

# Ecology

## Standard

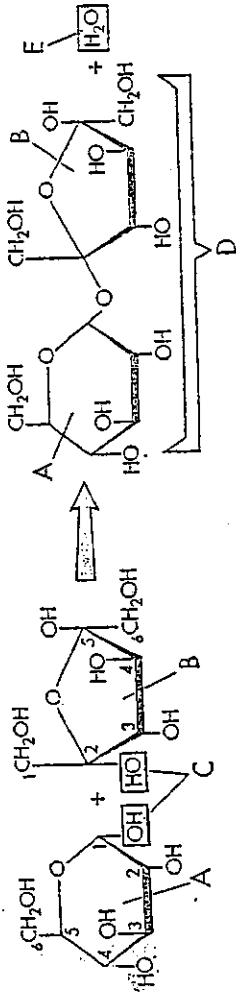
6. Stability in an ecosystem is a balance between competing effects. As a basis for understanding this concept, students will know:

## Concepts

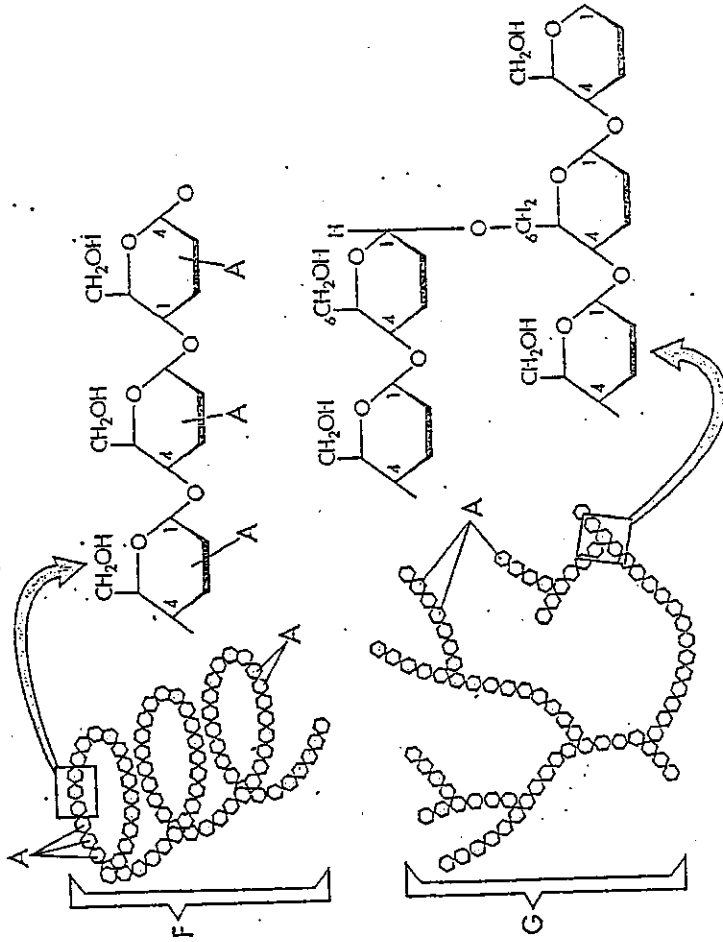
- a. bio-diversity is the sum total of different kinds of organisms and is affected by alteration of habitats
- b. how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of non-native species, or changes in population size.
- c. how fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration, and death.
- d. how water, carbon. And nitrogen cycle between abiotic resources and organic matter in the ecosystem and how oxygen cycles through photosynthesis and respiration.
- e. a vital part of an ecosystem is the stability of its producers and decomposers.
- f. at each link in the food web some energy is stored in newly made structures but much energy is dissipated into the environment as heat. This dissipation may be represented in the an energy pyramid.
- g. \* how to distinguish between the accommodation of an individual organism to its environment and the gradual adaptation of a lineage of organisms through genetic change

# Carbohydrates

Simple Sugars



Polysaccharides



Carbohydrates

- Glucose Molecule .....A
- Fructose Molecule .....B
- Hydroxyl Group .....C
- Sucrose Molecule .....D
- Water Molecule .....E
- Starch Molecule .....F
- Glycogen Molecule .....G

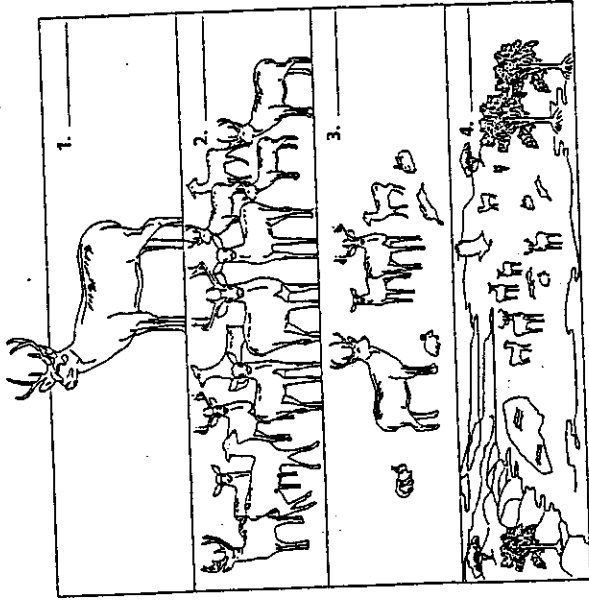




Chapter 2 Principles of Ecology, continued

Study the Pictures

Label each drawing with one of these words: community, ecosystem, organism, population.

