

**12.1****Ecosystems**

Key Concept Summaries

How Are Ecosystems Organized?

An **ecosystem** is all the things that live in a particular area, along with their nonliving environment. The parts of an ecosystem that are living or were once living are called **biotic factors**. The nonliving parts of an ecosystem are called **abiotic factors**. Sunlight, soil, water, oxygen, and temperature are all abiotic factors. An organism's **habitat** is the environment that

provides the things an organism needs to live, grow, and reproduce. An ecosystem's levels of organization are **organism, population, community, and ecosystem**. All members of one species that live in the area make up a **population**. All of the populations that live together in a particular area form a **community**.

What Are the Energy Roles of Organisms in Ecosystems?

All organisms have an energy role in their ecosystem. The energy role an organism plays in its ecosystem is that of a **producer, a consumer, or a decomposer**. An organism that makes its own food is called a **producer**. Plants, phytoplankton, and algae are producers. An organism that feeds on other organisms to obtain energy is called a **consumer**. Consumers are classified by the type of food they eat.

Herbivores get their energy by eating only plants. **Omnivores** eat plants and animals. **Carnivores** eat only animals. A **scavenger** is a carnivore that feeds on the bodies of dead or decaying organisms. A **decomposer** is an organism that gets energy by breaking down biotic wastes and dead organisms, returning the raw materials to soil and water. Fungi, such as mushrooms, and bacteria are all decomposers.

How Does Energy Flow in Ecosystems?

Energy flows through an ecosystem when one organism eats another. Food chains and food webs are ways to model how energy flows in an ecosystem. A **food chain** is a series of events in an ecosystem in which organisms transfer energy

by eating and being eaten. A food chain always begins with a producer. A **food web** is a model that shows the overlapping feeding relationships, or food chains, in an ecosystem.

**12.2****Populations**

Key Concept Summaries

How Do Populations Change in Size?

Populations can change in size when new members join the population or when members leave the population. The **birth rate** counts the number of births in a population over a certain amount of time. The **death rate** counts the number of deaths in a population over a certain amount of time.

When the birth rate is greater than the death rate, the population will generally increase. The population will generally decrease when the death

rate is greater than the birth rate. For example, the white-tailed deer population in Iowa decreased due to over-hunting.

The population can also change when individuals move into or out of the population. **Immigration** means moving into a population and **emigration** means leaving a population. Ecologists can graph how a population changes over time. The **population density** is the number of individuals in an area of a specific size.

What Factors Limit Population Growth?

A **limiting factor** is something in the environment that keeps a population from growing or makes a population smaller. Some limiting factors for populations are climate, space, food, and water.

Climate changes and unusual weather events, such as tornados, can limit population growth. The amount of available space can also limit population

growth. For example, a plant needs to grow in a large enough space to obtain the things it needs to survive. Food and water are also often limiting factors when they are in limited supply.

Limiting factors determine an area's carrying capacity. **Carrying capacity** is the largest population that an area can support.

**12.3****Interactions Among Living Things**

Key Concept Summaries

How Do Adaptations Help an Organism Survive?

Individuals with characteristics that are best suited for their environment tend to survive and pass on these characteristics to their offspring through a process called **natural selection**. The behaviors and physical characteristics that allow organisms to live successfully in their environments are called **adaptations**. Individuals with characteristics that are poorly suited for their environment are less likely to survive and reproduce.

An organism has a role, or **niche**, in its habitat. A niche includes the type of food the organism eats, how it gets this food, and what other organisms eat it. A niche also includes when and how the organism reproduces and the physical conditions that it needs to survive. Every organism has a variety of adaptations that are suited to its specific living conditions and help it survive.

What Are Competition and Predation?

Two major types of interactions among organisms and populations are competition and predation. **Competition** is the struggle between organisms to survive as they attempt to use the same limited resources. Populations that share the same habitat often have adaptations that reduce competition. For example, three types of birds can each get food from different parts of the same tree.

An interaction in which one organism kills another for food or nutrients is called **predation**.

The **predator** organism kills the prey organism. Predators have adaptations that help them catch prey. Organisms have adaptations that help them avoid becoming prey.

