Ms. Fatuma Abbas
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Term 1 End of Term Revision Grade 7 Science

Module 1: Matter and Energy in Ecosystems

| | | |
|---|---|---|
| Illustrate the relationship of photosynthesis with light and carbon dioxide | Text & Figures | 11. 15 |

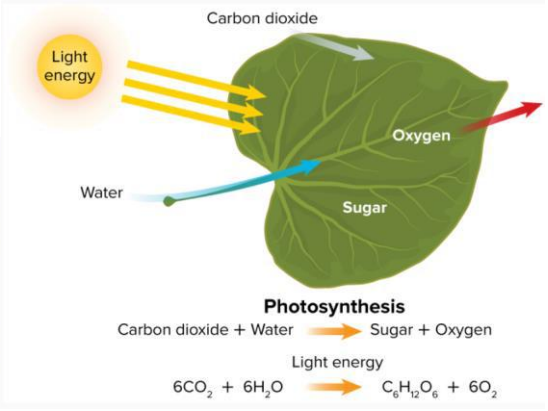
**Photosynthesis** Leaves are the sites of photosynthesis in plants. Plants and some unicellular organisms such as algae, phytoplankton, and other microorganisms obtain energy from light through the process of photosynthesis. **Photosynthesis** (foh toh SIHN thuh sus) is a series of chemical reactions that convert light energy, water, and carbon dioxide into the food-energy molecule glucose and give off oxygen. The sugars produced in photosynthesis can be used immediately or stored for growth or later use.

stomata (STOH muh tuh). Carbon dioxide, water vapor, and oxygen pass through stomata. Epidermal cells can

Most photosynthesis occurs in two types of mesophyll (ME zuh fil) cells inside a leaf. These cells contain chloroplasts, the organelle where photosynthesis occurs. Near the top surface of the leaf are palisade mesophyll cells. They are packed together. This arrangement exposes the most cells to light. Spongy mesophyll cells have

**Capturing Light Energy** In the first step of photosynthesis, plants capture the energy in light. This occurs in chloroplasts, which contain plant pigments. Pigments are chemicals that can

**Making Sugars** Sugars are made in the second step of photosynthesis, which can occur without light. In chloroplasts, carbon dioxide from the air is converted into sugars by using the energy stored and trapped by chlorophyll. Carbon dioxide combines with hydrogen atoms from the splitting of water molecules and forms sugar



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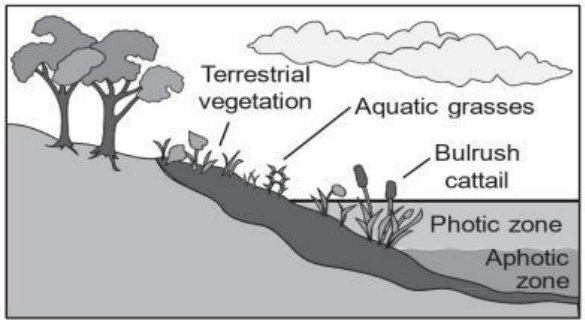
| Photosynthesis Summary | | |
|---|---|---|
| Input | Output | Location |
| Carbon dioxide, water, and Light energy | Glucose and Oxygen waste | Chloroplast found in mesophyll cells |

1. In the upper part of the photic zone, organisms carry out both photosynthesis and cellular respiration. Deep in the aphotic zone, only cellular respiration occurs. Which statement is the most likely reason photosynthesis does not occur in the deepest aphotic zone?




   a. Sunlight for photosynthesis does not reach the deepest aphotic zone
   b. Water pressure limits the survival of animals in the deepest aphotic zone
   c. Not enough soil is present to support plant growth in the deepest aphotic zone
   d. Not as much dissolved oxygen from the surface reaches the deepest aphotic zone

2. Photosynthesis uses all the following except _____ to make food.
   a. Carbon dioxide
   b. Chemical energy
   c. Light
   d. water

3. What is the source of the carbon atoms in a plant's cells?
   a. They were created as the plant grew
   b. The sun
   c. Water molecules
   d. The environment

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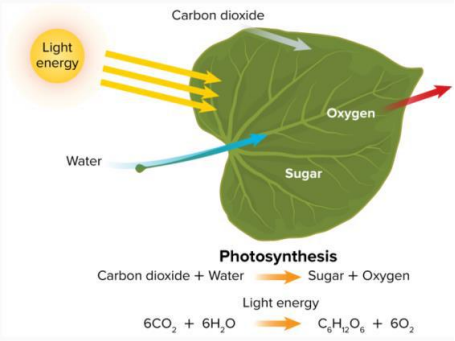
4. Which is the best explanation of the change in energy shown in the model?




   a. New energy is produced by the plants during photosynthesis
   b. Large amount of energy is released into the environment during photosynthesis
   c. Energy from sunlight is destroyed as it powers photosynthesis
   d. Energy input from the environment is stored in food molecules during photosynthesis

5. Chloroplasts are the location of photosynthesis
   a. True
   b. False
6. Photosynthesis is the process in which plants use energy from light to produce_____
   a. New cells
   b. Organelle's
   c. Food
   d. None of the above
7. In recent decades, average global temperatures have increased significantly. Scientists agree that the widespread destruction of the amazon rain forest contribute to climate change. Which mechanism might be cited to support that hypothesis?
   a. Deforestation causes water on the ground to reflect sunlight
   b. Deforestation reduces the number of plants able to absorb carbon dioxide
   c. Photosynthesis produces energy, which gives off heat
   d. Plants use up energy during cellular respiration

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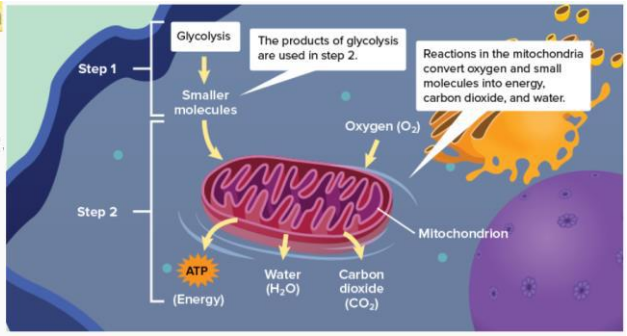
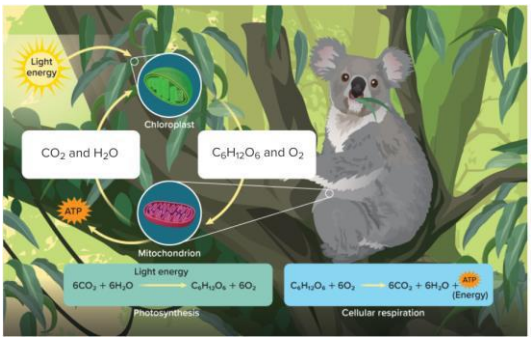
|---|---|---|
| Describe the cellular respiration two steps process, the molecules (inputs & outputs) and the organelles involved and their functions | Textbook & figures | 19, 20 |

**Cellular respiration** is a series of chemical reactions that convert the energy in food molecules into a usable form of energy called ATP. Cellular respiration occurs in two parts of a cell—the cytoplasm and the mitochondria.