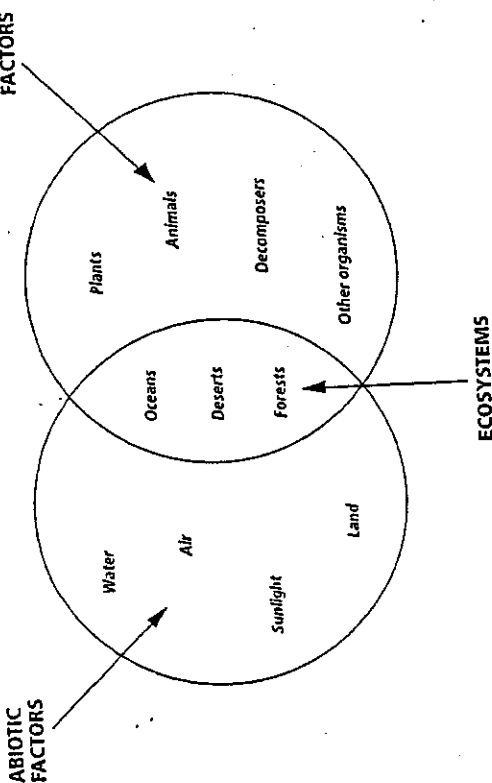


1. Define a population. Give an example of a population of animals from the drawings above.
2. Define a community. Give an example of a community from the drawings above.
3. Define an ecosystem. Give an example of an ecosystem from the drawings above.



Chapter 2 Principles of Ecology

Get the Big Picture



Ecology is the study of interactions between the biotic factors and abiotic factors on Earth. Biotic factors are all living things. Abiotic factors are all nonliving things. An ecosystem is all the interactions between the biotic factors and abiotic factors in a certain place.

- Use the diagram to answer the following questions.
1. What things make up the biotic factors on Earth? Give examples.
  2. What things make up the abiotic factors on Earth? Give examples.
  3. What is an ecosystem? Give examples.
  4. During the carbon cycle, plants take in carbon dioxide gas from the air and use it to make food. So the carbon cycle involves the air and plants. Where on the diagram does the carbon cycle belong?

