energy does not cycle through ecosystems because it does not return to the Sun. Instead, energy flows through ecosystems. Organisms use some energy for life processes. In addition, organisms store some energy in their bodies as chemical energy. When consumers eat these organisms, this chemical energy moves into the bodies of consumers. However, with each transfer of energy from organism to organism, some energy changes to thermal energy. The bodies of consumers emit excess thermal energy, which then enters the environment. Scientists use models to study this flow of energy through an ecosystem. They use different models depending on how many organisms they are studying.

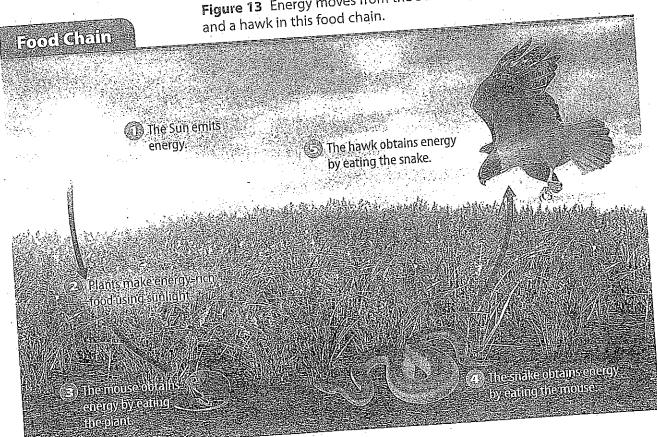
## Food Chains

A food chain is a model that shows how energy flows in an ecosystem through feeding relationships. In a food chain, arrows show the transfer of energy. A typical food chain is shown in Figure 13. Notice that there are not many links in this food chain. That is because the amount of available energy decreases every time it is transferred from one organism to another.



Key Concept Check How does a food chain model energy flow?

Figure 13 Energy moves from the Sun to a plant, a mouse, a snake,



# MathSkills #

## **Use Percentages**

The first trophic level—producers—obtains energy from the Sun. They use 90 percent of the energy for their own life processes. Only 10 percent of the energy remains for the second trophic level—herbivores. Assume that each trophic level uses 90 percent of the energy it receives. Use the following steps to calculate how much energy remains for the next trophic

First trophic level gets 100 units of energy.

First trophic level uses 90 percent = 90 units

Energy remaining for second trophic level = 10 units

Second trophic level uses 90 percent = 9 units

Energy remaining for third trophic level = 1 unit

#### Practice

If the first trophic level receives 10,000 units of energy from the Sun, how much energy is available for the second trophic level?

Available energy decreases.



- Math Practice
- Personal Tutor

# **Energy Pyramids**

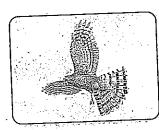
Food chains and food webs show how energy moves in an ecosystem. However, they do not show how the amount of energy in an ecosystem changes. Scientists use a model called an energy pyramid to show the amount of energy available in each step of a food chain, as shown in Figure 15. The steps of an energy pyramid are also called trophic (TROH fihk) levels.

Producers, such as plants, make up the trophic level at the bottom of the pyramid. Consumers that eat producers, such as squirrels, make up the next trophic level. Consumers such as hawks that eat other consumers make up the highest trophic level. Notice that less energy is available for consumers at each higher trophic level. As you read earlier, organisms use some of the energy they get from food for life processes. During life processes, some energy is changed to thermal energy and is transferred to the environment. Only about 10 percent of the energy available at one trophic level transfers on to the next trophic level.

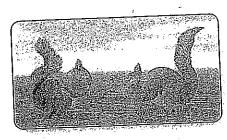
Figure 15 An energy pyramid shows the amount of energy available at each trophic level.

**Visual Check** How does the amount of available energy change at each trophic level?





Trophic level 3 (1 percent of energy available)



Trophic level 2 (10 percent of energy available)



Trophic level 1 (100 percent of energy available)

# Lesson 1

# **Reading Guide**

**Populations** 

# Key Concepts © ESSENTIAL QUESTIONS

- What defines a population?
- What factors affect the size of a population?

#### Vocabulary

biosphere p. 741

community p. 742

population p. 742

competition p. 743

limiting factor p. 743

population density p. 744

biotic potential p. 744

carrying capacity p. 745

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# (Inquiry) Looking for Something?

Meerkats live in family groups. They help protect each other by watching for danger from eagles, lions, and other hunters of the Kalahari Desert. What other ways might the meerkats interact?



## How many times do you interact?

Every day, you interact with other people in different ways, including talking, writing, or shaking hands. Some interactions involve just one other person, and others happen between many people. Like humans, other organisms interact with each other in their environment.

- Make a list in your Science Journal of all the ways you have interacted with other people today.
- Use a **highlighter** to mark the interactions that occurred between you and one other person.
- Use a **highlighter** of another color to mark interactions that occurred among three or more people.



