

# Chapter 21 Populations and Ecosystems

## Learning Targets

For each of the following targets, please circle your current skill level, and draw an arrow pointing to your goal.

### Vocabulary

Advanced	Proficient	Developing	Beginning
I can define and use all unit vocabulary to discuss the key concepts of the unit.	I can define and use 80% of the unit vocabulary to discuss the key concepts of the unit.	I recognize the unit vocabulary words, but I can not define them.	I don't know most of the vocabulary words.

### Limiting Factors

Advanced	Proficient	Developing	Beginning
I can describe specific ways in which limiting factors affect the number of individuals within a population	I can identify some limiting factors and use them to predict population changes	I can define limiting factors, but I can't use them to make predictions.	I don't know what limiting factors are or how they affect populations.

### Population Size

Advanced	Proficient	Developing	Beginning
I can identify the 3 main factors affecting population size and use data to predict change over time.	I can identify the 3 main factors that affect population size.	I know some of the factors that affect population size.	I don't know what factors affect population size.

### Community Interaction

Advanced	Proficient	Developing	Beginning
I can compare and contrast predator-prey relationships and cooperative relationships within a community.	I can identify predator-prey relationships and cooperative relationships within a community.	I can identify some of the relationships within a community but I can't always correctly label them.	I don't know how organisms relate within a community.

Interdependence

<b>Advanced</b>	<b>Proficient</b>	<b>Developing</b>	<b>Beginning</b>
I can analyze symbiotic relationships within a community to determine which are parasitic, mutualistic, or commensalistic.	I can identify symbiotic relationships within a community and determine whether they are harmful or beneficial.	I know that some organisms interact in ways that are helpful or harmful, but I can't identify specific examples.	I don't know how organisms relate within a community.

Population Change

<b>Advanced</b>	<b>Proficient</b>	<b>Developing</b>	<b>Beginning</b>
I can accurately predict at least 4 changes to a community caused by removing a population from the community.	I can predict how removing a population from a community might affect another part of the community.	I know that removing a population from a community will cause changes, but I can't give specific examples.	I don't know why population size changes.

Some steps I will follow to reach my goals:

1

---

---

2

---

---

3

---

---

---

---

---

---

---

---

---

---

**Lesson Outline****LESSON 1****Populations****A. The Biosphere and Ecological Systems**

1. The \_\_\_\_\_ is the parts of Earth and the surrounding atmosphere where there is life.
2. The biosphere includes all the \_\_\_\_\_, water, and ice on Earth.

**B. What is a population?**

1. A(n) \_\_\_\_\_ is a group of organisms that have similar traits and are able to produce fertile offspring.
2. A(n) \_\_\_\_\_ is all the organisms of the same species that live in the same area at the same time.
3. A(n) \_\_\_\_\_ is all the populations of different species that live in the same area at the same time.
4. A(n) \_\_\_\_\_ is a group of organisms that live in an area at one time, as well as the climate, soil, water, and other nonliving parts of the environment.
5. The study of all ecosystems on Earth is called \_\_\_\_\_.

**C. Competition**

1. \_\_\_\_\_ is the struggle in a community for the same resources, such as food, water, and shelter.
2. When few \_\_\_\_\_ are available, there is more competition to survive in a community.

**D. Population Sizes**

1. Changes in \_\_\_\_\_ factors, such as temperature, food availability, water, and shelter, can change the size of a population.
2. A(n) \_\_\_\_\_ is anything that restricts the size of a population.
3. Limiting factors can include water, food, shelter, sunlight, temperature, disease, predators, and \_\_\_\_\_ disasters.
4. One method that is used to count and monitor animal populations is the \_\_\_\_\_ method.
5. \_\_\_\_\_ is the size of a population compared to the amount of space available.
6. A population's \_\_\_\_\_ is the potential growth of a population if it could grow in perfect conditions with no limiting factors.