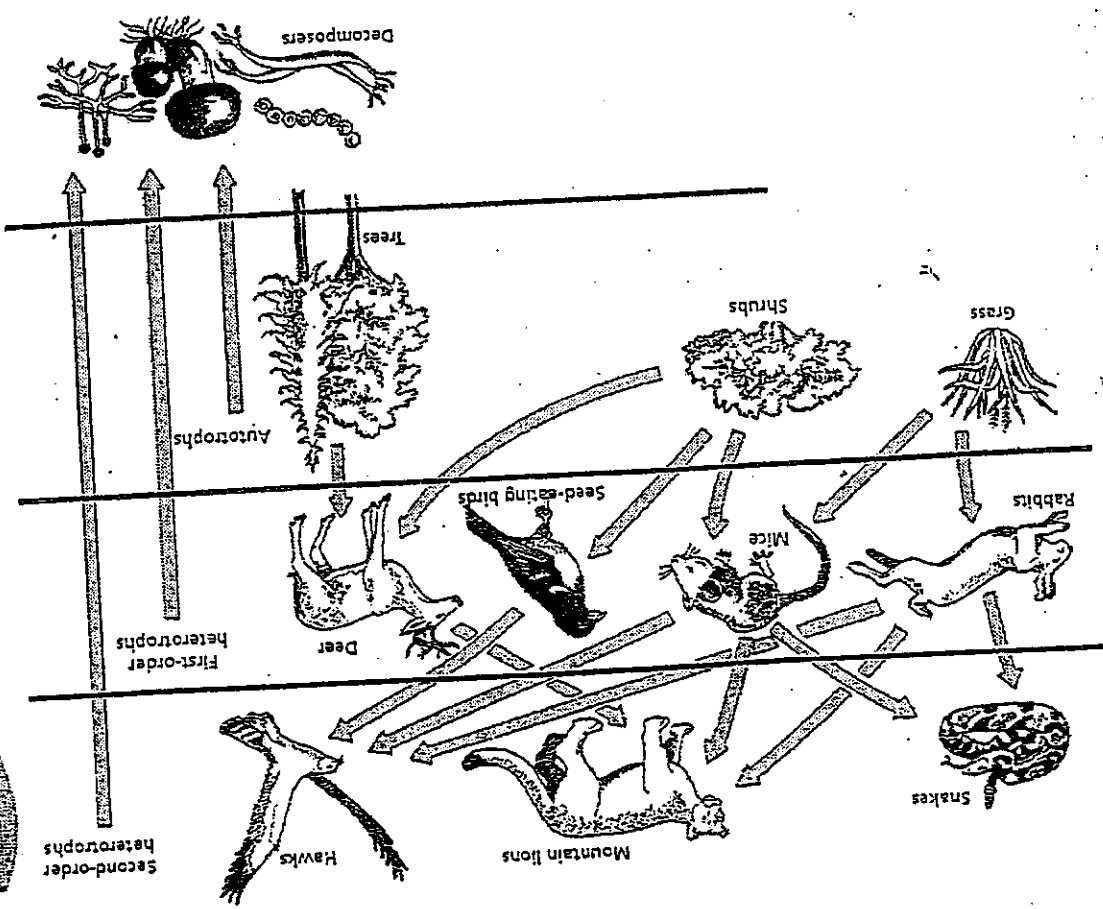
# A Food Web

Use with Chapter 2, Section 2.2

1. At which level of the food web is the supply of energy the greatest? Explain.
2. Which feeding relationship do first-order heterotrophs have in common?
3. Which feeding relationship do second-order heterotrophs have in common?
4. Explain why plants are called autotrophs.
5. Food webs and food chains both involve multiple trophic levels. How do they differ?
6. Use the transparency to describe a food chain that includes a mountain lion and a shrub.
7. How might the organisms pictured in the food web be affected if most of the mouse population was destroyed by disease?

# A Food Web

Use with Chapter 2, Section 2.2



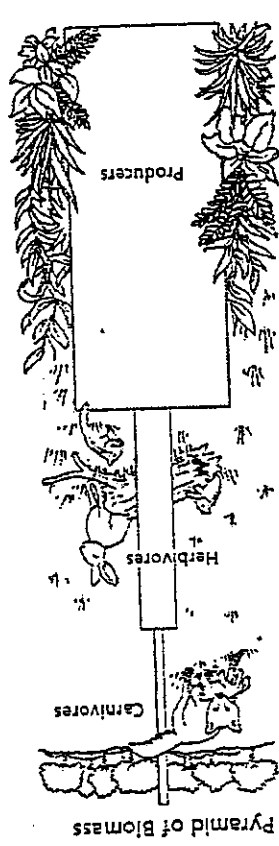
## Ecological Pyramids

### Using Basic Concepts

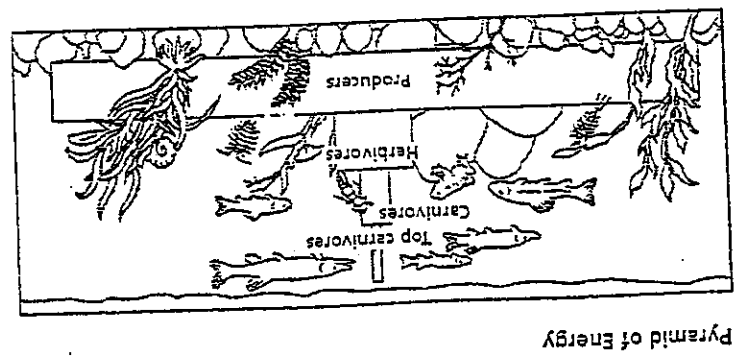
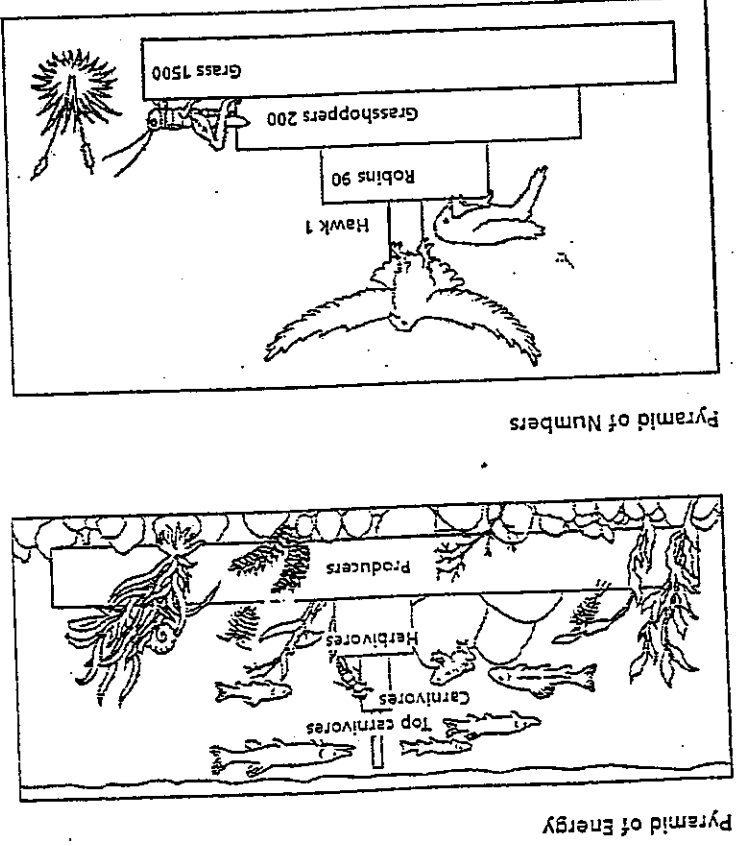
### Ecological Pyramids