#### **Think About This**

- 1. Were your interactions mainly with one person or with three or more people?
- 2. Key Concept How might your interactions change if the group of people were bigger?

## The Biosphere and Ecological Systems

Imagine flying halfway around the world to Africa. When your plane flies over Africa, you might see mountains, rivers, grasslands, and forests. As you get closer to land, you might see a herd of elephants at a watering hole. You also might see a group of meerkats, like the ones on the previous page.

Now imagine hiking through an African forest. You might see monkeys, frogs, insects, spiders, and flowers. Maybe you catch sight of crocodiles sunning themselves by a river or birds perching on trees.

You are exploring Earth's biosphere (Bl uh sfir)—the parts of Earth and the surrounding atmosphere where there is life. The biosphere includes all the land of the continents and islands. It also includes all of Earth's oceans, lakes, and streams, as well as the ice caps at the North Pole and the South Pole.

Parts of the biosphere with large amounts of plants or algae often contain many other organisms as well. The biosphere's distribution of chlorophyll, a green pigment in plants and algae, is shown in **Figure 1**.

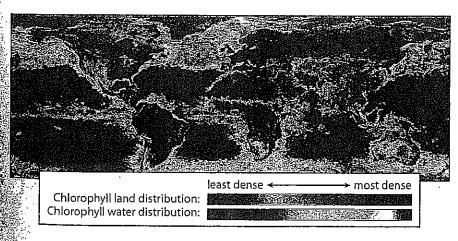


Figure 1 The colors in this satellite image represent the densities of chlorophyll, a green pigment found in plants and algae.

**Visual Check** Why might the North Pole have very little green?

## What is a population?

The Kalahari Desert in Africa is a part of the Earth's biosphere. A wildlife refuge in the Kalahari Desert is home to several groups of meerkats. Meerkats are small mammals that live in family groups and help each other care for their young.

Meerkats rely on interactions among themselves to survive. They sleep in underground burrows at night and hunt for food during the day. They take turns standing upright to watch for danger and call out warnings to others.

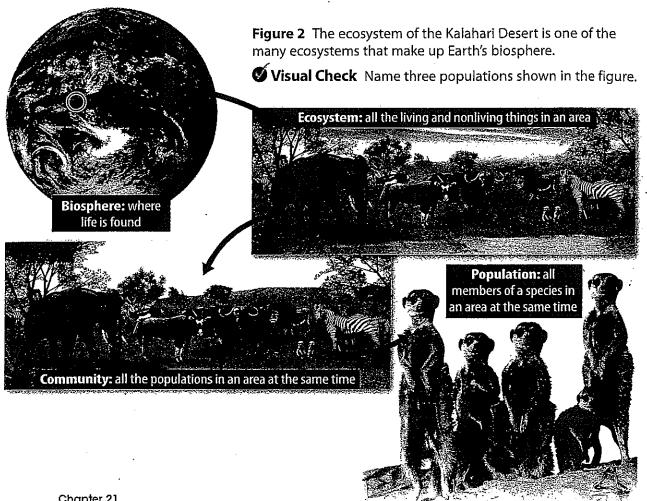
Meerkats are part of an ecosystem, as shown in Figure 2. An ecosystem is a group of organisms that lives in an area at one time, as well as the climate, soil, water, and other nonliving parts of the environment. The Kalahari Desert is an ecosystem. The study of all ecosystems on Earth is ecology.

Many species besides meerkats live in the Kalahari Desert. They include scorpions, spiders, insects, snakes, and birds such as eagles and owls. Also, large animals like zebras, giraffes, and lions live there. Plants that grow in the Kalahari Desert include shrubs, grasses, small trees, and melon vines. Together, all these plants, animals, and other organisms form a community. A community is all the populations of different species that live together in the same area at the same time.

All the meerkats in this refuge form a population. A **population** is all the organisms of the same species that live in the same area at the same time. A species is a group of organisms that have similar traits and are able to produce fertile offspring.



Key Concept Check What defines a population?



## Competition

At times, not enough food is available for every organism in a community. Members of a population, including those in the Kalahari Desert, must compete with other populations and each other for enough food to survive. Competition is the demand for resources, such as food, water, and shelter, in short supply in a community. When there are not enough resources available to survive, there is more competition in a community.

## **Population Sizes**

If the amount of available food decreases. what do you think happens to a population of meerkats? Some meerkats might move away to find food elsewhere. Female meerkats cannot raise as many young. The population becomes smaller. If there is plenty of food, however, the size of the population grows larger as more meerkats survive to adulthood and live longer. Changes in environmental factors can result in population size changes.

#### **Limiting Factors**

Environmental factors, such as available water, food, shelter, sunlight, and temperature, are possible limiting factors for a population. A limiting factor is anything that restricts the size of a population. Available sunlight is a limiting factor for most organisms. If there is not enough sunlight, green plants cannot make food by photosynthesis. Organisms that eat plants are affected if little food is available.