Predators can affect population size. If too many predators live in an area, the number of prey will decrease. As a result, there is less food for predators and the predator population will decrease as well.

What Are the Three Types of Symbiosis?

Symbiosis is any relationship in which two species live closely together and at least one of the species benefits. The three main types of symbiotic relationships are **mutualism**, **commensalism**, and **parasitism**. **Mutualism** is a relationship in which both species benefit. When an oxpecker eats ticks living on the impala's ear, both organisms benefit. **Commensalism** is a

relationship in which one species benefits and the other species is not affected, such as a bird's nest in a tree. **Parasitism** is a relationship that involves one organism living with, on, or inside another organism and harming it. The organism that benefits is called a **parasite**. The organism that it lives on or in is called the **host**.

TEKS 8.11(A) readiness

Choose the best answer for each question. Circle the letter for the correct answer or bubble the answer in the provided griddable.

1 Dr. Wilson is studying a marine ecosystem that contains copepods, diatoms, great white sharks, krill, leopard seals, orcas, and squid. Over a short period of time, the orca population decreases sharply. Soon after, the squid population decreases, and the great white shark and leopard seal populations increase.

Based on this information, what can you determine about the ecosystem?

- A** The orcas are predators that prey on both the great white sharks and the leopard seals. The great white sharks, the leopard seals, or both, are predators that prey on the squid.
- B** The orcas are predators that prey on the squid. The squid are predators that prey on both the great white sharks and the leopard seals.
- C** The orcas are predators that prey on the squid. The squid are predators that prey on the great white sharks.
- D** The squid are predators that prey on the orcas, the great white sharks, and the leopard seals.

2 Hector is going to draw a food web for a rain forest ecosystem. These are his notes:

Organism	Eats	Is Eaten By
butterfly	nectar	ants
sloth	leaves	harpy eagle
scarlet macaw	fruits, nuts	harpy eagle
beetle	leaves	squirrel monkey
squirrel monkey	beetles, fruit	harpy eagle

Which should Hector draw to indicate the correct energy transformation?

- F** an arrow pointing from the harpy eagle to the squirrel monkey
- G** an arrow pointing from the squirrel monkey to the harpy eagle
- H** an arrow pointing from the scarlet macaw to the beetles
- I** an arrow pointing from the beetles to the scarlet macaw

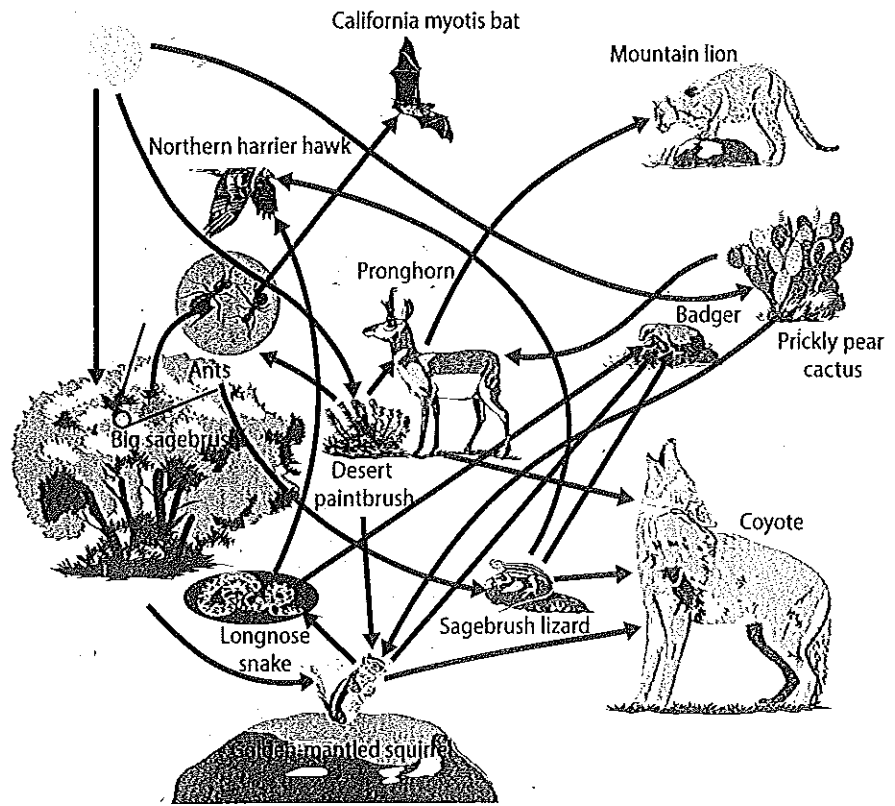
Explain your choice.

