

SECTION 1 **Populations**

KEY IDEAS

As you read this section, keep these questions in mind:

- Why is it important to study populations?
- What is the difference between exponential growth and logistic growth?
- What factors affect population size?
- How have science and technology affected human population growth?

READING TOOLBOX

Summarize As you read, underline the main ideas. When you finish reading, make an outline of this section using the underlined ideas.

Why Do We Study Populations?

Some biologists study groups of organisms and how the groups change over time. A group of organisms of the same species that live in the same place at the same time is called a **population**.



These zebras are part of a population that lives in Kenya, Africa.

LOOKING CLOSER

1. **Define** What is a population?

Background

Recall that an *ecosystem* is made up of many groups of organisms, together with their environment.

Talk About It

Discuss In a small group, talk about different ways that populations can interact with one another and with ecosystems. Try to come up with ten examples of different interactions.

In an ecosystem, populations of different species, including humans, interact. These interactions can have many effects. Therefore, biologists study populations to learn how they interact and the effects of the interactions. This can help them better understand how changes in one population may affect the whole ecosystem.

The size of a population can change over time. If a population increases too quickly, it may use up all the resources in an area. This can harm the population, as well as populations of other species.

For example, in the 1850s, people brought about 24 rabbits from Europe to Australia. In Australia, the rabbits had plenty of food, but there were few predators. As a result, the rabbit population increased to about 600 million by the 1950s. These rabbits ate so much vegetation that populations of native organisms began to decrease.

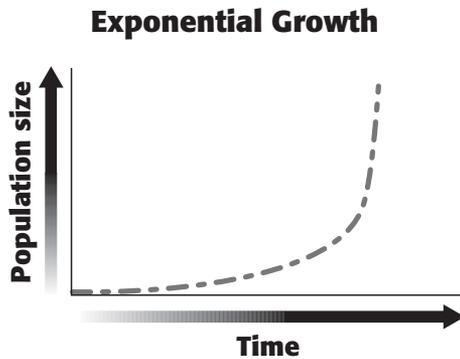
SECTION 1 Populations *continued*

How Do Populations Grow?

Biologists may use graphs of population size versus time to show how populations grow. Populations can grow exponentially or logistically.

EXPONENTIAL GROWTH

Exponential growth occurs when a population increases by a certain factor in a given time period. For example, a population that doubles in size every year is growing exponentially.



On a graph of population size versus time, a J-shaped curve represents a population that is growing exponentially.

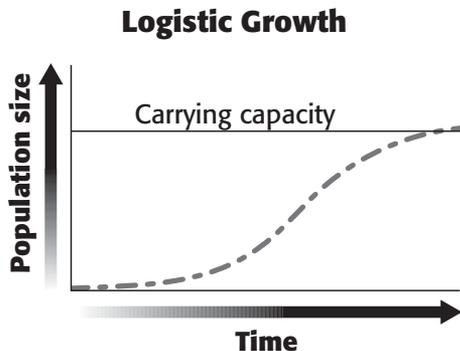
Math Skills

2. Calculate A population of bacteria is growing exponentially. It doubles in size every 3 hours. If the population starts out with 10 bacteria, how many bacteria will there be after 12 hours?

LOGISTIC GROWTH

No population can grow forever. When a population reaches a certain size, its environment can no longer support it. The largest population that an environment can support at a given time is its **carrying capacity**. The carrying capacity of a particular environment can vary over time. ✓

Logistic growth occurs when a population increases until it reaches the carrying capacity. Then, it stops growing. Most populations grow logistically.



On a graph of population size versus time, an S-shaped curve represents a population that is growing logistically. The population grows until it reaches the carrying capacity.

READING CHECK

3. Explain Why can't a population grow forever?

SECTION 1 Populations *continued*

What Factors Affect Population Growth?

There are two main factors that affect population growth: abiotic factors and biotic factors.

ABIOTIC FACTORS

Abiotic factors are nonliving factors that affect population size. Weather and climate are two of the most important abiotic factors. For example, if the summer in an area is hotter and drier than usual, populations in the area may shrink.

BIOTIC FACTORS

Biotic factors are living factors that affect population size. All living organisms, such as plants and animals, are biotic factors. Diseases, predators, and parasites are biotic factors that can cause populations to decrease in size.

Critical Thinking

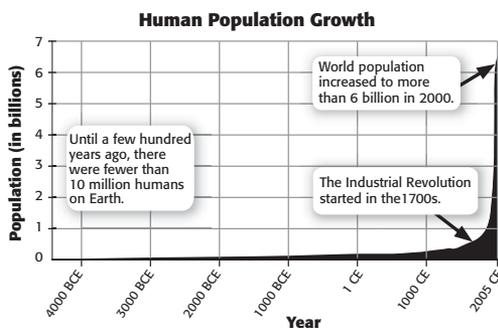
4. Infer How could biotic factors cause a population to increase? Give one example.

How Do Human Populations Grow?

There are over 6 billion people in the world, and many more are born than die every day. Right now, the human population is growing exponentially. If the human population continues to grow exponentially, there may be more than 9 billion people on Earth by the year 2050.

LOOKING CLOSER

5. Explain How does the shape of this curve show that the human population is growing exponentially?



Science and technology are the main reasons that the human population is growing so rapidly. For example, scientists have learned a great deal about treating diseases in the last few hundred years. This has allowed more people to live longer and reproduce.

Biotechnology has allowed people to grow more food today than in the past. More food can support more people. This is one example of how advances in biotechnology have allowed the human population to grow rapidly.

Talk About It

Identify With a partner, try to think of four other ways that advances in science and technology have allowed the human population to grow exponentially.

Section 1 Review

SECTION VOCABULARY

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

population a group of organisms of the same species that live in a specific geographical area

1. Explain Why do biologists study populations?

2. Apply Concepts One group of rabbits lives in a forest in New York. Another group of rabbits of the same species lives in a forest in Connecticut. Are these two groups of rabbits part of the same population? Explain your answer

3. Compare Describe how a graph showing exponential growth is different from a graph showing logistic growth.

4. Identify Give two examples of abiotic factors that can affect population size.

5. Describe Give an example of how a biotic factor can affect a population.

6. Explain Give one example of how advances in science and technology have allowed the human population to increase rapidly.

7. Infer Give one example of a biotic factor that could affect the size of the human population. Describe how a change in this biotic factor could affect the human population.