Temperature is a limiting factor for some organisms. When the temperature drops below freezing, many organisms die because it is too cold to carry out their life functions. Disease, predators—animals that eat other animals—and natural disasters such as fires or floods are limiting factors as well.

**Key Concept Check** What factors affect the size of a population?

# MiniLab

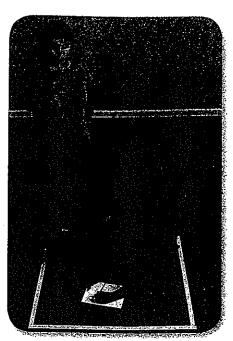
15 minutes

# What are limiting factors?



Certain factors, called limiting factors, can affect the size of a population.

- Read and complete a lab safety form.
- Your teacher will divide your class into groups.
- Using a meterstick and masking tape, mark a 1-m square on the floor. Place a piece of paper in the middle of the square.
- All members of your group will stand entirely within the square. While one member keeps time with a stopwatch, members of the group will write the alphabet on the sheet of paper one at a time.



5 In your Science Journal, calculate the average time it took each person to write the alphabet.

#### Analyze and Conclude

- 1. Describe how the space limitations affected each member's ability to complete the task.
- 2. Key Concept What functions must an organism perform that can be limited by the amount of available space?





**Figure 3** A sedated lynx is fitted with a radio collar and then returned to the wild.

#### WORD ORIGIN .

#### population

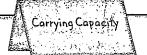
from Latin *populus*, means "inhabitants"

#### density

from Latin densus, means "thick, crowded"

# FOLDABLES

Make a horizontal half book and label it as shown. Use it to organize your notes on the relationship between population size and carrying capacity in an ecosystem.



#### **Measuring Population Size**

Sometimes it is difficult to determine the size of a population. How would you count scampering meerkats or wild lynx? One method used to count and monitor animal populations is the capture-mark-and-release method. The lynx in **Figure 3** is a member of a population in Poland that is monitored using this method. Biologists using this method sedate animals and fit them with radio collars before releasing them back into the wild. By counting how many observed lynx are wearing collars, scientists can estimate the size of the lynx population. Biologists also use the collars to track the lynx's movements and monitor their activities.

Suppose you want to know how closely together Cumberland azaleas (uh ZAYL yuhz), a type of flower, grow in the Great Smoky Mountains National Park. Population density is the size of a population compared to the amount of space available. One way of estimating population density is by sample count. Rather than counting every azalea shrub, you count only those in a representative area, such as 1 km². By multiplying the number of square kilometers in the park by the number of azaleas in 1 km², you find the estimated population density of azalea shrubs in the entire park.



**Reading Check** Describe two ways you can estimate population size.

#### **Biotic Potential**

Imagine that a population of raccoons has plenty of food, water, and den space. In addition, there is no disease or danger from other animals. The only limit to the size of this population is the number of offspring the raccoons can produce. Biotic potential is the potential growth of a population if it could grow in perfect conditions with no limiting factors. No population on Earth ever reaches its biotic potential because no ecosystem has an unlimited supply of natural resources.

#### Carrying Capacity

What would happen if a population of meerkats reached its biotic potential? It would stop growing when it reached the limit of available resources that the ecosystem could provide, such as food, water, or shelter. The largest number of individuals of one species that an environment can support is the carrying capacity. A population grows until it reaches the carrying capacity of an environment, as shown in Figure 4. Disease, space, predators, and food are some of the factors that limit the carrying capacity of an ecosystem. However, the carrying capacity of an environment is not constant. It increases and decreases as the amount of available resources increases and decreases. At times, a population can temporarily exceed the carrying capacity of an environment.

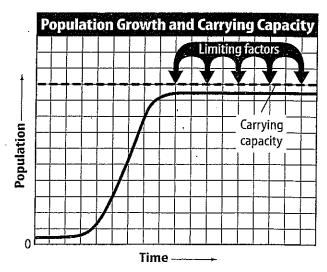
Reading Check What is carrying capacity?

#### Overpopulation

When the size of a population becomes larger than the carrying capacity of its ecosystem, overpopulation occurs. Overpopulation can cause problems for organisms. For example, meerkats eat spiders. An overpopulation of meerkats causes the size of the spider population in that community to decrease. Populations of birds and other animals that eat spiders also decrease when the number of spiders decreases.

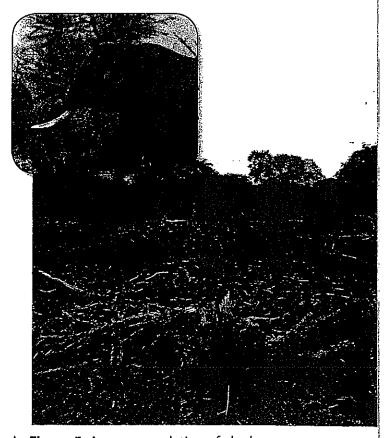
Elephants in Africa's wild game parks is another example of overpopulation. Elephants searching for food caused the tree damage shown in Figure 5. They push over trees to feed on the uppermost leaves. Other species of animals that use the same trees for food and shelter must compete with the elephants. The loss of trees and plants can also damage soil. Trees and plants might not grow in that area again for a long time.