Use with Chapter 2, Section 2.2

1. What is the source of energy for all of the ecological pyramids shown in the transparency?
2. In general, what kind of organism makes up the base of the pyramid of energy? Provide some specific examples.
3. Examine the pyramid of energy shown in the transparency. Explain why only about 10% of the energy available at one trophic level is transferred to the next higher trophic level.



4. How is the energy loss from one trophic level to the next reflected in the pyramid of numbers shown in the transparency?
5. Suppose an ecosystem has a greater number of individual herbivores than individual producers. How would this affect the shape of the ecosystem's pyramid of numbers?
6. What quantity does a pyramid of biomass express?
7. Explain how biomass is calculated.



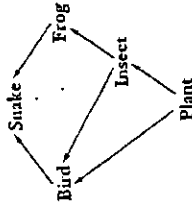
**Reinforcement and Study Guide**

Section 2.2 Nutrition and Energy Flow

**2 Principles of Ecology, continued**

In your textbook, read about how organisms obtain energy and about matter and energy flow in ecosystems.

Answer the questions below. Use the diagram of a food web to answer questions 1-7.



1. How many food chains make up the food web?  
\_\_\_\_\_
2. Which organism is an herbivore?  
\_\_\_\_\_
3. Which organism is an autotroph?  
\_\_\_\_\_
4. Which organism is a third-order heterotroph? To what trophic level does that organism belong?  
\_\_\_\_\_
5. Which organism is an omnivore?  
\_\_\_\_\_
6. Which organisms belong to more than one food chain?  
\_\_\_\_\_
7. Which organism belongs to more than one trophic level?  
\_\_\_\_\_
8. What are decomposers? From which trophic levels are the organisms that decomposers feed on?  
\_\_\_\_\_
9. What does a pyramid of energy show about the amount of energy available at different trophic levels of a food chain?  
\_\_\_\_\_
10. Why do different trophic levels have different amounts of energy?  
\_\_\_\_\_

**Reinforcement and Study Guide**

Section 2.2 Nutrition and Energy Flow, continued

**2 Principles of Ecology, continued**

In your textbook, read about cycles in nature.

Circle the letter of the choice that best completes the statement or answers the question.

11. Energy that is lost at each trophic level of an ecosystem is replenished by
  - a. heat.
  - b. nutrients.
  - c. sunlight.
  - d. organisms.
12. Besides energy, what moves through the organisms at each trophic level of an ecosystem?
  - a. organisms
  - b. nutrients
  - c. sunlight
  - d. cycles
13. Evaporation and condensation a part of the
  - a. carbon cycle.
  - b. nitrogen cycle.
  - c. phosphorus cycle.
  - d. water cycle.
14. Plants lose water to the air through
  - a. condensation.
  - b. photosynthesis.
  - c. their roots.
  - d. evaporation.
15. Animals lose water when they
  - a. breathe in.
  - b. urinate.
  - c. breathe out.
  - d. both b and c.
16. The water in the atmosphere is returned to the earth by
  - a. precipitation.
  - b. evaporation.
  - c. photosynthesis.
  - d. decomposition.
17. Autotrophs and heterotrophs use carbon molecules for energy and
  - a. photosynthesis.
  - b. growth.
  - c. decomposition.
  - d. both a and b.
18. What do plants use in photosynthesis to make carbon molecules?
  - a. carbon dioxide
  - b. carbohydrates
  - c. fertilizer
  - d. oxygen
19. Heterotrophs get carbon molecules by
  - a. making the molecules themselves.
  - b. feeding on other organisms.
  - c. decaying.
  - d. growing.
20. When decomposers break down the carbon molecules in dead organisms,
  - a. the dead organisms are converted to coal.
  - b. oxygen is released.
  - c. carbon dioxide is converted to energy-rich carbon molecules.
  - d. carbon dioxide is released.
21. Fertilizers provide plants with
  - a. nitrogen.
  - b. carbon.
  - c. water.
  - d. oxygen.
22. Which of the following convert(s) nitrogen in the air into a form plants can use?
  - a. bacteria
  - b. lightning
  - c. sunlight
  - d. both a and b
23. Plants use nitrogen to make
  - a. carbohydrates.
  - b. nitrogen gas.
  - c. proteins.
  - d. both b and c.
24. An animal returns nitrogen to the environment when it
  - a. breathes.
  - b. decomposes.
  - c. urinates.
  - d. both b and c.
25. Animals get phosphorus from
  - a. the air.
  - b. eating plants.
  - c. water.
  - d. the soil.
26. Phosphorus in the soil comes from
  - a. rocks.
  - b. decaying organisms.
  - c. the air.
  - d. both a and b.