Explain your choice.

TEKS 8.11(A) readiness

Explain your choice.

3 This food web shows the flow of energy through a desert ecosystem.



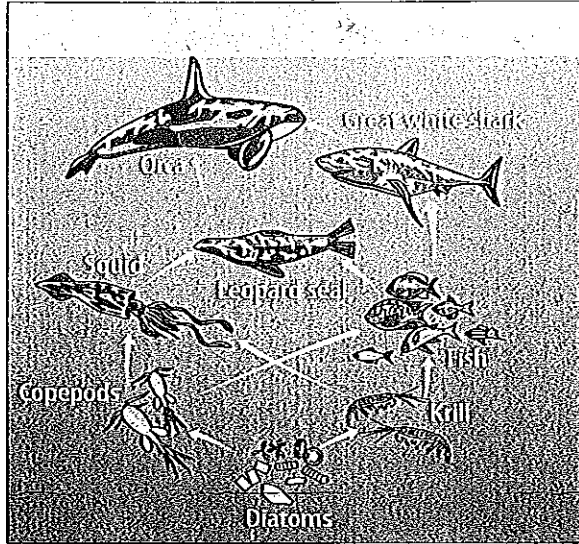
Which correctly describes a relationship shown on this food web?

- A The coyote and the mountain lion have a predator/prey relationship.
- B The coyote and the mountain lion have a producer/consumer relationship.
- C The golden-mantled squirrel and the big sagebrush have a predator/prey relationship.
- D The golden-mantled squirrel and the big sagebrush have a producer/consumer relationship.

TEKS 8.11(A) readiness

4 How many times is energy transferred when looking at the food chain between diatoms and squid?

Explain your choice.



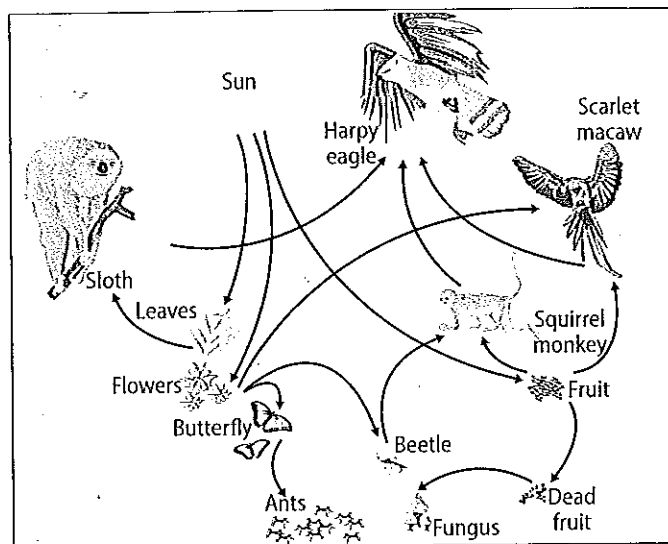
Record and bubble in your answer below.

0	0	0	0		0	0
1	1	1	1		1	1
2	2	2	2		2	2
3	3	3	3		3	3
4	4	4	4		4	4
5	5	5	5		5	5
6	6	6	6		6	6
7	7	7	7		7	7
8	8	8	8		8	8
9	9	9	9		9	9

TEKS 8.11(A) readiness

Explain your choice.

5 Use the diagram below to answer the question.



Which is a true statement that can be made about the food web?

- F** Ants are both consumers and producers.
- G** Flowers are both consumers and producers.
- H** Harpy Eagles are both predators and prey.
- I** Squirrel monkeys are both predators and prey.

Explain your choice.

6 Michelle is studying three different species in a food chain—species A, species B, and species C. She has noticed that when the population size of species C increases, then the population sizes of species A decreases and species B increases. When the size of species A increases, then the size of species B decreases and species C increases. When the size of species B increases, then the size of species A increases and species C increases.