## Lesson Outline continued

7. No populations on Earth ever reach their biotic potential because no ecosystems have a(n) \_\_\_\_\_ supply of natural resources.
8. The largest number of individuals of one species that an environment can support is the \_\_\_\_\_.
  - a. The carrying capacity of an ecosystem increases and decreases as the amount of available \_\_\_\_\_ increases and decreases.
  - b. \_\_\_\_\_ occurs when the size of a population becomes larger than the carrying capacity of its ecosystem.
  - c. Overpopulation of one species can cause problems for other organisms in the \_\_\_\_\_.

### Lesson 1 Vocabulary

biosphere- parts of Earth and the atmosphere where there is life

biotic potential- potential growth of a population in perfect conditions with no limiting factors

carrying capacity- largest number of individuals of one species that an environment can support

community- all the populations of different species living in the same area at the same time

competition- struggle in a community for the same resources

limiting factor- anything that restricts the size of a population

population- all the organisms of the same species that live in the same area at the same time

population density- size of a population compared to the amount of space available

**Content Vocabulary****LESSON 1****Populations**

**Directions:** Replace the underlined words with the correct term from the word bank below. NOTE: You may need to change a term to its plural form.

**biosphere****biotic potential****carrying capacity****community****competition****limiting factor****population****population density**

- \_\_\_\_\_ 1. You and all other living things inhabit the parts of Earth and the surrounding atmosphere where there is life.
- \_\_\_\_\_ 2. Mammals, insects, birds, grasses, trees, shrubs, and other organisms can be part of the same group of different species that live in the same area at the same time.
- \_\_\_\_\_ 3. The fewer the available resources are, the greater the struggle for the same resources is within a community.
- \_\_\_\_\_ 4. Because their predators are no longer abundant, there are large groups of the same species of deer in many regions of North America.
- \_\_\_\_\_ 5. Because resources are always limited, no population will ever reach its maximum production of offspring with no limiting factors.
- \_\_\_\_\_ 6. Temperature and availability of water, food, shelter, and sunlight are things that can restrict the size of a population.
- \_\_\_\_\_ 7. The size of a population compared to the amount of space available can be estimated with a sample count.
- \_\_\_\_\_ 8. A population typically stops growing when it is at the size of the largest number of individuals that an environment can support.

**Content Practice B****LESSON 1****Populations**

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

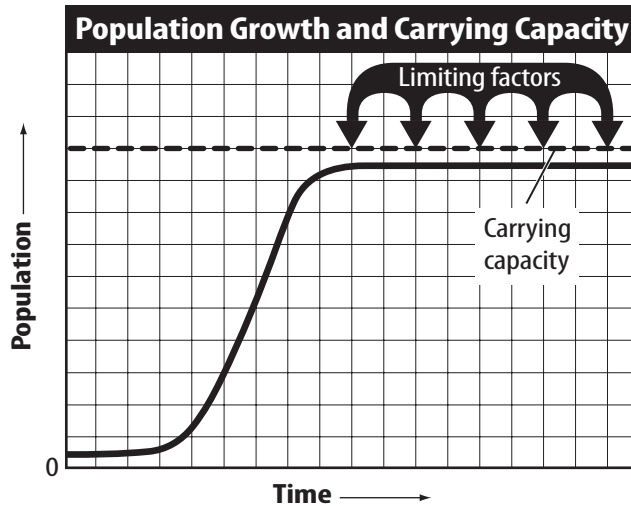
1. Earth's \_\_\_\_\_ is the parts of Earth and Earth's atmosphere where there is life.
2. A(n) \_\_\_\_\_ is all the organisms of the same \_\_\_\_\_ that live in the same area at the same time.
3. Plains zebras are a(n) \_\_\_\_\_ because they have similar traits and are able to produce fertile offspring.
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 the \_\_\_\_\_.
11. When the size of a population becomes larger than 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.