Reading Check How can overpopulation affect a community?



▲ Figure 4 Carrying capacity is determined in part by limiting factors.

**W** Visual Check What factors affect population size in the graph above?



▲ Figure 5 An overpopulation of elephants can cause damage to trees and other plants as the herd searches for food in the community.

# **Lesson 1 Review**



# **Visual Summary**



The population density of organisms, including green plants and algae, varies throughout the world.



A community is all the populations of different species that live together in the same area at the same time.



The number of individuals in a population varies as the amount of available resources varies.

# FOLDABLES

Use your lesson Foldable to review the lesson. Save your Foldable for the project at the end of the chapter.

## What do you think 🐠



You first read the statements below at the beginning of the chapter.

- 1. Some life exists in the ice caps of the North Pole and the South Pole.
- 2. A community includes all organisms of one species that live in the same area.

Did you change your mind about whether you agree or disagree with the statements? Rewrite any false statements to make them true.

#### **Use Vocabulary**

- **1** Define population.
- Distinguish between carrying capacity and biotic potential.
- 3 Food, water, living space, and disease are examples of \_\_\_\_\_.

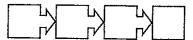
#### **Understand Key Concepts**



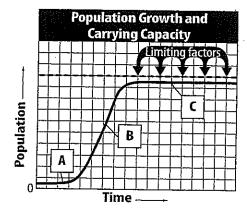
- 4 Explain how competition could limit the size of a bird population.
- 5 One example of competition among members of a meerkat population is
  - A. fighting over mates.
  - B. warning others of danger.
  - **c.** huddling together to stay warm.
  - **D.** teaching young to search for food.

#### **Interpret Graphics**

6 Sequence Draw a graphic organizer like the one below to show the sequence of steps in one type of population study.



Explain the changes in population size at each point marked on the graph below.



#### **Critical Thinking**

8 Explain Is the problem of elephants destroying trees in southern Africa overpopulation, competition, or both?

. 

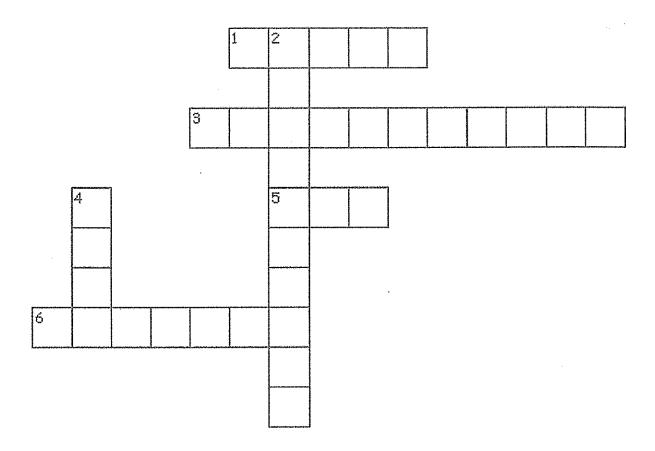
Name	
"Abiotic Factors" Pages 706-711	
1. What is an ecosystem? (Page 707) Complete sentence please!!	
2. What are <b>abiotic</b> factors in an ecosystem? ( <i>Page 707</i> ) Complete sentence please!!	
3. What are <b>biotic</b> factors in an ecosystem? (Page 707) Complete sentence please!!	
4. In a jaguar's ecosystem, what is the coldest month? (Page 709)	
5. In a jaguar's ecosystem, which month gets the most precipitation? (Page 70	19)
6. What abiotic factors on Mars make it difficult for life to exist? (Page 711)	
	٠

## 7. Circle true or false for the following:

- a.  $\it True \ \it False \ \it Ecosystems \ can \ be \ big \ or \ small.$
- b.  $\it True \ \it False \ \it A tiger is a biotic factor.$
- c. True False Water is a biotic factor.
- d. *True False* Mars would need terraformed to support much life.

#### Turn over

# **Abiotic Factors**



#### Across

- 1. Every ecosystem must contain this to support life.
- 3. How hot or cold it is in an area.
- 5. The source of almost all energy on earth.
- 6. Average weather conditions in an area over time.
- 2. The layer of gases that surrounds the earth.
- 4. Bits of rocks, water, air, minerals, and the remains of once living things.

# **Content Vocabulary**

**LESSON 1** 

# Abiotic Factors

**Directions:** Unscramble and write the words. Then on the line before each definition, write the term that matches it correctly.