**Chapter 2 Principles of Ecology, continued**

**Section 2.1 Organisms and Their Environment, continued**

In your textbook, read about organisms in ecosystems.

For each statement below, write **true** or **false**.

- 16. A habitat is the role a species plays in a community. \_\_\_\_\_
- 17. Habitats may change. \_\_\_\_\_
- 18. A niche is the place where an organism lives its life. \_\_\_\_\_
- 19. A habitat can include only one niche. \_\_\_\_\_
- 20. A species' niche includes how the species meets its needs for food and shelter. \_\_\_\_\_
- 21. The centipedes and worms that live under a certain log occupy the same habitat but have different niches. \_\_\_\_\_
- 22. It is an advantage for two species to share the same niche. \_\_\_\_\_
- 23. Competition between two species is reduced when the species have different niches. \_\_\_\_\_

Complete the table below by writing the kind of relationship described on the left.

Relationships Among Organisms	
Description of Relationship	Kind of Relationship
24. Organisms of different species live together in a close, permanent relationship.	
25. One species benefits and the other species is neither benefited nor harmed by the relationship.	
26. One species benefits from the relationship at the expense of the other species.	
27. Both species benefit from the relationship.	

**Chapter 2 Principles of Ecology**

**Section 2.1 Organisms and Their Environment**

In your textbook, read about what ecology is and about aspects of ecological study.

Use each of the terms below just once to complete the passage.

- ecology
- humans
- biotic factors
- organisms
- nonliving environments
- soil
- biosphere
- atmosphere
- abiotic factors

Living organisms in our world are connected to other (1) \_\_\_\_\_ in a variety of ways. The branch of biology called (2) \_\_\_\_\_ is the scientific study of interactions among organisms and their (3) \_\_\_\_\_, including relationships between living and (4) \_\_\_\_\_ things.

All living things on Earth can be found in the (5) \_\_\_\_\_, the portion of Earth that supports life. It extends from high in the (6) \_\_\_\_\_ to the bottom of the oceans. Many different environments can be found in the biosphere. All living organisms found in an environment are called (7) \_\_\_\_\_. Nonliving parts of an environment are called (8) \_\_\_\_\_. For example, whales, trees, and (9) \_\_\_\_\_ are biotic factors. Ocean currents, temperature, and (10) \_\_\_\_\_ are abiotic factors.

In your textbook, read about levels of organization in ecology.

For each item in Column A, write the letter of the matching item in Column B.

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|--|--|
| <p>Column A</p> <ul style="list-style-type: none"> <li>11. A group of organisms of one species that interbreed and live in the same place at the same time</li> <li>12. A collection of interacting populations</li> <li>13. Interactions among the populations and abiotic factors in a community</li> <li>14. Occurs between organisms when resources are scarce</li> <li>15. A terrestrial ecosystem</li> </ul> | <p>Column B</p> <ul style="list-style-type: none"> <li>a. community</li> <li>b. competition</li> <li>c. forest</li> <li>d. population</li> <li>e. ecosystem</li> </ul> |
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Communities and Biomes, continued

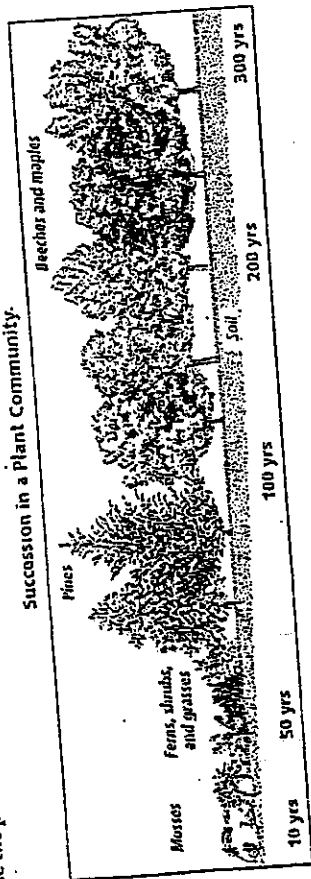
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Communities and Biomes

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Get the Big Picture

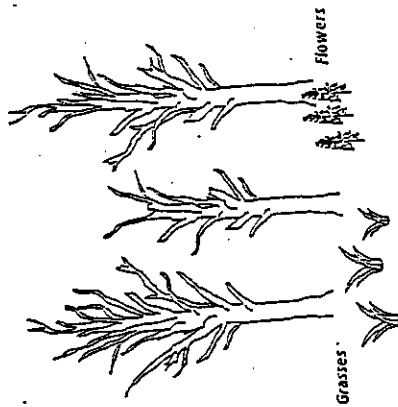
Use the picture below to answer the questions that follow.