---



---

**Lesson Outline****LESSON 2****Changing Populations****A. How Populations Change**

1. A population's \_\_\_\_\_ is the number of offspring produced over a given time period. The \_\_\_\_\_ is the number of individuals that die over the same time period.
2. When a population is in ideal conditions with unlimited resources, it grows in a pattern called \_\_\_\_\_.
3. During exponential growth, as a population gets larger, it grows at a(n) \_\_\_\_\_ rate.
4. Food shortages, natural disasters, disease, and \_\_\_\_\_ can reduce population size.
5. A(n) \_\_\_\_\_ is a species that has died out and has no living individuals.
6. Extinctions can be caused by predation, natural disasters, or damage to the \_\_\_\_\_.
7. A(n) \_\_\_\_\_ is a species whose population is at risk of extinction.
8. A(n) \_\_\_\_\_ is a species that is at risk but is not yet endangered.
9. Populations change when organisms \_\_\_\_\_ from place to place.
  - a. Animals move to less \_\_\_\_\_ places.
  - b. Wind and \_\_\_\_\_ can spread plant seeds far from their parent plants.
10. \_\_\_\_\_ is the instinctive seasonal movement of a population of organisms from one place to another. Many animals migrate to where \_\_\_\_\_ is more available.

**B. Human Population Changes**

1. Human population size is affected by the same three factors that determine the sizes of all populations—birthrate, death rate, and \_\_\_\_\_.
2. Unlike other species, humans have developed ways to increase the \_\_\_\_\_ of their environment.



## Lesson Outline continued

3. Human population growth can have negative effects on other \_\_\_\_\_.
4. Better access to food and other \_\_\_\_\_, such as fossil fuels, cloth, and metals, has led to human birthrates being higher than death rates.
5. Improvements in water treatment and medical care have helped reduce human \_\_\_\_\_.
6. Human populations in some parts of the world are decreasing due to \_\_\_\_\_, drought, and natural disasters.
7. Humans commonly move from place to place, affecting the local \_\_\_\_\_ size.

### Lesson 2 Vocabulary

birthrate- number of offspring produced over a given time period

death rate- number of individuals that die over a given time period

endangered species- population that is at risk of extinction

estimate- to determine roughly the size, nature, or extent of something

exponential- mathematical expression that contains a constant raised to a power

extinct species- population that has died out

migration- instinctive seasonal movement of a population

threatened species- population at risk but is not yet endangered

**Content Vocabulary**

**LESSON 2**

### Changing Populations

**Directions:** Answer each question or respond to each statement on the lines provided. You must include at least one of the terms below in each answer.

- birthrate                      death rate                      endangered species                      estimate
- exponential                      extinct species                      migration                      threatened species

1. What are the differences among threatened, endangered, and extinct species?

---

---

---

---

2. How do the birthrate and death rate of a population relate to population growth?

---

---

3. What is an estimate?

---

---

4. **Define** migration. What is one example of organisms that participate in migration?

---

---

---

5. What is the relationship of limiting factors to exponential population growth?

---

---

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

**Content Practice A**

**LESSON 2**

**Changing Populations**

**Directions:** On each line, write the term from the word bank that correctly completes each sentence. Each term is used only once.

- |                           |                           |                           |                  |
|---------------------------|---------------------------|---------------------------|------------------|
| <b>birthrate</b>          | <b>carrying capacity</b>  | <b>death rate</b>         | <b>decrease</b>  |
| <b>endangered species</b> | <b>exponential growth</b> | <b>extinct species</b>    | <b>increases</b> |
| <b>migration</b>          | <b>movement</b>           | <b>threatened species</b> |                  |

1. The number of offspring produced over a given time period is a population's \_\_\_\_\_; the number of individuals that die over that time is its \_\_\_\_\_.
2. If the birthrate is higher than the death rate, the population \_\_\_\_\_ in size.
3. A population grows in a pattern called \_\_\_\_\_ when it is in ideal conditions with abundant resources.
4. Lack of food, natural disasters, disease, and predation are reasons why a population might \_\_\_\_\_ in size.
5. When no individuals are left of a species, it is called a(n) \_\_\_\_\_.
6. A(n) \_\_\_\_\_ is a species whose population is at risk of extinction.
7. A(n) \_\_\_\_\_ is a species that is at risk but is not yet endangered.
8. The instinctive seasonal movement of a population of organisms from one place to another is called \_\_\_\_\_.
9. Changes in the human population size are caused by birthrate, death rate, and \_\_\_\_\_.
10. Humans have developed ways to increase the \_\_\_\_\_ of their environment.