- 1. malitec \_\_\_\_\_
- 2. tocibi tacfor \_\_\_\_\_
- 3. catiiob trocaf
- 4. scosmeety
- 5. streamhope \_\_\_\_\_
- \_\_\_\_\_\_ 6. the layer of gases that surrounds Earth
- 7. a living thing in an ecosystem
- - 9. a nonliving thing in an ecosystem
- \_\_\_\_\_\_\_ 10. average weather conditions in an area over time

# Lesson Outline

LESSON 1

## Abiotic Factors

	OI(	DTIC FACTORS
A.	Wh	at is an ecosystem?
	۳.	All living and nonliving things in an area make up a(n)
	2.	The living things in a system are the
	3.	Sunlight and temperature are examples of the nonliving factors,
		or, in an ecosystem.
8.	Wh	at are the nonliving parts of an ecosystem?
	1.	Almost all energy on Earth originally came from the
		a. Sunlight is used by plants to make
		<b>b.</b> Two other abiotic factors that are affected by sunlight are temperature
		and
	2.	If you describe the average weather conditions of an area over time, you describe the
		area's
		a. Wind, temperature, and moisture influence the daily
		b. A lizard might live in a hot, dry climate.
	3.	is how warm or cold something is.
		a. Animals that have thick fur live in climates that havetemperatures.
		b. Tropical birds are adapted totemperatures.
	4.	Most organisms are made mostly of
		a. Organisms need to grow and reproduce.
		b must contain water to support life.
	5.	The layers of gases that surround Earth make up the
		a. Earth's atmosphere is mainly and oxygen.
		<b>b.</b> Earth's atmosphere protects organisms from harmful rays from
		the
	6.	covers much of Earth's surface. It is made up of rock,
		water, air, minerals, and the remains of
		a. Soil provides water and for plants that grow in it.

recycle nutrients by breaking down dead organisms.

# **Content Practice A**

LESSON 1

# Abiotic Factors

**Directions:** On each line, write the term from the word bank that correctly completes each sentence. Some terms may be used more than once.

abiotic atmosphere biotic climate ecosystem soil sunlight water weather 1. The \_\_\_\_\_ gives us air to breathe. **2.** A(n) \_\_\_\_\_ contains living and nonliving things. 3. Living things are known as \_\_\_\_\_\_ factors. Nonliving things are known as \_\_\_\_\_\_factors. \_\_\_\_\_ is its average \_\_\_\_\_ **4.** A region's \_\_\_\_\_ conditions over time. 5. In addition to fertile \_\_\_\_\_\_, outdoor plants need and \_\_\_\_\_ to grow. 6. A desert's hot and dry \_\_\_\_\_\_ determines what kind of organisms can live there. **Directions:** On the line before each statement, write T if the statement is true or F if the statement is false. 7. Some organisms are not affected by any abiotic factors. 8. The abiotic factors in an environment may change.

Name <sub>.</sub>		Date	Class
Co	ntent Practice B		LESSON 1
Abi	iotic Factors		
Direc	ctions: Answer each question o	n the lines provided.	
1. V	What is an ecosystem?		
***			•
2. V		used for the living and nonliving th	,
3. V	What is a climate?		
4. V		conditions that make up an area's c	
	What are the two main at each one in the atmosphe	mospheric gases, and what is the apre?	oproximate percentage of
-			
6. T	What are three important	living things found in soil, and wh	at do they do?
_			
•			

# School to Home

**LESSON 1** 

# Abiotic Factors

**Directions:** Use your textbook to answer each question and respond to the statement.

- 1. Into which two categories can the parts of every ecosystem be classified?
- 2. Discuss with your learning partner an ecosystem near your home or school. What are the components of this ecosystem?
- 3. Complete the table below by describing how each of the listed factors affects the living things in ecosystems.

Factor	Description
Sun ,	a.
Climate	b.
Temperature	C.
Water	d.
Atmosphere	е.
Soil	f.

# Key Concept Builder 🗇



LESSON 1

Abiotic Factors

Key Concept What are the nonliving parts of an environment?

**Directions:** Circle the abiotic factors in the sentences below. Underline the biotic factors.

- 1. Fish breathe oxygen that is dissolved in water.
- 2. A man waters his tomato plants.
- 3. Earthworms make tunnels in soil.
- 4. A drought kills plants and animals in Australia.
- 5. Pollution enters a river, and the otter population declines.
- 6. A girl snacks on an orange.
- 7. Temperatures drop, and squirrels go into hibernation.
- **8.** Ferns absorb nutrients from soil.
- 9. A lion preys upon an antelope.
- 10. An elm tree releases oxygen into the atmosphere.

**Directions:** Answer the question on the line provided.

11. Which sentences above show how abiotic and biotic factors affect each other in an ecosystem?

# Key Concept Builder 🐲



**LESSON 1** 

#### Use pages 706 **Abiotic Factors**

**Key Concept** What are the nonliving parts of an environment?

Directions: Explain the role of each abiotic factor in supporting life or determining which organisms inhabit an ecosystem.

- 1. sunlight \_\_\_\_\_
- 2. climate \_\_\_\_\_
- 3. soil \_\_
- 4. water \_\_\_\_\_
- 5. atmosphere \_\_

**Directions:** Answer each question on the lines provided.

- 6. What are the two main gases in the atmosphere?
- 7. Of those two gases, which one is the most abundant?