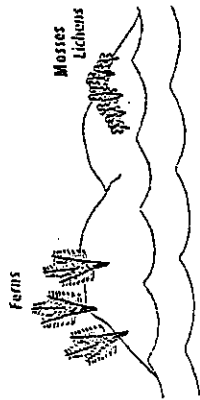
1. What type of plants were the first to grow in this community?
2. What types of plants were the first to grow in soil?
3. What types of plants were the last to grow in this community?
4. Why did it take many years for trees to grow in this community?

Study the Pictures

A. Burned Forest



B. New Island



Look at the pictures and read what is in the boxes. Then use the pictures and definitions to answer the questions.

Primary Succession

This happens when organisms start to live in a new place.

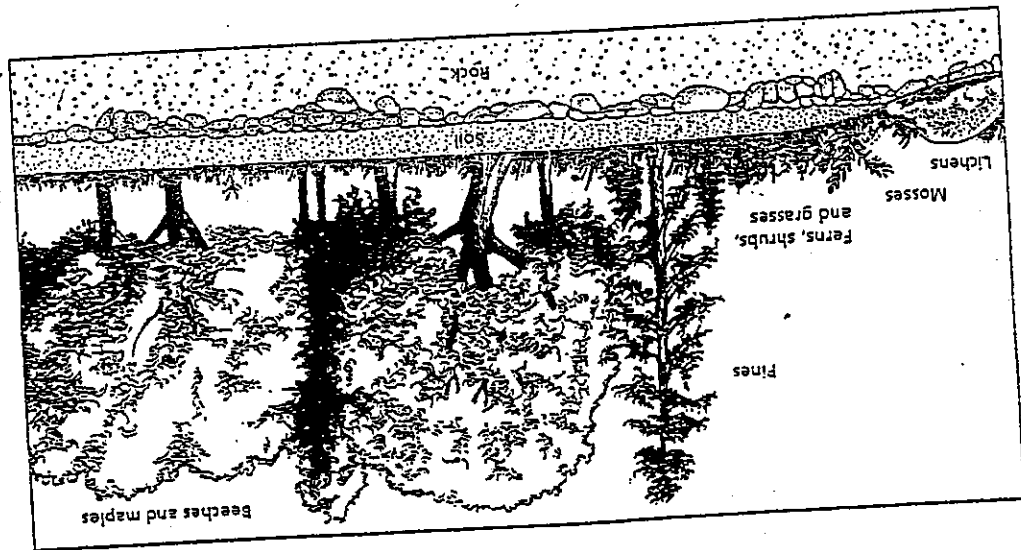
Secondary Succession

This happens when organisms start to live again in a place that had been destroyed by a flood, fire, or other natural disaster.

1. Which picture shows primary succession? Explain your answer.
2. Which picture shows secondary succession? Explain your answer.
3. True or false? Primary succession happens after a grassland is destroyed by a flood.

### Primary Succession

3



### Primary Succession

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1. What do ecologists mean by the term *succession*?

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2. Explain the process of primary succession as illustrated in the transparency.

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3. What is a climax community, and which organisms in the transparency represent this type of community?

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4. How is secondary succession different from primary succession?

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5. Based on the transparency, if you lifted through a patch of land that contained a pine forest into an area that contained only ferns, shrubs, and grasses, would you be moving from an older to a younger community or vice versa?

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6. Which parts of the ecosystem had to be established before the primary succession shown in the transparency could occur?