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

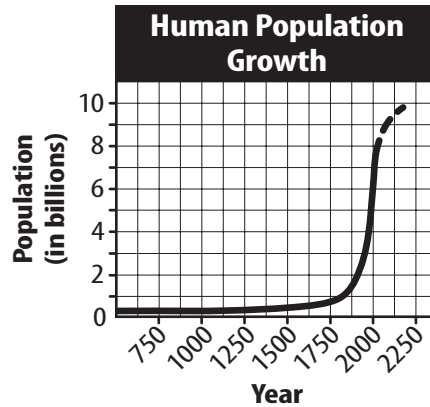
**Key Concept Builder** 

**LESSON 2**

# Changing Populations

**Key Concept** Why do human populations change?

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



1. How has the human population changed in the past 150 years?

---



---

2. **Compare** the birthrate and death rate in the year 1000.

---

3. **Compare** the birthrate and death rate in the year 2000.

---

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

4. How has carrying capacity affected the human population in the past? How might it affect it in the future?

---



---



---



---



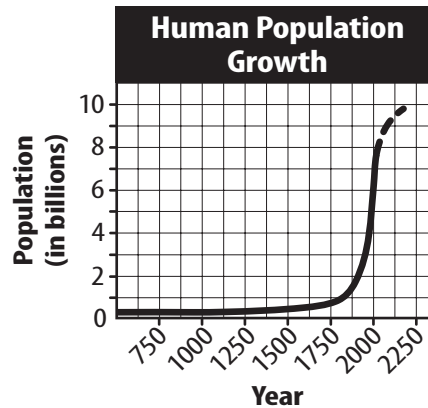
---



---

**Math Skills** **LESSON 2****Use Graphs**

Graphs can show trends in data. For example, a line graph is often used to show how one variable changes over a period of time. The line graph below shows human population growth over the last 2,000 years. The dashed line represents a prediction for population growth after the year 2000.



Estimate the size of the human population in the year **1250**.

Step 1 Find the year along the bottom, horizontal axis.

Step 2 Find the corresponding value on the left, vertical axis.

Step 3 Estimate to answer the question. The population is around  $\frac{1}{3}$  of **1** billion, which is about **333,000,000**.

**Practice**

- Estimate the population in 1500.
- Estimate the population in 1750.
- About when did the population reach 1.5 billion?
- About when did the population reach 3 billion?
- By approximately how much did the population increase from 1750 to 1875?

**Lesson Outline****LESSON 3****Communities****A. Communities, Habitats, and Niches**

1. A(n) \_\_\_\_\_ is made up of all the species that live in the same ecosystem at the same time.
2. The place within an ecosystem where an organism lives is its \_\_\_\_\_. It has to provide all the \_\_\_\_\_ an organism needs.
3. A(n) \_\_\_\_\_ is what a species does in its habitat to survive.
4. All living things use \_\_\_\_\_ to carry out life processes such as growth and reproduction.
  - a. \_\_\_\_\_ are organisms that get energy such as sunlight from the environment and make their own food.
  - b. \_\_\_\_\_ are organisms that get energy by eating other organisms.
  - c. Consumers are classified by the types of organisms they \_\_\_\_\_. Types of consumers include herbivores, carnivores, omnivores, and \_\_\_\_\_.

**B. Energy Flow**

1. A food chain is a way of showing how \_\_\_\_\_ moves through a community.
2. Energy flows from the Sun to producers to consumers and eventually to \_\_\_\_\_.
3. A food \_\_\_\_\_ shows many food chains within a community and how they overlap.

**C. Relationships in Communities**

1. All populations in a community \_\_\_\_\_ with each other.
2. A(n) \_\_\_\_\_ is an animal that hunts other animals for food.
  - a. Animals that are hunted for food are called \_\_\_\_\_.
  - b. Predators help prevent prey populations from growing too \_\_\_\_\_ for the carrying capacity of the ecosystem.