		· · · · · · · · · · · · · · · · · · ·	
Key	Concept	Builder	

LESSON 1

#### Abiotic Factors

**Key Concept** What are the nonliving parts of an environment?

Climate is a nonliving part of an environment. It is an important factor in determining which plants and animals live there. Climate is the type of weather an area receives, on average, over time.

**Directions:** On each line, write the term that correctly completes this sentence. 1. The three main weather conditions that make up climate are \_\_\_\_\_ \_\_\_\_\_, and \_\_\_\_\_. **Directions:** Below left is a list of some common ecosystems. On the line before each one, write the letter of the conditions given in the list on the right that would be found there. A. hot, dry B. mild, rainy \_\_\_ 3。North Pole C. hot, rainy \_\_\_\_\_ 4. Canadian forest D. cold, dry \_\_\_\_\_ 5. Pacific Northwest E. cold, snowy \_\_ 6. African desert Directions: Answer the question on the lines provided. 7. What is the climate like in your area? Describe it using complete sentences.

	Class LESSON  LESSON  ed. Use complete sentences.
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#### Enrichment

# Weather, Climate, and Ecosystems

Weather is the condition of the atmosphere at a particular place and time. It includes factors such as temperature, rainfall, and wind speed and direction. As you have learned, the term *climate* refers to the average weather in a region over a long period of time. When you describe a morning as cold, rainy, and windy, you're talking about the weather. When you say that your city typically has mild winters with little snow, you're talking about the climate.

#### The Sun's Influence on Climate

The Sun is the most important influence on climate. Because Earth is curved, different areas receive different amounts of solar energy. Sunlight strikes areas along the equator most directly, so the tropics receive more solar energy than areas farther north or south of the equator. Sunlight strikes the areas farther north and south of the equator at an angle, so those areas receive less solar energy. As a result, the tropics are warmer than the temperate regions. Thus, latitude—the distance north or south of the equator—largely determines the climate of most regions.

The intensity of solar energy at the equator also affects the pattern of rainfall on Earth. High temperatures near the equator cause water to evaporate from Earth's surface. The moist, warm air rises.

# **Applying Critical-Thinking Skills**

Directions: Respond to each statement.

As it rises, it cools. Cool air cannot hold as much water as warm air, so the water falls as rain. That's why the tropics are generally rainy.

# Climate's Influence on Ecosystems

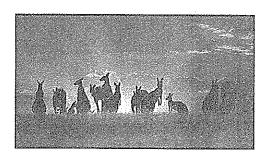
Just as the Sun has a major influence on climate, the climate influences which plants and animals live in a particular area. Abundant rainfall and warm temperatures produce the rain forests of the tropics. Dry air blowing from the equator descends at about 30 degrees north and south latitude. The dry air soaks up water, producing a zone of low rainfall. These latitudes contain the world's largest deserts, including the Sahara. Farther north and south are the temperate regions, where moderate temperatures and rainfall produce the temperate forests. Near the poles, cold temperatures produce the tundra and ice caps of the polar regions.

### Other Influences on Climate

As you probably know from experience, areas at the same latitude can have different climates. That's because factors other than sunlight, such as altitude and nearness to an ocean, also affect an area's climate. For example, mountains are colder than surrounding lowlands, and ocean winds affect the temperature of coastal areas.

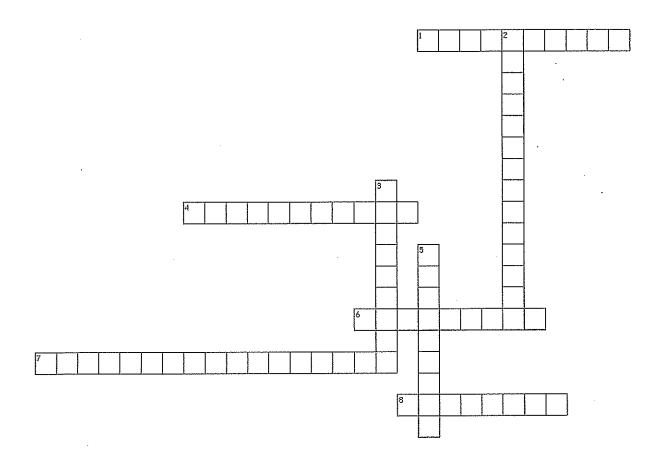
- 1. Apply the information above to explain how the amount of solar energy that your area receives affects its climate and ecosystem.
- 2. Compare the climate of your area with the climate of a city at the same latitude but with a different climate. Explain some of the factors that cause the difference.