The first step of cellular respiration, called glycolysis, occurs in the cytoplasm of all cells. **Glycolysis** is a process by which glucose, a sugar, is broken down into smaller molecules.

The second step of cellular respiration occurs in the mitochondria of eukaryotic cells. This step requires oxygen. The smaller molecules made from glucose during glycolysis are broken down. Large amounts of ATP— usable energy—are produced. Cells use ATP to power all cellular processes. Two waste products—water and carbon dioxide ($CO_2$)—are given off during this




| Cellular Respiration Summary | | |
|---|---|---|
| Input | Output | Location |
| Oxygen and glucose | ATP energy<br>Water and Carbon dioxide waste | Cytoplasm-glycolysis<br>Mitochondria-ATP production |

8. Water is a product of cellular respiration
    a. True
    b. False

9. Cellular respiration is the process in which organisms break down food to release ___.
    a. Energy
    b. Nutrients
    c. Sugar
    d. oxygen
10. Which organisms use cellular respiration to convert energy into usable form?
    a. Seedless plants only
    b. Only photosynthetic organisms
    c. Only mammals
    d. All organisms
11. Sucrose molecules break down during cellular respiration
    a. True
    b. False

| | | |
|---|---|---|
| Differentiate between producers and consumers, identify and describe with examples four types of consumers: herbivores, carnivores, omnivores, and detritivores | Textbook and figures | 31 and 32 |

**Producers** Living things that make their own food are called **producers.** Producers make thei food from materials found in their environments. Most producers are photosynthetic, such as plants. Other producers, including some bacteria, are chemosynthetic. Chemosynthesis i the process during which producers use chemical energy in matter rather than light energy to make food.

**Consumers** Unlike producers, **consumers** do not produce their own energy-rich food. Instead they get the energy they need to survive by consuming other organisms. Consumers can be classified by the type of food that they eat. Herbivores feed on only producers. Carnivores eat other animals. Omnivores eat both producers and other consumers.

**Detritivores** Another group of consumers are detritivores (dih TRI tuh vorz). **Detritivores** get their energy by eating the remains of other organisms. Some detritivores, such as bacteria and mushrooms, feed on dead organisms and help break down or decompose them. For this reason, these organisms often are called decomposers. The yeast in the activity is a decomposer. During decomposition, decomposers produce carbon dioxide that enters the atmosphere. Some of the decayed matter enters the soil or water. In this way, decomposers help recycle nutrients through ecosystems. They also help keep ecosystems clean. Without decomposers, dead organisms would pile up in an ecosystem.

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| Type of Consumer | Meaning | Example |
|---|---|---|
| herbivore | Eat only plants |  |
| Carnivore | Eat only animals (meat) |  |
| Omnivore | Eat both plants and animals |  |
| Detritivore | Eat dead or decaying organisms. It does include decomposers like bacteria and yeast. |  |

12. Consumers produce their own food
    a. True
    b. False
13. Which of the following eats only eucalyptus leaves?
    a. Herbivores
    b. Carnivores
    c. Omnivores
    d. Detritivores
14. Which of the following would eat a dead rabbit?
    a. Herbivores
    b. Carnivores
    c. Omnivores
    d. Detritivores
15. Which of the following would eat a hamburger with lettuce on it?
    a. Herbivores
    b. Carnivores
    c. Omnivores
    d. Detritivores

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| | | |
|---|---|---|
| Demonstrate how energy flows through an ecosystem in food chains, food webs, and energy pyramids; differentiate between them | Textbook and figures | 35, 37,38 |

You just created a food chain. A **food chain**, such as the one shown on the next page, is a simple model that shows how energy moves from the Sun, to a producer, to one or more consumers through feeding relationships. In a food chain, arrows show the transfer of energy. The amount of available energy decreases every time it is transferred from one organism to another. A food chain is helpful when studying certain parts of an ecosystem, but it does not show the whole picture.

You just created a food web. Scientists use a model of energy transfer called a **food web**, such as the one shown below, to show how food chains in a community are interconnected. You can think of a food web as many overlapping food chains. Like in a food chain, arrows show how energy flows in a food web. Some organisms in the food web might be part of more than one food chain in that web.

**Energy Pyramid** 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**, shown below, to show the amount of energy available in each step of a food chain. The steps of an energy pyramid are also called trophic levels.

Producers make up the trophic level at the bottom of the pyramid. Consumers that eat producers make up the next trophic level. Consumers that eat other consumers make up the highest trophic level. Less energy is available for consumers at each higher trophic level. Only about 10 percent of the energy available at one trophic level transfers on to the next trophic level.

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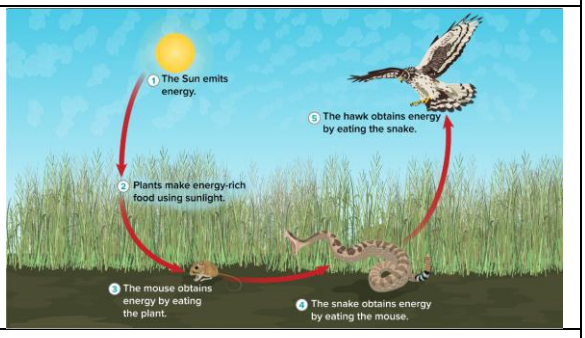
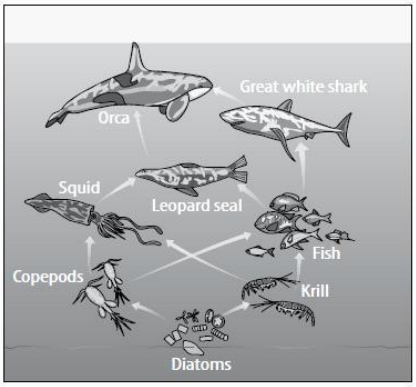
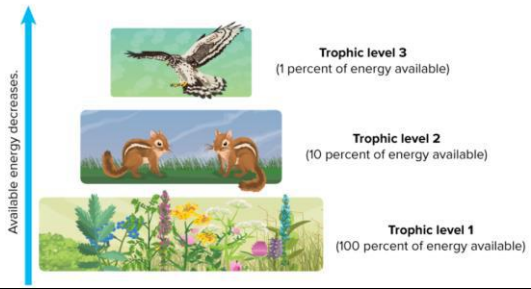
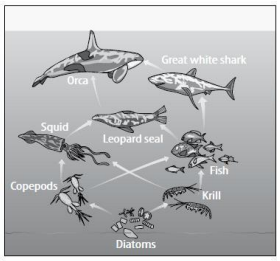
| Energy in an ecosystem flows in one direction from the sun to producers to consumers. | | |
|---|---|---|
| Food Chain | Shows how energy moves from the sun to the producer to the consumer |  |
| Food Web | Shows interconnected food chains in a community. |  |
| Energy Pyramid | Shows the amount of energy available in each trophic level of a food chain. At each step only 10% of energy is transferred to the next level. 90% of available energy is used by the organism or lost to the environment as thermal energy or heat. |  |

16. Which is a model of feeding relationships?
    a. Protein building
    b. Food map
    c. Food web
    d. Sugar molecule

17. Analyze the food web. Which statement is correct?




    a. The model tracks the transfer of energy as energy flows in this ecosystem
    b. The transfer of matter back into the environment occurs only at the detritivore level.
    c. The model shows the transfer of matter only
    d. The decomposers in the model use matter but not energy for their life processes.