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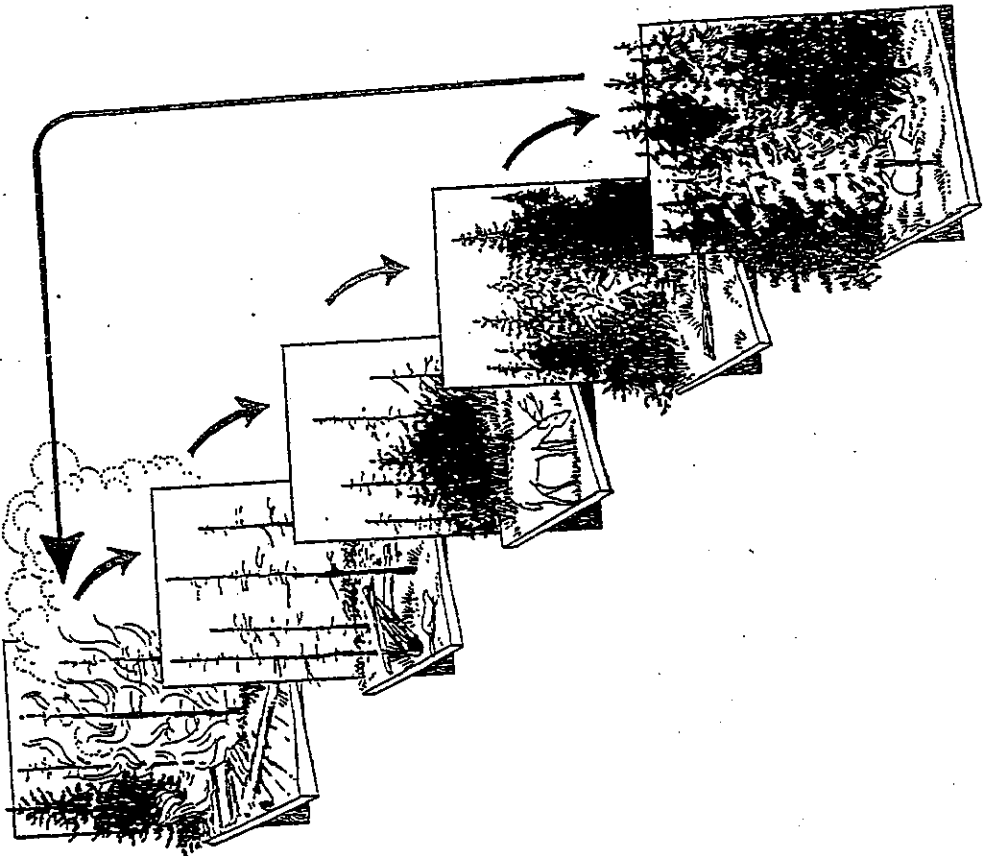
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## 4 Secondary Succession

## 4 Secondary Succession

As you work on this exercise, remember that plants compete for sunlight, nutrients, and water. The transparency shows what biologists predict will happen at Yellowstone Park in the years following the most extensive forest fire in its history. About 45 percent of the park burned.



1. a. After the fire, what resources remained in Yellowstone?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

b. How are these resources different from those found in an area such as a lava flow, where no life existed before?

2. In the first stage of secondary succession, grasses and wildflowers abound. Why do these plants flourish where there used to be forest?

3. Why will shrubs grow before trees?

4. For a time, the major plants in Yellowstone will be yellow pines, which will ultimately be replaced by lodgepole pines. What does this tell you about yellow pines and lodgepole pines? Explain your hypothesis.

5. Once lodgepole pines are established, the forests of Yellowstone Park will not change radically again. What is the term for the lodgepole pine community?

6. a. Elk, large herbivores that live in the Yellowstone area, eat mainly grasses. In winter, they eat twigs and needles from small trees and shrubs. Explain what may happen to the elk population during the first 10 years after the fire.

b. What may happen to the elk population during the following 15 years?

\_\_\_\_\_

\_\_\_\_\_

### 3 Communities and Biomes

#### Section 3.1 Communities

In your textbook, read about living in a community.

Determine if the statement is true. If it is not, rewrite the italicized part to make it true.

- The interactions of abiotic and biotic factors result in conditions that are suitable for some organisms but not for others.
- Food availability and temperature can be *biotic factors* for a particular organism.
- A limiting factor is any biotic or abiotic factor that *promotes* the existence, numbers, reproduction, or distribution of organisms.
- At high elevations where the soil is thin, vegetation is limited to *large, deep-rooted trees*.
- Factors that limit one population in a community may also have an *indirect* effect on another population.
- Tolerance* is the ability of an organism to withstand fluctuations in biotic and abiotic environmental factors.
- A population of deer would become *larger* as conditions move away from optimal toward either extreme of the deer's range of tolerance.
- Different species may have different ranges of tolerance.

In your textbook, read about succession: *changes over time*.

Use each of the terms below just once to complete the passage.

- |         |            |         |            |
|---------|------------|---------|------------|
| climax  | primary    | decades | succeed    |
| pioneer | succession | species | slows down |

The natural changes and (9) \_\_\_\_\_ replacements that take place in the communities of ecosystems are known as (10) \_\_\_\_\_. It can take (11) \_\_\_\_\_ or even centuries for one community to (12) \_\_\_\_\_, or replace, another. When new sites of land are formed, as in a lava flow, the first organisms to colonize the new area are (13) \_\_\_\_\_ species. This colonization is called (14) \_\_\_\_\_ succession. The species inhabiting the area gradually change. Eventually, succession (15) \_\_\_\_\_ and the community becomes more stable. Finally, a mature community that undergoes little or no change, called a (16) \_\_\_\_\_ community, develops.

### 3 Communities and Biomes, continued

#### Section 3.1 Communities continued

For each item in Column A, write the letter of the matching item in Column B.

