

# Populations and Communities

## Changing Populations

### Key Concepts

- How do populations change?
- Why do human populations change?

### Study Coach

**Organize Information** Take notes as you read. Organize your notes into two columns. On the left, list a main idea about the material under each heading. On the right, list the details that support the main idea.

### SCIENCE USE V. COMMON USE

#### exponential

**Science Use** a mathematical expression that contains a constant raised to a power, such as  $2^3$  or  $x^2$

**Common Use** in great amounts

### ..... Before You Read .....

**What do you think?** Read the two statements below and decide whether you agree or disagree with them. Place an A in the Before column if you agree with the statement or a D if you disagree. After you've read this lesson, reread the statements to see if you have changed your mind.

Before	Statement	After
	3. Some populations decrease in numbers because of low birthrates.	
	4. An extinct species has only a few surviving individuals.	

### ..... Read to Learn .....

## How Populations Change

Spiders lay hundreds of eggs. When these eggs hatch, the spider population suddenly becomes larger. But it does not stay that way for long. Many spiders die or are eaten before they reproduce. The size of the spider population increases when the eggs hatch. The population decreases as the spiders die.

A population change can be measured by the population's birthrate and death rate. A population's **birthrate** is the number of offspring produced over a given time period. The **death rate** is the number of individuals that die over the same time period. If the birthrate is higher than the death rate, the population increases. If the death rate is higher than the birthrate, the population decreases.

## Exponential Growth

A population in ideal conditions with unlimited resources grows in a pattern called exponential growth. During exponential growth, the larger a population gets, the faster it grows. For example, it takes *E. coli*, a type of microscopic bacterial organism, only 10 hours to grow from one organism to more than 1 million organisms. Exponential growth cannot continue for long. Limiting factors stop the population growth.

## Population Size Decrease

Population size can increase, but it also can decrease. Several factors cause a population size to decrease.

- **Lack of resources** A mouse population might decrease in size during the winter because less food is available. Some mice will starve. More mice will die than will be born. When food is plentiful, the population usually increases.
- **Natural disasters** Floods, fires, hurricanes, and volcanic eruptions affect population size. They destroy habitats and food sources for organisms. The populations decrease.
- **Disease** The spread of disease causes populations to decrease. In the mid-1900s, a disease destroyed thousands of elm trees in the United States. The size of the population of elm trees decreased.
- **Predation** The hunting of animals for food is predation. Cats that live in barns feed on mice and reduce the mouse population. Predation reduces population size. ✓

**Extinction** Populations can decrease in numbers until they disappear. An **extinct species** is a species that has died out and no individuals are left. Extinctions can be caused by predation, natural disasters, or damage to the environment.

Scientists hypothesize that the extinction of the dinosaurs about 65 million years ago was caused by a meteorite crashing into Earth. The impact would have sent tons of dust into the atmosphere, blocking sunlight. Without sunlight, plants could not grow. Dinosaurs that ate plants probably starved.

Most extinctions involve fewer species. For example, about 700 years ago humans settled in New Zealand where a flightless bird called the giant moa lived. Humans hunted the moa for food. As the human population increased, the size of the moa population decreased. The species became extinct within 200 years.

**Endangered Species** Wild mountain gorillas are an endangered species. Just over 400 gorillas remain in the wild in Africa. An **endangered species** is a species whose population is at risk of extinction.

**Threatened Species** A **threatened species** is a species at risk, but not yet endangered. California sea otters are a threatened species. Worldwide, more than 4,000 species are classified as endangered or threatened. ✓

### ✓ Reading Check

**1. Summarize** What are four reasons that a population might decrease in size?

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### ✓ Reading Check

**2. Contrast** What is the difference between an endangered species and a threatened species?

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## Movement

Populations change when organisms move from place to place. When an animal population becomes overcrowded, some individuals might move to find food or living space.

Plant populations also move from place to place. Seeds might be carried by the wind. Animals also help spread seeds.



**Migration** Sometimes an entire population moves from one place to another. It later returns to its original location.

**Migration** is the instinctive seasonal movement of a population of organisms from one place to another. Ducks, geese, and monarch butterflies are examples of organisms that migrate annually. As shown by the arrows in the map, humpback whales mate and give birth in warm ocean waters near the

Bahamas during the winter. In the summer, they migrate north to find food.

### Visual Check

**3. Locate** Circle the northern area on the map where the whales migrate in summer.

### Key Concept Check

#### 4. Find the Main Idea

List three ways that populations change.