18. Energy cycles through ecosystems because it returns to the Sun.
    a. True
    b. False

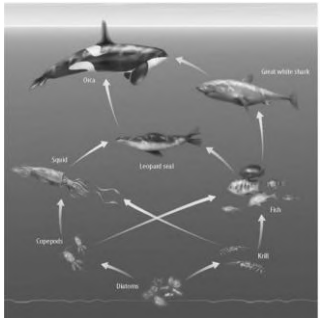
19. In what form is energy NOT used for life processes released from living things?
    a. Light energy
    b. Sound energy
    c. Thermal energy
    d. Chemical energy

20. Which is most likely the first step in a basic food chain?
    a. The snake obtains energy by eating the mouse
    b. Plants make energy-rich food using sunlight
    c. The sun emits energy
    d. The hawk obtains energy by eating the snake

21. Which of the following flows through ecosystems in one direction?
    a. Carbon
    b. Energy
    c. Nitrogen
    d. water

22. Which of the following organisms would NOT be on the first trophic level of an energy pyramid?
    a. Dog
    b. Tree
    c. Grass
    d. Algae

23. Which organism has the most available in the food web?

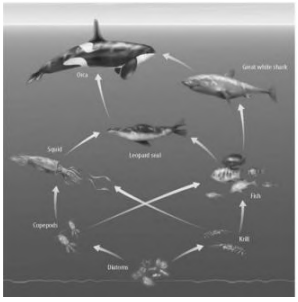



a. Diatoms
b. Leopard seal
c. Squid
d. Orca

24. As you move upward, from level to level in an energy pyramid, available energy ____.
a. Decreases
b. Increase
c. Stays the same
d. Is destroyed

25. Available energy increases as it is transferred from one organism to another in a food chain.
a. True
b. False

26. What eats the squid?




a. Diatoms
b. Leopard seal
c. Squid
d. Orca

27. In an energy pyramid approximately 10 percent of the energy available in one trophic level is transferred to the next level. Which statement helps to explain why this occurs?
    a. Consumers eat both consumers and other producers.
    b. Organisms use most of the available energy to fuel their own life processes.
    c. Predators eat more organisms at their own trophic level than organisms at other levels.
    d. Producers exist only in the lower level of the energy pyramid.
28. Why are food webs better representations of how energy moves through an ecosystem than food chains?
    a. Food chains include decomposers, which do not play a role in energy movement through an ecosystem.
    b. Food chains show how matter moves through an ecosystem, not energy.
    c. Food webs include how energy enters an ecosystem, and food chains do not.
    d. Food webs show that animals in an ecosystem can get energy by eating different things.

| | | |
|---|---|---|
| Describe and identify steps of the nitrogen cycle, explain what nitrogen fixing is and the different ways that it can occur | Textbook and figures | 53 |

Recall that the atmosphere is mostly nitrogen. However, this nitrogen is in a form that plants and animals cannot use. The process that changes atmospheric nitrogen into nitrogen compounds that are usable by living things is called **nitrogen fixation** (NI truh jun • fihk SAY shun). Plants and some other organisms take in this changed nitrogen from the soil and water. Then, animals take in nitrogen when they eat the plants or other organisms.

As you learned in the previous lesson, decomposers can break down the tissues of dead organisms. When organisms die, nitrogen-fixing bacteria help return the nitrogen in the tissues of dead organisms to the environment. Nitrogen also returns to the environment in the waste products of organisms. Farmers often spread animal wastes, called manure, on their fields during the growing season. The manure provides nitrogen to plants for better growth.

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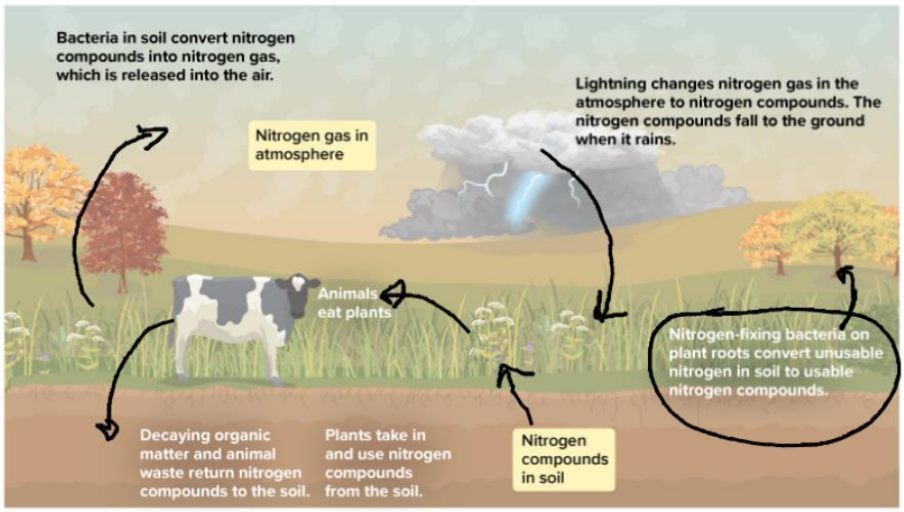
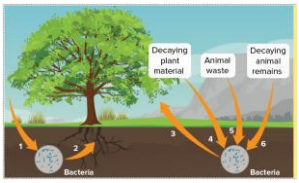



29. Elements such as oxygen, nitrogen, and carbon cycle through a system once
    a. True
    b. False

30. Keisha and her classmates created a model of the nitrogen cycle. What is the function of the bacteria in the picture?




    a. They prevent nitrogen from harming the plants.
    b. They remove nitrogen from the soil.
    c. They remove nitrogen from the soil
    d. They return nitrogen to the system

31. Which of the following steps in the nitrogen cycle takes place after animals eat plants?
    a. Lightning changes nitrogen gas into nitrogen compounds.
    b. Plants use nitrogen from the soil.
    c. Bacteria on plant roots fix nitrogen to make it usable.
    d. Decaying waste returns nitrogen to the soil.