# "POPULATIONS" Pages 740-745



- 1. What all is included in the earth's biosphere? (Page 741)
- 2. Analyze the map in figure 1 on page 741. Which continents have a lot of chlorophyll and which ones do not?
- 3. Name some of the plant and animals that are a part of the Kalahari Desert ecosystem. (Page 742)
- 4. When organisms are engaged in "competition" what are some of the resources they are competing for? (Page 743)
- 5. Name some limiting factors that might restrict the size of a population. (Page 743)
- 6. Why can an overpopulation of meerkats cause a decrease in some bird species populations? (page 745)

# Populations



#### Across

- 1. All organisms of the same species living together in the same ecosystem at the same time. (page 742)
- 4. What happens when food, shelter or other resources are in short supply. (page 743)
- 6. All of the places on the earth or surrounding the earth where organisms can be found. (page 741)
- 7. The size of a population compared to the size of the area it lives in. (page 744)
- 8. African mammals that live in tight family groups. (page 742)
- 2. Anything that restricts the size of a population. (page 743)
- 3. All of the populations living together in an ecosystem. (page 742)
- 5. The nonliving and living things coexisting in an area. (page 742)

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#### School to Home

**LESSON 1** 

# **Populations**

In this activity, you will model the capture-mark-and-release system, with packing peanuts representing an animal population. You will need markers, packing peanuts, a calculator, and a large paper bag.

	Marked Packing Peanuts Removed	Total Packing Peanuts Removed	Estimated Packing Peanuts Total
First Collection			
Second Collection	ų		

- 1. Place the packing peanuts in the paper bag without counting them. Remove a large number of the packing peanuts and mark each one with the marker. Record the number of marked packing peanuts and place them back in the bag.
- 2. Shake the bag. Pull out a few handfuls of packing peanuts. Count the number of marked packing peanuts and the total number of packing peanuts you pulled out of the bag. Record these numbers in the First Collection row.
- **3.** Use the formula below to estimate the total number of packing peanuts in the bag. Round your answer to the nearest whole number. Record this number in the table.

(number of animals originally tagged)  $\times$  (total animals in second collection) (number of tagged animals in second collection)

- **4.** Place the packing peanuts back in the bag. Repeat Steps 2 and 3. Record your data in the Second Collection row.
- **5.** How does this activity model a capture-mark-and-release program for estimating population?
- **6. Compare** your population estimates in the first and second collection.
- 7. Remove all the packing peanuts from the bag. Count them. What is the total?
- **8.** How do your estimates compare to the total? What does this tell you about determining population using the capture-mark-and-release tagging method?

# Key Concept Builder 🖘

LESSON 1

# Populations

Key Concept What defines a population?

Directions: Put a check mark in the space that correctly identifies each description.

Description	Population	Community	Ecosystem	Biosphere
The parts of Earth and Earth's atmosphere where there is life				
2. All the organisms of the same species that live in the same area at the same time				
3. All the organisms and the nonliving parts of the environment in an area				
4. All the different species that live in the same area at the same time				

**Directions:** Answer each question or respond to each statement on the lines provided.

	species is a group of organisms that have similar traits and are able to produce fertifications. What is meant by the term <i>fertile offspring?</i>
— Н	ow can two individuals in the same species not be in the same population?

# Key Concept Builder

LESSON 1

**Populations** 

Pages 748-755

**Key Concept** What defines a population?

**Directions:** Answer each question in the space provided.

Measuring Population Size and Density				
Question	Answer			
1. Why is it sometimes difficult to determine the size of a population?				
2. What is the capture-mark-and-release method?				
3. How can scientists use radio collars to estimate a population's size?				
<b>4.</b> What is another way radio collars are used?				
<b>5.</b> What is population density?				
<b>6.</b> What is one way of estimating population density?				
7. What is a population's biotic potential?				
8. What is the only limit to a population's size based on its biotic potential?				

			<del></del>
Key	Concept	Builder	

Lesson 1

# **Populations**

**Key Concept** What factors affect the size of a population?

Directions: Work with a partner. Answer each question or respond to each statement on the lines provided.

1. What is the struggle in a community for the same resources called?

- 2. Name three resources that animals in a community need.
- 3. Explaim what can happen to a population's size when plenty of food is available. Why doesn't this always happen?

- 4. Explain what happens to a population's size when the amount of available food decreases.
- 5. Are all resources also limiting factors? Explain your answer.
- 6. Are all limiting factors also resources? Explain your answer.