Given the information above, which species are producers?

- A** Species A
- B** Species B
- C** Species A and C
- D** Species B and C

Check your answers.

If you missed 0-1, great job!

If you missed 2-3, not bad.

If you missed 4-6, review material on the relationships in ecosystems.

TEKS 8.11(B) readiness

Choose the best answer for each question. Circle the letter for the correct answer or bubble the answer in the provided griddable.

1 Joel is studying forest ecosystems. He noticed flowers that live directly under large, shady trees do not grow as well as flowers that live away from large, shady trees. Which answer best explains this observation?

- A** The flowers are competing with the trees for nitrogen.
- B** The flowers are competing with the trees for oxygen.
- C** The flowers are competing with the trees for prey.
- D** The flowers are competing with the trees for sunlight.

Explain your choice.

2 Jenn and Murphy are studying data from a small forest ecosystem in a city park. The data indicates that the deer population in the forest has grown significantly over the last several years. Why will the size of the deer population most likely decrease in the next few years?

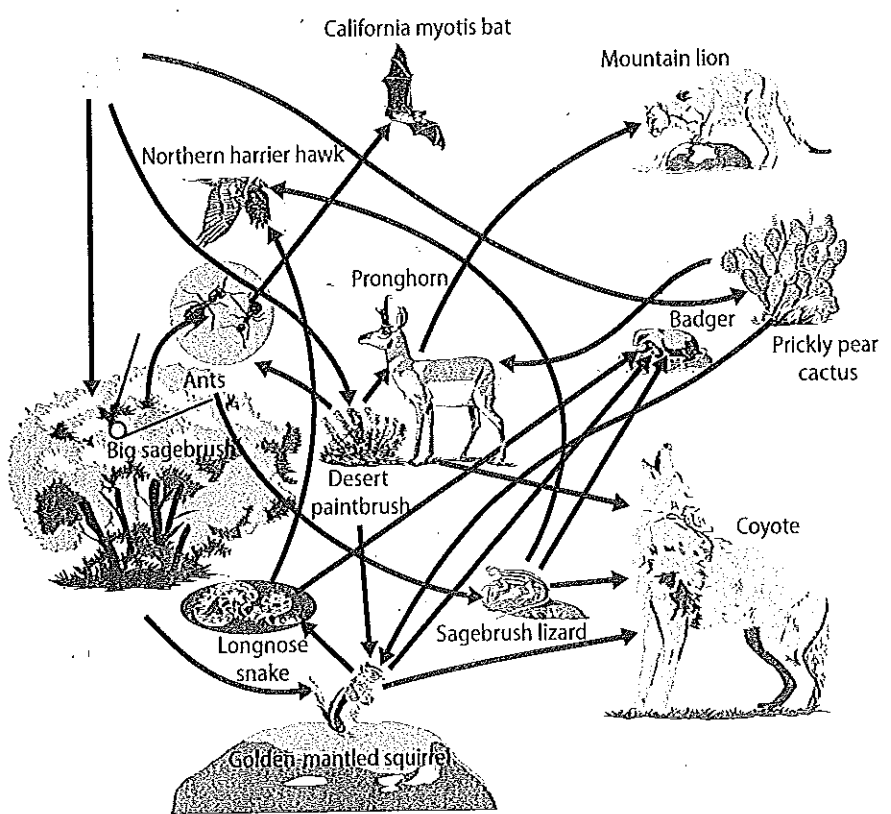
- F** The deer are competing for oxygen.
- G** The deer are competing for soil.
- H** The deer are competing for space.
- I** The deer are competing for sunlight.

Explain your choice.

TEKS 8.11(B) readiness

Explain your choice.

3 This food web shows some of the species that live in a desert ecosystem.



Which species would compete with each other for food?