32. Which of the following is NOT an example of how bacteria aid in the nitrogen cycle?
    a. nitrogen fixation
    b. breaking down the tissue of dead organisms
    c. changing nitrogen compounds into atmospheric nitrogen
    d. infecting tissue

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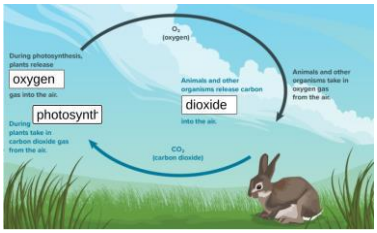
| | | |
|---|---|---|
| Identify processes that release and take in oxygen and carbon dioxide into the atmosphere (the oxygen cycle) | Textbook and figures | 54 |

increased. Today, photosynthesis is the primary source of oxygen in Earth's atmosphere. Some scientists estimate that unicellular organisms in water, called phytoplankton, release more than 50 percent of the oxygen in Earth's atmosphere. Many living things, including humans, take in oxygen and release carbon dioxide. The interaction of the carbon and oxygen cycles is one example of a relationship between different types of matter in ecosystems. As the matter




33. Phytoplankton are said to release how much of the oxygen in Earth's atmosphere?
    a. between 5% and 10%
    b. between 15% and 20%
    c. less than 5%
    d. more than 50%

Module 1 Answer Key

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. A | 2. B | 3. D | 4. d | 5. a | 6. c | 7. b |
| 8. a | 9. a | 10. d | 11. b | 12. b | 13. a | 14. d |
| 15. c | 16. c | 17. a | 18. b | 19. c | 20. c | 21. b |
| 22. a | 23. a | 24. a | 25. b | 26. b | 27. b | 28. d |
| 29. b | 30. d | 31. d | 32. d | 33. d | | |

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Module 2: Dynamic Ecosystems:

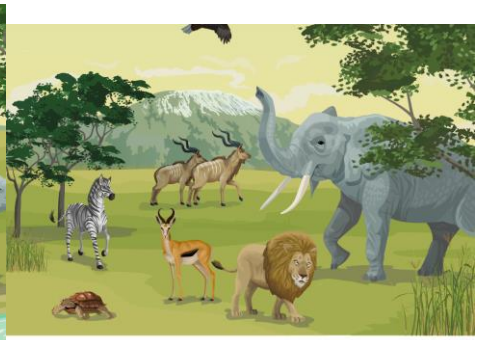
| Define biosphere, and list what it includes | Textbook and figures | 74 |
|---|---|---|

water. Recall that all of the living and nonliving things in an area make up an ecosystem. All of the ecosystems on Earth make up the **biosphere**—the parts of Earth and the surrounding atmosphere where there is life.

The biosphere is the largest level of organization made up of smaller part including: individuals, populations, communities, and ecosystems

Individual: a single member of a species

Population: all members of a species in an area at the same time



Community: all the populations in an area at the same time

Ecosystem: all the living and nonliving things in an area

Biosphere: where life is found

1. What is the difference between a community and an ecosystem?
    a. An ecosystem consists of living and nonliving things in an area. A community is all the members of one species in the area.
    b. An ecosystem consists of living and nonliving things in an area. A community is all the populations in the area.
    c. An ecosystem consists of nonliving things in an area. A community is all the living things in the area.
    d. An ecosystem consists of all the populations in an area. A community is all the nonliving things in the area.
2. All the meerkats that live in a wildlife refuge make up which of the following?
    a. Population
    b. Community
    c. Biosphere
    d. Niche

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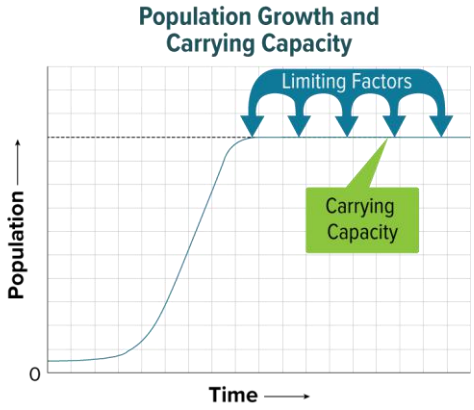
3. What is the difference between a population and a community
    a. A population is made up of all species in an area. A community is made up only of one species
    b. A population is made up of only one species. A community is made up of all species in an area
    c. A population is made up of all the species and nonliving things in an area. A community if made up of all species in in nan area.
    d. The words mean the same thing

| | | |
|---|---|---|
| Describe different factors that can affect the size and carrying capacity of a population | Textbook and figures | 79 |

Without limiting factors, populations would keep growing until they reached their biotic potential. **Biotic potential** is the potential growth of a population if it could grow in perfect conditions with no limiting factors.

Almost no population reaches its biotic potential. Instead, it reaches its carrying capacity. **Carrying capacity** is the largest number of individuals of one species that an ecosystem can support over time. For example, in the *Fishy Population Changes* lab, the pond could only support 16 fish before it reached its carrying capacity. The limiting factors of an area determine the area's carrying capacity, as shown in the graph.




The largest number of individuals of one species that an ecosystem can support over time is its biotic potential.

a. True

b. False

4. What is the effect of the growth of a population on an ecosystem?
    a. fewer resources for each individual in the population
    b. a greater amount of resources in the ecosystem
    c. a decrease in the amount of resources needed by each individual
    d. an increase in the size of the ecosystem

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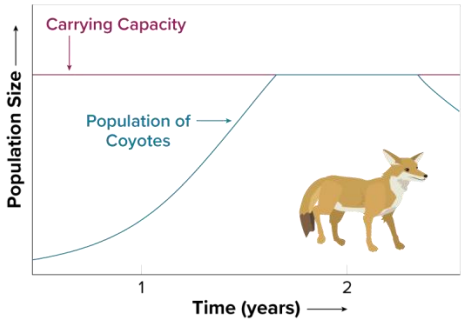
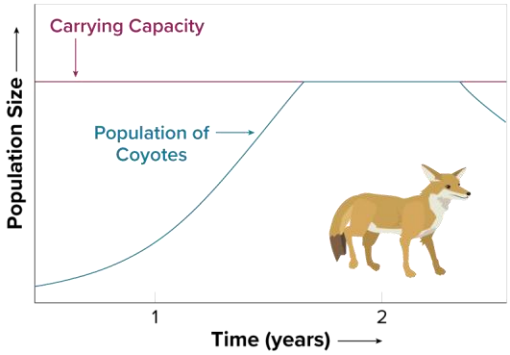
5. A population of coyote's lives in a habitat with plentiful food and no predators. Analyze the graph and interpret what is happening to their population size at the one-year mark.




   a. The population size is increasing
   b. The population size is decreasing
   c. The population size remains the same.
   d. The population size cannot be inferred from the graph.

6. Which of the following explains what happened to the coyote population size when it reached its carrying capacity, and why?




   a. The population size continued to increase because the ecosystem had not changed.
   b. The population size stopped increasing because it had reached the largest number of coyotes that the ecosystem could support.
   c. The population size became zero because the ecosystem could no longer support the coyote population.
   d. The population size can no longer be inferred from the graph once carrying capacity is reached.