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### Reading Check

**5. Determine Cause and Effect** Explain how human population growth affects other species.

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## Human Population Changes

Birthrates, death rates, and movement also affect human population size. But unlike other species, humans have developed ways to increase the carrying capacity of their environment. Improved crop yields, domesticated farm animals, and timely methods of transporting foods and other resources enable people to survive in all types of environments.

The human population is growing quickly. Scientists estimate that there were about 300 million humans on Earth a thousand years ago. Today there are more than 6 billion humans on Earth. By 2050, there could be more than 9 billion. No one knows when the human population will reach Earth's carrying capacity. Some scientists estimate that Earth's carrying capacity is about 11 billion.

As the human population grows, people need more houses and roads. They clear more land for crops. This means less living space, food, and other resources are available for other species. Also, people use more energy to heat and cool homes; to fuel cars, airplanes, and other forms of transportation; and to produce electricity. This energy use adds pollution that affects other populations.

## Population Size Increase

People are living longer today than people in past generations. More children reach adulthood. Recall that when the birthrate is higher than the death rate, the population grows. Several factors keep the human birthrate higher than the death rate.

**Food** For some people, finding food is easy. They simply go to the grocery store. Improved farming methods have helped farmers produce food for billions of people.

**Resources** Planes, trains, trucks, or boats transport fossil fuels, cloth, materials, food, and many other resources around the world. Today, people can get more resources because of better transportation methods.

**Sanitation** Only 100 years ago, diseases that spread through unclean water supplies and untreated waste caused many deaths. Better water treatment has reduced the spread of disease. Less-expensive and more-effective cleaning products are now available to help prevent the spread of organisms that cause disease.


**Medical Care** Modern medical care is keeping people alive and healthy longer than ever before. Scientists have developed vaccines, antibiotics, and other medicines to prevent and treat disease. As a result, human death rates have decreased.

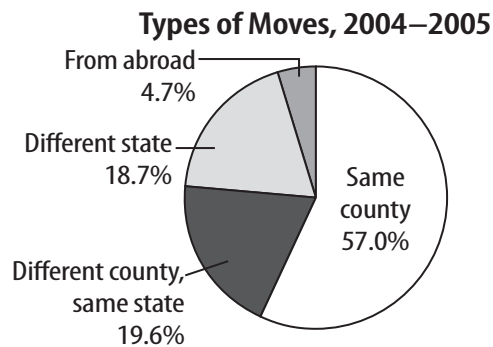
## Decreases in Human Population Size

Human populations in some parts of the world are decreasing in size. Diseases such as AIDS and malaria cause high death rates in some countries. Severe drought has caused crop failures and a lack of food. Floods, earthquakes, and other natural disasters can cause the deaths of thousands of people.

## Population Movement

The size of a human population changes as people move from place to place. Humans might move when more resources are available in a different place.

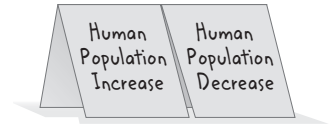
Immigration takes place when organisms move into an area. Typical population movements in the U.S. are shown in the graph. 



**Source:** U.S. Census Bureau, Current Population Survey, 2005 Annual Social and Economic Supplement.

## FOLDABLES®

Make a two-tab book to summarize why human populations change in size.



## Math Skills

Graphs are used to make large amounts of information easy to interpret. The circle graph below represents 100 percent, and each segment represents one part making up the whole. The graph shows all the moves made by people in the United States during 2004–2005. The percentage of moves within the same county was 57 percent.

### 6. Interpreting a Graph

- What percentage of the moves were from one state to another?
- What percentage of the moves were within the same state?

## Key Concept Check

**7. Explain** What makes human populations increase or decrease?

## ..... After You Read .....

### Mini Glossary

**birthrate:** the number of offspring produced by a population over a given time period

**death rate:** the number of individuals that die over the same time period

**endangered species:** a species whose population is at risk of extinction

**extinct species:** a species that has died out and no individuals are left

**migration:** the instinctive seasonal movement of a population of organisms from one place to another

**threatened species:** a species at risk, but not yet endangered

- Review the terms and their definitions in the Mini Glossary. Write a sentence that compares threatened species, endangered species, and extinct species.

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- Decide how each example would affect the human population size. Put a check mark in the correct box.

Example	The human population size would . . .		
	increase	decrease	stay the same
a. A hurricane kills thousands of people in Thailand.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Scientists discover a cure for cancer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. The birthrate and death rate are equal in Germany this year.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Many people flee their homeland to escape war.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Explain how the relationship between birthrate and death rate affects population size.

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### What do you think **NOW?**

Reread the statements at the beginning of the lesson. Fill in the After column with an A if you agree with the statement or a D if you disagree. Did you change your mind?



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