# **Content Practice A**

Pages 748 - 755

LESSON 1

# **Populations**

**Directions:** Write the missing letters in the spaces provided to find the terms that match the hints.

1. \_\_\_\_ SPHERE

Hint: the parts of Earth and the surrounding atmosphere where there is life

**2.** P \_\_\_ \_ \_ \_ TION

Hint: all the organisms of the same species that live in the same area at the same time

**3.** S \_\_\_\_ \_\_ S

Hint: a group of organisms that have similar traits and are able to produce fertile offspring

4. \_\_\_ \_ UNITY

Hint: all the populations of different species that live in the same area

**5.** CO \_\_\_\_\_ TION

Hint: the struggle in a community for the same resources

**6.** L \_\_\_ \_ \_ ING FACTOR

Hint: anything that restricts the size of a population

Hint: the size of a population compared to the amount of space available

8. B \_\_\_\_ IC \_\_\_ ENT \_\_ L

Hint: the potential growth of a population in perfect conditions with no limiting factors

9. CA \_\_\_\_ YING \_\_\_ \_ ACITY

Hint: the largest number of individuals of one species that an environment can support

**10.** \_\_\_ \_ POPULATION

Hint: what occurs when the size of a population becomes larger than the carrying capacity of its ecosystem

## Content Practice B

LESSON 1

# Populations

**Directions:** On each line, write the term that correctly completes each sentence.

- 1. Earth's \_\_\_\_\_\_ is the parts of Earth and Earth's atmosphere where there is life.
- 2. A(n) \_\_\_\_\_\_ is all the organisms of the same time.
- 3. Plains zebras are a(n) \_\_\_\_\_\_ because they have similar traits and are able to produce fertile offspring.
- 4. All the populations of different \_\_\_\_\_\_ that live in the same area at the same time form a(n) \_\_\_\_\_\_.
- 5. A(n) \_\_\_\_\_\_ is a group of organisms that live in one area at one time, as well as the nonliving parts of the environment.
- **6.** The struggle among organisms for resources in a community is called \_\_\_\_\_\_.
- 7. A(n) \_\_\_\_\_\_ is anything that restricts the size of a population.
- **8.** The \_\_\_\_\_\_ of meerkats is the size of the population relative to the amount of space available.
- 9. A population's \_\_\_\_\_\_ is the potential growth of a population if it could grow in perfect conditions with no \_\_\_\_\_\_ present.
- **10.** The largest number of individuals of one species that an environment can support is
- 11. When the size of a population becomes larger that the carrying capacity of its ecosystem, \_\_\_\_\_\_ occurs.

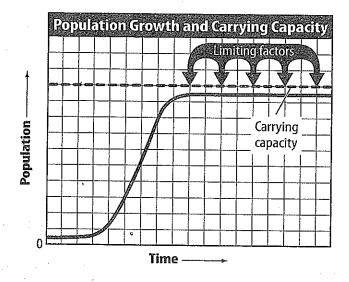
# Key Concept Builder



**LESSON 1** 

# **Populations**

**Key Concept** What factors affect the size of a population?



**Directions:** Use the graph to answer each question or respond to each statement.

- 1. What does the horizontal, dotted line represent? Explain what it is.
- 2. State the limiting factors that can determine carrying capacity.
- 3. Can carrying capacity change over time? Explain your answer.
- 4. What happened to the population's growth when it reached the carrying capacity?
- 5. Does this graph show overpopulation? Explain.

#### Enrichment

LESSON 1

# Competition in the Great Lakes

The first zebra mussels in North America were found in Lake Saint Clair in Ontario, Canada, in the 1980s. The small mollusks are not native to this continent. They spend their lives attached to underwater surfaces in the seas of northern and western Europe. Scientists theorize that the mussels made their way to Canada by way of ballast water, seawater stored aboard a ship and used to maintain its stability.

#### Population Explosion

The population of the zebra mussels grew rapidly. Within months, they had spread to the Great Lakes and nearby rivers. They have been found from New York to California.

The growing population of the zebra mussels is due in part to their lack of natural predators in North America. In addition, the species has a high biotic potential. A female zebra mussel releases an estimated 1 million eggs each year.

#### **Limited Resources**

Each day, an adult zebra mussel can consume all the plankton in 1 L of water. Native species that consume plankton are left with little or no food. The native species die out, leaving a shortage of food for organisms farther up the food chain.

Zebra mussels affect nonliving parts of the ecosystem, too. Because zebra mussels

#### **Applying Critical-Thinking Skills**

the zebra mussel population?

species into ecosystems?

Directions: Answer each question.

consume most of the plankton in a lake, the lake water becomes clearer. More light penetrates deeper into the lake. The populations of algae and other photosynthesizing organisms increase in size.

Zebra mussels attach to underwater surfaces, including the pipes and machinery of water-treatment plants along the shores of the Great Lakes. They block the pipes' openings and, in some cases, completely cut off the flow of water.

#### Remedies

1. Evaluate What problems might arise from using nonnative predators to help control

2. Suggest What steps could be taken to reduce or stop the introduction of nonnative

Scientists are exploring different methods of controlling zebra mussel numbers. The safest method involves removing the mussels by hand. This method, however, takes a great deal of time.

Many water-treatment plants use chlorine to kill the mussels. The treatment is effective, but too much chlorine can contaminate drinking water. Testing continues on alternative methods that use potassium, ozone, bromine, and ultraviolet light to destroy the mussels.

Some scientists propose introducing nonnative predators to help control zebra mussels. Another possibility is to regulate the spawning of zebra mussels. If the mussels could be made to spawn when plankton levels are low, the larvae would not survive.