7. If there are no limiting factors, a population can reach its _____.
   a. competition level
   b. population potential
   c. population density
   d. biotic potential

8. The population size can no longer be inferred from the graph once carrying capacity is reached.
   a. True

b. False

| | | |
|---|---|---|
| Define the different factors that can affect the size and carrying capacity of an ecosystem | Textbook | 80 |

**Population Size Decrease** Population size can increase, but it also can decrease. For example, a population of field mice might decrease in size in the winter because there is less food. Natural disasters such as floods, fires, or volcanic eruptions also affect population size. Sometimes, a population's size can decrease to such an extent that it may threaten the entire species. Examine the table to learn about what happens to species that see large decreases in population size.

9. A male and female rabbit hop into a new area where there are no other rabbits. Before they can even find shelter, they are killed by a coyote. The existence of a predator is a _____ factor on the population of rabbits in the area.
    a. Community
    b. Ecosystem
    c. Limiting
    d. negative
10. Which of these is a limiting factor?
    a. food supply
    b. Shelter
    c. existence of predators
    d. all the above

| | | |
|---|---|---|
| Define commensalism and give examples of it | Textbook and figures | 94 |
| Compare and contrast mutualism commensalism, and parasitism and give examples | Textbook and figures | 95 |

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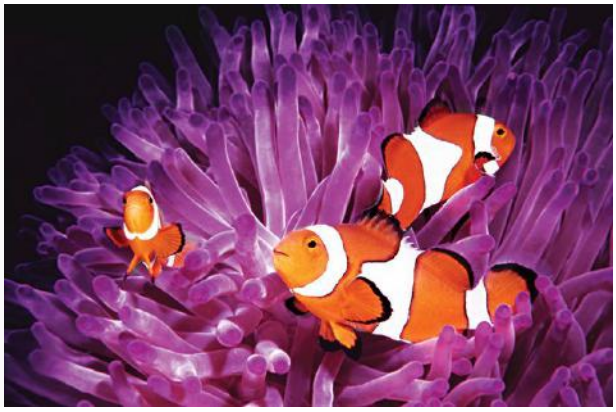
**Commensalism** A symbiotic relationship that benefits one species but does not harm or benefit the other is **commensalism.** Plants called epiphytes (EH puh fites) grow on the trunks of trees and other objects. The roots of an epiphyte anchor it to the object. The plant's nutrients are absorbed from the air. Epiphytes benefit from attaching to tree trunks by getting more living space and sunlight. The trees are neither helped nor harmed by the plants.

**Parasitism** A symbiotic relationship that benefits one species and harms the other is **parasitism.** The species that benefits is the parasite. The species that is harmed is the host. The larvae of the hunting wasp is a parasite. The female wasp, shown in the photo on the left, stings a spider to paralyze it. Then she lays eggs in its body. When the eggs hatch into larvae, they eat the paralyzed spider.

**Mutualism** A symbiotic relationship in which both partners benefit is called **mutualism.** Clownfish and sea anemones live in tropical coral reef communities. The clownfish receives protection from the anemone as the anemone will sting predators of the clownfish. The anemone in turn receives energy from the waste produced by the clownfish. The barbel fish and hippos you learned about earlier also share a mutualistic relationship.



11. A symbiotic relationship that benefits both species is referred to as commensalism.
    a. True
    b. False
12. Mutualism is any close relationship between different species.
    a. True

b. False

13. Imagine that you are growing bean plants. You notice that every bean plant with *Rhizobium*, a type of nitrogen-fixing bacteria, is very healthy. You also notice that the plants without *Rhizobium* in their root nodules seem to be doing poorly. Through research, you learn that *Rhizobium* gains food from the plant. What can you infer about the relationship between the *Rhizobium* bacteria and the bean plants?

a. *Rhizobium* and the bean plant are an example of commensalism.
b. *Rhizobium* and the bean plant are an example of mutualism.
c. *Rhizobium* and the bean plant are an example of a predator-prey interaction.
d. *Rhizobium* and the bean plant are not part of a relationship.

14. A documentary on sharks shows a small remora fish attached to the shark. The remora fish eats any parasites on the shark and leftover food. Which explanation best fits this type of relationship?
    a. This relationship is parasitism because the fish is eating off the shark.
    b. This relationship is mutualism because the fish receives food, and the shark is cleared of dangerous parasites.
    c. This relationship is commensalism because only the fish is benefiting while the shark is neither helped nor harmed.
    d. This relationship is cooperative because both are working together to help the fish receive food.

| | | |
|---|---|---|
| Describe the importance of interactions within ecosystems in maintaining a healthy ecosystem. | Textbook and figures | 98 |

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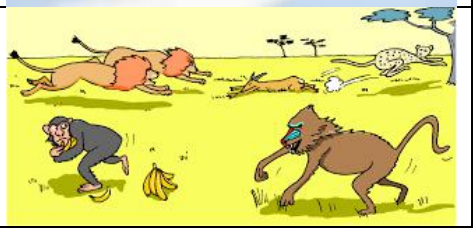
**Cooperative Relationships** The leafcutter ants in the *Assorted Associations* investigation work together in cooperative relationships for their survival. Together they carry leaves to their nest to be used to grow fungus for food and building. Cooperative relationships can be found in many different populations across the world. For example, elephants cooperate with each other to raise young and watch for predators. Squirrel monkeys benefit in a similar way by living in groups. They cooperate as they hunt for food and watch for danger.

**Predator-Prey Relationships** The osprey catching a fish is an example of a predator-prey relationship. A predator-prey relationship is one in which one organism, the predator, eats another, the prey. Predators help prevent prey populations from growing too large for the carrying capacity of the ecosystem. Predators often capture weak or injured individuals of a prey population. When the weak members of a population are removed, there are more resources available for the remaining members. This helps keep the prey population healthy.

**Competitive Relationships** Organisms that share the same habitat often compete for resources. This is known as a competitive relationship. Competition describes interactions between two or more organisms that need the same resource at the same time. For example, trees compete for sunlight, and the shade from tall trees can slow the growth of younger trees. Wolves compete with ravens for meat from the animals that wolves kill, as shown in the previous photo.

| Non-symbiotic interaction | definition | example |
|---|---|---|
| Cooperative relationships | Individuals of the same species work together for the good of the group |  |
| Predator-Prey | A predator hunts and kills a prey organism |  |
| Competitive relationships | Two or more organisms fight for the same resource at the same time |  |