#### Column A

- Sequence of community changes where soil is formed, allowing small, weedy plants to inhabit the area
- Sequence of community changes occurring as a result of a natural disaster, such as a forest fire
- A stable, mature community with little or no succession occurring
- An example of a biotic limiting factor affecting a community of organisms
- An example of an abiotic limiting factor affecting a community of organisms

#### Column B

- a severe drought
- primary succession
- amount of plant growth
- secondary succession
- climax community

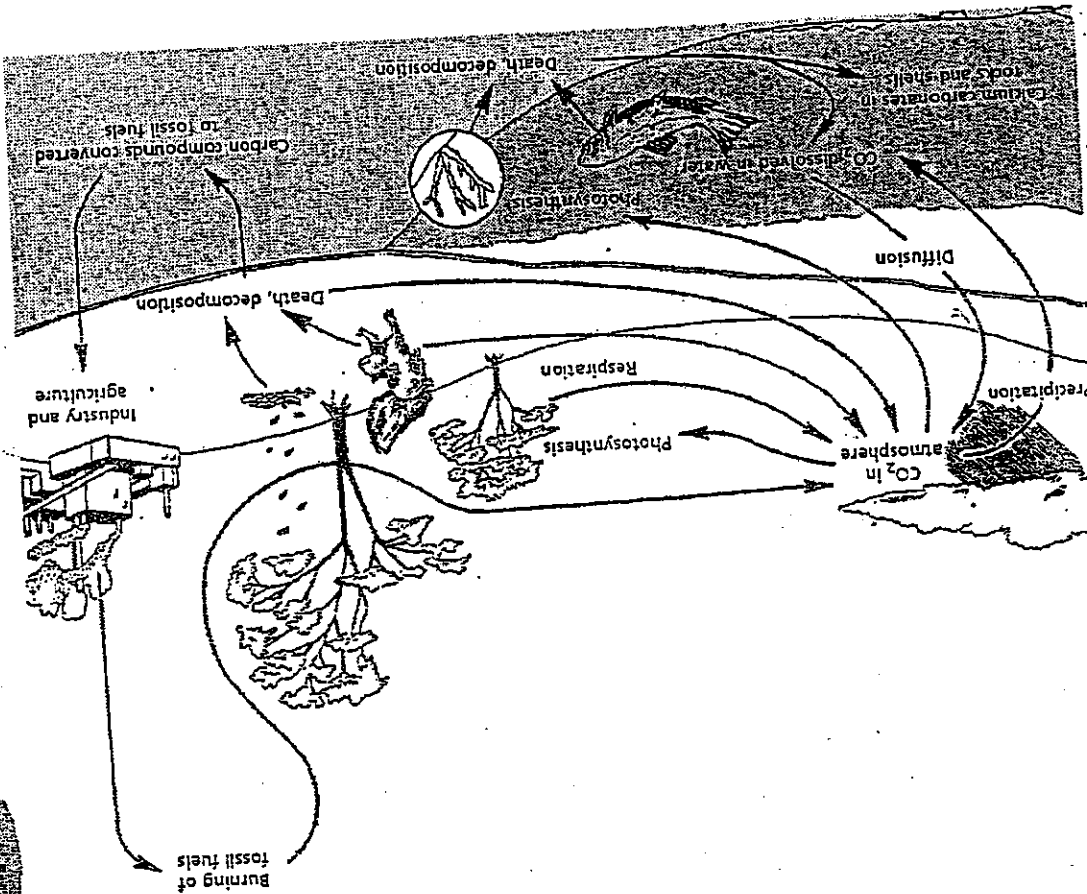
The statements below describe the secondary succession that occurred within an area of Yellowstone National Park. Number the events in the order in which they occurred.

- Grasses, ferns, and pine seedlings inhabited the area.
- Annual wildflowers grew from the bare soil.
- A fire burned thousands of acres of land.
- A climax community of lodgepole pines developed.

# The Carbon Cycle

1. What is the process by which plants convert carbon dioxide into energy-rich carbon compounds?
2. Explain what can happen over millions of years to the carbon compounds in organisms that die and decompose.
3. What processes in the transparency release carbon dioxide into the atmosphere?
4. Identify the two major reservoirs of carbon dioxide on Earth.
5. What are the forms in which carbon is found in the oceans?
6. How do plants and animals help to maintain a balance of carbon dioxide in the atmosphere?
7. Atmospheric carbon dioxide produces a so-called "greenhouse effect" by trapping heat near Earth's surface. What human activities might lead to increase the greenhouse effect?

# The Carbon Cycle



# The Nitrogen Cycle

Use with Chapter 2, Section 2.2

1. What percent of the air consists of nitrogen gas?

2. Bacteria in root nodules change nitrogen gas into what form?

3. What is the role of decomposers in the nitrogen cycle?

4. How do plants obtain the nitrogen they need?

5. How do herbivores obtain the nitrogen they need?

6. How do other animals obtain the nitrogen they need?

7. According to the transparency, how is nitrogen returned to the atmosphere?

8. What would be the impact on the nitrogen cycle if there were a decrease in decomposition in a given ecosystem?

# The Nitrogen Cycle

Use with Chapter 2, Section 2.2