## Lesson Outline continued

3. The members of some populations work together for their survival in \_\_\_\_\_ relationships.
4. A close relationship between two species that involves an exchange of food or energy is \_\_\_\_\_.
  - a. A symbiotic relationship in which both partners benefit is called \_\_\_\_\_.
  - b. A symbiotic relationship that benefits one species but does not harm or benefit the other is called \_\_\_\_\_.
  - c. A symbiotic relationship that benefits one species and harms the other is called \_\_\_\_\_.
  - d. Fleas and lice are parasites that feed on blood from a(n) \_\_\_\_\_ organism, such as a human.

### Lesson 3 Vocabulary

commensalism- symbiotic relationship that benefits one species but does not harm or benefit the other

consumer- organism that gets energy by eating other organisms

habitat- place within an ecosystem where an organism lives

mutualism- symbiotic relationship in which both partners benefit

niche- what a species does in its habitat to survive

parasitism- symbiotic relationship that benefits one species and harms the other

predator- organism that survives by hunting

producer- organism that gets energy from making its own food

symbiosis- close, long-term relationship between two species that usually involves exchange of food and energy

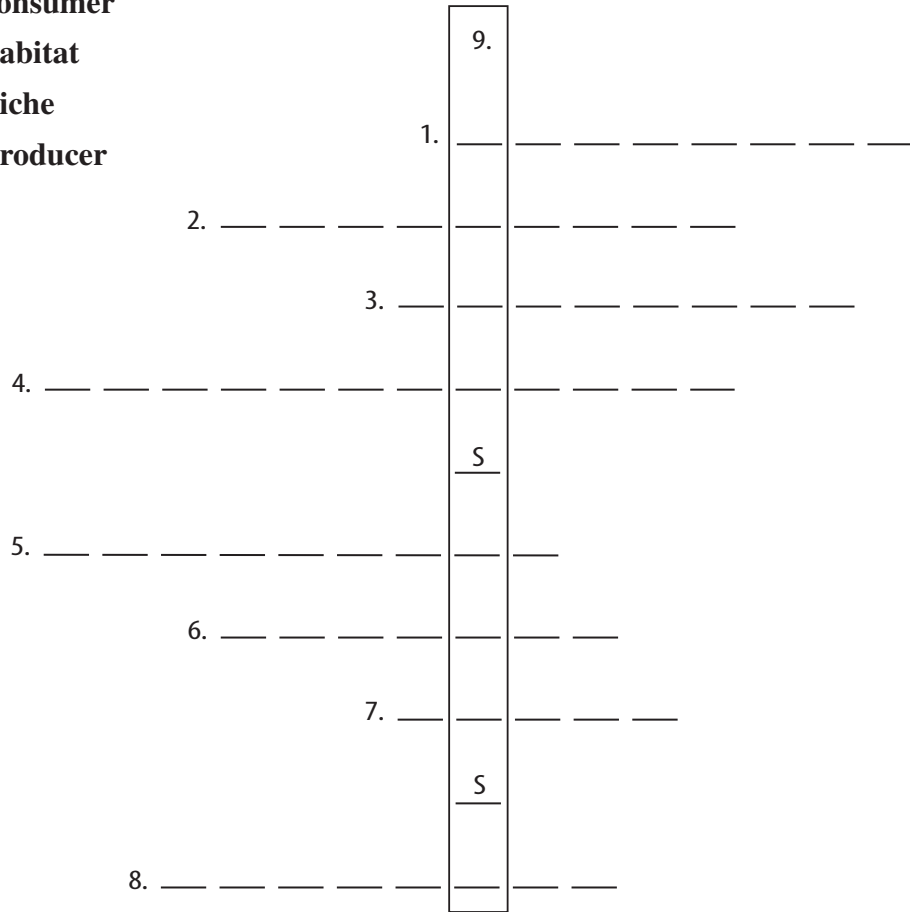
**Content Vocabulary**

**LESSON 3**

**Communities**

**Directions:** Use the clues and the terms listed below to complete the puzzle. Unscramble the letters in the vertical box to spell a ninth term.