15. Which of the following are examples of predation? Select all that apply.
    a. A bear wades into the water, catches a fish, and eats it.
    b. A cleaner shrimp eats tiny organisms that were on a fish.
    c. A buzzard finds a dead raccoon on the side of the road and eats it.
    d. A tick drinks the blood of a cat, but the cat is unharmed.
16. Nutria are large rodents from South America that escaped from captivity in the United States over 50 years ago. They live in burrows near water, where they feed on aquatic and land plants. Nutria altered many native marshes by removing plants. Nutria eats only the roots and stems, leaving the rest of the plant untouched. Nutria has few natural predators in the United States and reproduce quickly. Nutria have surpassed muskrats, which are native marsh herbivores, as the most abundant fur-bearing animal in Louisiana. Which statement best supports the argument that nutria changes ecosystems and negatively affects other populations?
    a. Nutria are large rodents and are not native to the United States
    b. Nutria lives in burrows near water and feed on aquatic and land plants.
    c. Nutria eats only the roots and stems of plants.
    d. Nutria has few natural predators and reproduce quickly.
17. Samantha plants some flowers in a flower bed and then ignores them. Soon weeds grow and the flowers die. The weeds had been able to get enough resources to survive, while the flowers had not. This is an example of _____.
    a. competition
    b. population size
    c. habitat
    d. community
18. Which change in the ecosystem increases the carrying capacity for a particular species?
    a. drought
    b. flood
    c. appearance of a competing species
    d. disappearance of a competing species
19. In a predator-prey relationship, _____.
    a. the predator hunts the prey for food
    b. the prey hunts the predator for food
    c. the prey keeps the predator population from growing too large
    d. the prey are producers
20. Some populations have cooperative relationships. This is where _____.
    a. members of the same species compete for resources
    b. members of different species compete for resources
    c. members of the same species work together for survival
    d. members of different species work together for survival
21. Two types of fish are introduced to a small pond in the school courtyard. The pond contains some algae and water plants, but no other fish. Both the Fish A and Fish B populations do well at first, but after several weeks, the population of Fish B begins to drop until no individuals are left. Several students have hypothesized why this event occurred. 2 Which argument is best supported by the data?

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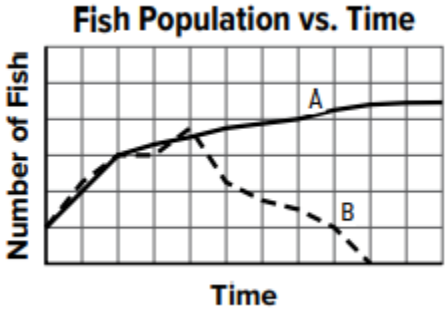


a. Fish A and Fish B competed for the same food resources. Fish A outcompeted Fish B
b. Fish A and Fish B had a mutually beneficial relationship where Fish A removed and ate parasites from Fish B.
c. Fish A was a predator of Fish B. Fish A hunted Fish B until none were left.
d. Fish B was a predator of Fish A. Fish A evolved a special toxin that made it toxic to Fish B.

| | | |
|---|---|---|
| Identify changes in ecosystems and their causes, identify examples of ecological succession | Textbook and figures | 108 |
| List all the negative environmental impacts on ecological systems because of secondary succession | textbook | 114 |

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An ecosystem can change over time. Change usually happens so gradually that you might not notice the differences from day to day. Examine the pond community below to observe what changes occur.

McGraw-Hill Education

**ENVIRONMENTAL Connection**

Too much sediment can damage stream habitats, clog waterways, and cause flooding. Negative environmental impacts of sedimentation include habitat loss, change in available nutrients, and coastline alteration. Sediment that is suspended in water may reduce visibility and make it difficult for animals to find food. It may also prevent light from reaching plants that need sunlight for food. Sediment that has collected on the bottoms of rivers and streams may cover habitats of fish or other animals.

22. Ecological succession can begin when seeds are carried to bare areas by birds or the wind.
    a. True
    b. False
23. Succession continues until it reaches a pine forest community.
    a. True
    b. False
24. Ecological succession in new areas of land with little or no soil is secondary succession.
    a. True
    b. False
25. As eutrophication occurs, populations of algae grow. How does this speed up succession?
    a. The algae use so much oxygen in the water that fish die, decay and add to the buildup of soil.
    b. The algae become soil.
    c. The growth of the algae causes pollution to increase.

d. The presence of the algae encourages sediment to drop out of streams into the pond.

26. How might a lake suffering from eutrophication affect a population of fish?
    a. The population will grow because of the extra nutrients.
    b. The population will suffer due to decreases in oxygen and habitat loss.
    c. The fish population will not be affected.
    d. The size of the population will waver.
27. A climax community is a community that is _____.
    a. is about to experience a major change
    b. has just been radically altered by a natural disaster
    c. is a stable community that no longer goes through major ecological change
    d. is always characterized by large trees
28. If an existing ecosystem is destroyed, _____.
    a. primary succession occurs
    b. secondary succession occurs
    c. a climax community is formed.
    d. a different type of biome emerges.
29. As plants in an area undergoing ecological succession die, _____.
    a. they are replaced by plants of the same species
    b. they are replaced by plants of a different species
    c. either a or b could occur
    d. no plants grow in their place
30. What is happening in the image?

    a. The forest is undergoing primary succession.
    b. The forest is undergoing secondary succession.
    c. The green sprouts will not grow into full plants and the forest will not recover.
    d. The forest is suffering from eutrophication.

Module 2 Answer Key

| | | | | | |
|---|---|---|---|---|---|
| 1. b | 2. a | 3. b | 4. a | 5. a | 6. b |
| 7. d | 8. b | 9. c | 10. d | 11. b | 12. b |
| 13. b | 14. b | 15. A, b | 16. d | 17. a | 18. d |
| 19. a | 20. c | 21. a | 22. a | 23. b | 24. b |

| | | | | | |
|---|---|---|---|---|---|
| 25. a | 26. b | 27. c | 28. b | 29. c | 30. b |

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**Module 3: Biodiversity in Ecosystems**

| | | |
|---|---|---|
| Define biodiversity and link it to ecosystem stability, list types of biodiversity with examples | Textbook and figures | 141 |

**Biodiversity** The number and variety of organisms found in a specific region, such as a small pond, a grassy field, a desert, or all of Earth is known as **biodiversity**. The coral reef in the photo from the Investigation *Discovering Biodiversity* has high biodiversity because it has many organisms and many different types of organisms. What is the biodiversity of Earth? To date, scientists have identified about 2 million species. A **species** is a group of organisms that have similar traits and are able to produce fertile offspring. A recent estimate of the total number of species on Earth, both known and yet-to-be discovered, is approximately 9 million species. Observe how many of each type of known species exist in the graph below.

**Types of Biodiversity** The variety of genes or inherited traits that are present in a population make up its **genetic diversity.** You can look at your friends and observe all of their different traits, such as eye color, hair texture, and height, to see the genetic variation that exists among humans. The difference in color and patterns on the snails to the right is another example of genetic diversity.

Diversity exists within species as well as within an ecological community as a whole. The number of different species and the quantity of each species in an ecological community is called **species diversity.**

Diversity also exists among ecosystems. The variety of ecosystems in the biosphere is called **ecosystem diversity.** Different ecosystems have different abiotic factors that support different types of life.

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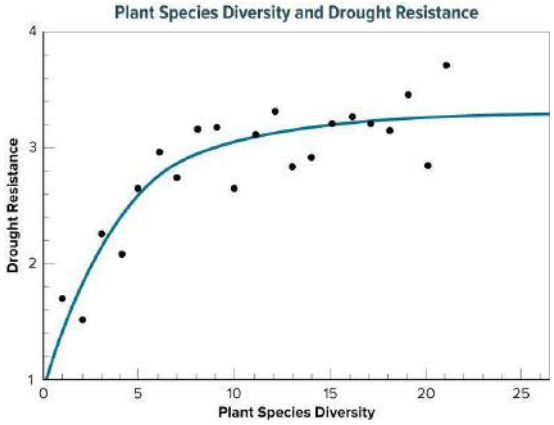
1. During the course of the experiment, the region experienced a drought. The researchers tracked the relationship between plant species diversity and the ecosystem's resilience to drought. Values closer to one on the vertical axis imply less resilience to the drought. What conclusions can be made by analyzing the data from the graph?




   a. As plant biodiversity increases, resistance to drought decreases
   b. As plant biodiversity increases resistance to drought increases.
   c. Ecosystems with lower biodiversity are better able to respond to changes
   d. Ecosystems with higher biodiversity are less able to respond to changes.

2. Soil erosion is a natural process; however, soil is eroding at a faster rate due to human activity. Although good soil is a renewable resource, the creation of one inch of topsoil takes 100 to 1000 years. Erosion causes loss of nutrients and valuable microorganisms from the soil, which results in decreased species diversity within the affected ecosystem. Scientists have learned that protecting the soil from rain and wind is more important than preventing runoff. Which activity is most likely to prevent or slow down soil erosion and help preserve biodiversity and the benefits that come from ecosystems?
   a. plowing a field and not replanting in order to allow the soil to rest for a year
   b. adding more cattle to a grassland region to help provide food for more people
   c. burning forests and fields to remove invasive plants that compete with native plant species
   d. planting many crop varieties in a field surrounded by native trees and shrubs in order to help feed more people

3. An ecosystem with a large number of individuals can have a low biodiversity.
   a. True
   b. False

| | | |
|---|---|---|
| Calculate the biodiversity index | Textbook investigation | P144-145 |

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Scientists often use a simple formula called the biodiversity index to calculate the biodiversity of an area.

$$\text{Biodiversity Index} = \frac{\text{Number of species in an area}}{\text{Total number of individuals in the same area}}$$

**1.** To find the biodiversity index, first find the total number of individuals by adding up the number of individuals of each species.

| Number of Species | Number of Individuals of Each Species |
|---|---|
| 6 | Species A = 4<br>Species B = 30<br>Species C = 1<br>Species D = 3<br>Species E = 1<br>Species F = 2 |

**Type in each box to complete the equation. When you're done, tap the button to check your answer.**

Species A + Species B + Species C + Species D + Species E + Species F = _____

4 + 30 + 1 + 3 + 1 + 2 = 41

Record your answer for the total number of individuals in the table above.

**2.** Then calculate the biodiversity index by dividing the number of species by the total number of individuals.

**Type your answer in each box.**

$$\frac{\text{\# of species}}{\text{\# of individuals}} = \frac{6}{41} = 0.15$$

4. An ecosystem has 150 organisms of 15 different species. What is the biodiversity index of this ecosystem?
   a. 165
   b. 10
   c. 0.15
   d. 0.1
5. Scientists can use aerial photos to collect data to determine the biodiversity index of an area.
   a. True
   b. False
6. What would happen to the biodiversity index of an ecosystem if a change in the ecosystem caused the number of species to stay the same and the total number of individuals to increase?
   a. The biodiversity index would increase.
   b. The biodiversity index would decrease.
   c. The biodiversity index would stay the same.
   d. The biodiversity index will increase, then decrease.

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| Describe the different biomes that make up the biosphere and differentiate them by using figures | Textbook and figures | 152-154 |
|---|---|---|

| Biome | Description | Image |
|---|---|---|
| Desert | 1/3 of earths land, low precipitation, plants and animals adapted to hot dry climate |  |
| grasslands | Contain rye grass, buffalo grass, wild oats, and foxtail, rich in invertebrates, birds and mammals. |  |
| Tropical rainforest | Near the equator Warm wet climate. High biodiversity, large number of insects, parrots, toucans, snakes, frogs |  |
| Temperate Rain Forest | Between the tropics and polar circle, mild climate with distinct seasons, moist ecosystems in coastal areas lower biodiversity than tropical rainforest |  |

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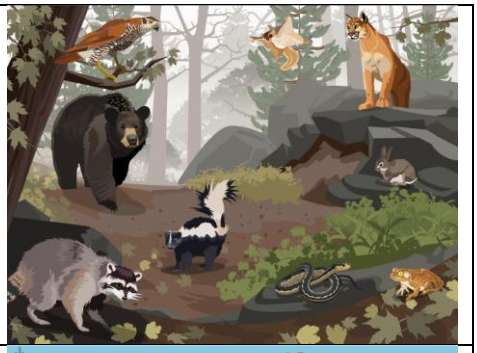
|---|---|---|
| Temperate Deciduous Forest | More variation in winter and summer temperatures, the most common forest in USA, mostly deciduous trees lose their leaves in fall |  |
| Taiga | A forest biome mostly of evergreen trees, exists only in the northern hemisphere. Colder temperatures fewer species of mammals and birds |  |
| Tundra | South of the north pole, frozen ground, diverse range of mammals |  |

7. Tropical rain forests and coral reefs are examples of ecosystems with low biodiversity.
    a. True
    b. False
8. Which is NOT an aquatic ecosystem?
    a. freshwater
    b. taiga
    c. estuary
    d. Wetland
9. Which of the following describes a taiga?
    a. warm and moist
    b. exists only in the northern hemisphere
    c. treeless
    d. mostly deciduous trees