- |                     |                 |
|---------------------|-----------------|
| <b>commensalism</b> | <b>consumer</b> |
| <b>cooperative</b>  | <b>habitat</b>  |
| <b>mutualism</b>    | <b>niche</b>    |
| <b>parasitism</b>   | <b>producer</b> |
| <b>symbiosis</b>    |                 |



1. an organism that survives by hunting
2. a relationship that benefits both species involved
3. an organism that makes its own food, using energy from the environment
4. a relationship that benefits one species but does not harm or benefit the other
5. a close relationship between two species that involves an exchange of energy
6. the place where an organism lives
7. what a species does in its habitat to survive
8. an organism that eats other organisms
9. The letters in the vertical box spell \_\_\_\_\_, which is a relationship that benefits one species and harms the other.



**Content Practice B****LESSON 3****Communities**

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

1. All the populations that live in the same ecosystem at the same time are a(n) \_\_\_\_\_.
2. The place within an ecosystem where an organism lives is its \_\_\_\_\_.
3. A(n) \_\_\_\_\_ is what a species does in its habitat to survive.
4. A plant is a(n) \_\_\_\_\_ because it gets energy from sunlight and makes its own food.
5. All animals are \_\_\_\_\_ because they get energy by eating other organisms.
6. A food chain is a way of showing how \_\_\_\_\_ moves through a community.
7. A(n) \_\_\_\_\_ is an animal that hunts other animals that are referred to as \_\_\_\_\_.
8. A(n) \_\_\_\_\_ relationship is a close relationship between two species that involves an exchange of food or energy.
9. A symbiotic relationship that benefits one species and harms the other is called \_\_\_\_\_.
10. In a symbiotic relationship called \_\_\_\_\_, both partners benefit.
11. In a symbiotic relationship called \_\_\_\_\_, one species benefits but does not harm or help the other.

**Language Arts Support**

**LESSON 3**

**Reading-Comprehension Activity: True-False**

**Directions:** *On the line before each statement, write T if the statement is true or F if the statement is false.*

- \_\_\_\_\_ 1. The biosphere does not include frozen areas of Earth, such as the North and South Poles.
  
- \_\_\_\_\_ 2. A community includes many different populations.
  
- \_\_\_\_\_ 3. Water and sunlight are examples of limiting factors.
  
- \_\_\_\_\_ 4. A population includes many different species.
  
- \_\_\_\_\_ 5. Competition increases when resources are limited.
  
- \_\_\_\_\_ 6. The population density of humans is lowest in cities.
  
- \_\_\_\_\_ 7. Overpopulation occurs when too many different species live in the same community.
  
- \_\_\_\_\_ 8. Because limiting factors are always present, no population on Earth could ever reach its biotic potential.
  
- \_\_\_\_\_ 9. A population stops growing when it reaches its carrying capacity.
  
- \_\_\_\_\_ 10. A species is a group of organisms that has similar traits and can produce fertile offspring.

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

**Language Arts Support****LESSON 3*****Language-Usage Activity: Using Plural Endings***

Most nouns in the English language are count nouns. That means they refer to things that can be counted. Count nouns have an –s ending when they refer to more than one person, place, thing, or idea. *Tree, bird, and turtle* are count nouns. Their plural forms are *trees, birds, and turtles*.

Noncount nouns refer to things that cannot be counted. *Water, air, and rice* are noncount nouns. The plural form of a noncount noun is the same as the singular form, even when it is used to refer to more than one person, place, thing, or idea. Attention must be paid to the verb and to sentence context to determine the noun's number.

Count noun: a noun that can be preceded by a number indicating how many.

The three **aquariums** contain salt water.

Noncount noun: a noun that cannot be counted (also called uncountable).

The three aquariums contain **salt water**.

**Directions:** *Circle the correct forms of the nouns in the sentences below.*

Many different (species/specieses) can live in the same habitat. In general, a habitat provides the (resource/resources) for the organisms that live there. Different habitats are characterized by specific (condition/conditions) that provide for the organisms that live there, including temperature, amount of (food/foods) available, and amount of (moisture/moistures) present. A niche is what a species does in its habitat to survive. The way an organism obtains (energy/energies) is an important part of its niche. (Producer/Producers) get energy from the environment and make their own (food/foods), and consumers get energy by eating other (organism/organisms). The path of (energy/energies) through a community can be represented in a food chain. Many (food chain/food chains) can be shown together in a food web.