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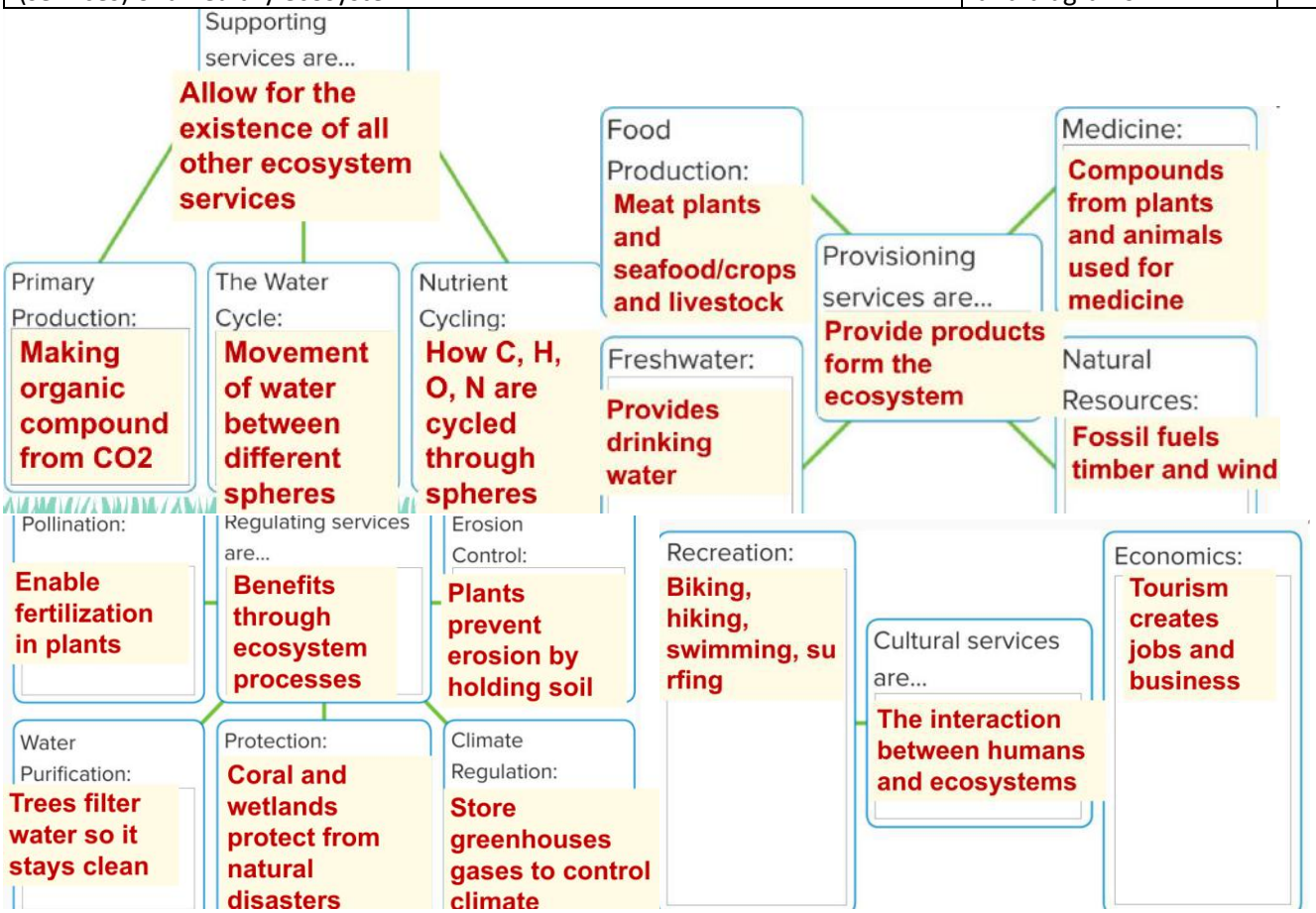
|---|---|---|
| Model biodiversity's importance to ecosystem stability and list the benefits (services) of a healthy ecosystem | Textbook investigation and diagrams | 159-162 |




10. Which of the following is a regulating service provided by ecosystems?
    a. the water cycles
    b. pollination
    c. food production
    d. natural resources
11. Which of the following is NOT a main type of ecosystem service?
    a. restoring
    b. supporting
    c. provisioning
    d. cultural
12. Which of the following is an example of a supporting ecosystem service?
    a. nutrient cycling
    b. recreation
    c. tourism
    d. habitat restoration

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| | | |
|---|---|---|
| Give examples of strategies to maintain biodiversity including controlling methods: mechanical, chemical and biological | Textbook and figures | 179 |

**Habitat Restoration and Conservation**

Two processes seek to restore land that was damaged by human intervention. **Reforestation** involves planting trees to replace trees that have been cut or burned down. **Reclamation** refers to the process of restoring land disturbed by mining.

**Controlling Invasive Species** Three main methods, or technologies, are used to control invasive species:

- mechanical controls—the use of physical means, such as fences, barriers, weeding, and trapping;
- chemical controls—the use of chemicals, such as herbicides and pesticides; and
- biological controls—the use of other species to combat an invasive species.

Which method (or methods) is used depends on the life history of the species, such as how it reproduces and spreads, the number of organisms in a defined area, and financial cost.

**Cleaning Up and Reducing Pollution**

One action that has reduced water pollution is the United States Clean Water Act, which regulates sources of water pollution. People can help reduce pollution by reducing the use of harmful chemicals and properly disposing of wastes. Sometimes living organisms, such as bacteria and plants, are used to remove chemicals from soil.

**Sustaining Populations** There are many regulations in place to help keep populations of organisms at sustainable levels. In the United States, hunting and fishing regulations are in place for sports people.

13. Which of these is a chemical control used to help control invasive species?
    a. using fences
    b. using other species
    c. using herbicides
    d. using barriers
14. Habitat restoration can have a positive impact on biodiversity in an area.
    a. True
    b. False
15. Which of the following is NOT a method used for controlling invasive species?
    a. the use of herbicides
    b. weeding
    c. reclamation
    d. the use of other species

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| | | |
|---|---|---|
| Identify significant threats to biodiversity, Explain the effects of habitat loss, the introduction of exotic species, hunting, and climate change to biodiversity. | Textbook figures and questions | 173, 183 |

**Threats to Biodiversity** You just explored how one type of pollution—air pollution—moves through an environment. **Pollution** is the contamination of the environment with substances that are harmful to life. You observed another threat to biodiversity at the beginning of this lesson—an invasive species. An **invasive species** is an organism that is introduced into an ecosystem, either by accident or on purpose, that spreads on its own and outcompetes native species for resources, such as space, food, light, and nutrients.

| Threat to Biodiversity | Example |
|---|---|
| **Habitat destruction** involves cutting down forests, draining wetlands, or generally changing a habitat so much that it is no longer usable by the organisms that live there. The photo to the right shows a wetland being drained. |  U.S. Fish & Wildlife Service |
| **Overexploitation** is the overuse of animal and plant species by humans for purposes including food, medicine, or clothing. |  MIXA/Getty Images |
| **Climate change** refers to changes in climate patterns over time. Recently there has been an increase in Earth's average surface temperature both on land and in oceans, referred to as global warming. |  |

16. The orange-spotted filefish, a fish that lives on coral reefs, is highly sensitive to changes in water temperature. After an extended period of warm water temperatures in 1988, the fish disappeared from the coral reefs off the coasts of Japan. Which threat to biodiversity caused the change in the population of orange spotted filefish?
    a. invasive species
    b. Overexploitation
    c. habitat destruction
    d. climate change
17. Evaluate the following possible solutions to combat the threats to biodiversity shown in the image above. Which of the following would be the least effective solution?

    a. regulating fishing

b. bioremediation
c. proper disposal of wastes
d. reducing the use of harmful chemicals

18. A wetland being drained so a housing development can be built is an example of _____. A) B) C) D)
    a. habitat destruction
    b. overexploitation
    c. pollution
    d. conservation
19. Climate change is a threat to biodiversity on Earth.
    a. True
    b. False
20. Which of the following is NOT one of the five major threats to biodiversity?
    a. habitat destruction
    b. invasive species
    c. overexploitation
    d. Reclamation

Module 3 Answer Key

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. b | 2. d | 3. b | 4. d | 5. a | 6. b | 7. b |
| 8. b | 9. b | 10. b | 11. a | 12. a | 13. c | 14. a |
| 15. c | 16. d | 17. a | 18. a | 19. a | 20. d | |