- A the coyote and the golden-mantled squirrel
- B the golden-mantled squirrel, the pronghorn, and the sagebrush lizard
- C the northern harrier hawk, the badger, and the coyote
- D the pronghorn and the badger

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TEKS 8.11(B) readiness

- 4 Kenny is writing a report for science class. His topic is "Competition for Resources in an Ecosystem." This is part of his report:

Every ecosystem has biotic and abiotic factors. Organisms in an ecosystem that use the same factor may have to compete for them. For example, two different plant species may compete for biotic factors, such as nutrients in the soil. Two different animal species, like a lion and a cheetah, may compete for other biotic factors, such as food.

Which mistake did Kenny make?

- F Food is an abiotic factor.
- G Nutrients in the soil are abiotic factors.
- H Organisms do not compete for biotic factors.
- I Species do not compete for biotic factors.

- 5 Use the text below to answer the question.

Dr. Jones is studying an ecosystem near the university. During her study, two things happened slowly: the average temperature rose by nearly two degrees Celsius, and population size of one plant species got smaller. Then, the plant disappeared from the ecosystem. Then the population sizes of two different rodent species started to get smaller. Soon, one of the rodent species disappeared from the ecosystem. Now, the population of the other rodent species has recovered to near its original level.

Which is a possible explanation for what Dr. Sweeney observed in the ecosystem?

- A The increase in temperature led directly to the decrease in the rodent populations.
- B The disappearance of the plant species led to the decrease in rodent populations.
- C The missing rodent species relied on the missing plant species for food, while the other rodent species did not.
- D The rodent population decline caused the decline and disappearance of the plant species.

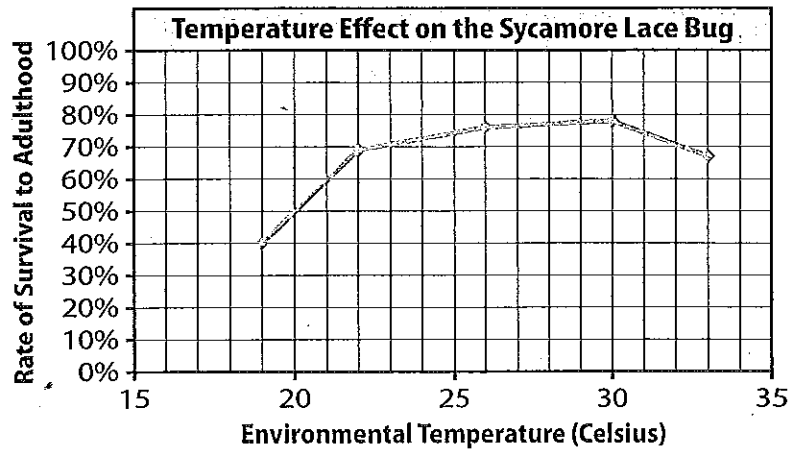
Explain your choice.

Explain your choice.

TEKS 8.11(B) readiness

Explain your choice.

6 Environmental factors, such as temperature, can significantly affect the populations in an ecosystem. A group of scientists studied the sycamore lace bug (*Corythucha ciliata*) to determine how it is affected by the temperature of its environment. They allowed batches of eggs to hatch and the larva to grow to adulthood at five different temperatures. The survival rates of the lace bug at each temperature are shown on this graph.



At which temperature is the sycamore lace bug is best adapted? Record and bubble in your answer below.

0	0	0	0	.	0	0
1	1	1	1		1	1
2	2	2	2		2	2
3	3	3	3		3	3
4	4	4	4		4	4
5	5	5	5		5	5
6	6	6	6		6	6
7	7	7	7		7	7
8	8	8	8		8	8
9	9	9	9		9	9

Check your answers.

If you missed 0-1, great job!

If you missed 2-3, not bad.

If you missed 4-6, review the biotic and abiotic factors.

TEKS 8.11(C) readiness

Choose the best answer for each question. Circle the letter for the correct answer or bubble the answer in the provided griddable.

1

The Texas state small mammal is the nine-banded armadillo, *Dasyus novemcinctus*. This solitary, nocturnal animal feeds mainly on insects and insect larvae such as termites, ants, beetles, and grubs. Armadillos forage mostly by smell, using their long snouts to probe for insects, worms, or other invertebrates in loose soil or decaying plant material. The sensitive nose of an armadillo can detect insects or worms living up to 20 centimeters underground. When an armadillo locates an anthill or termite mound, it digs frantically and then uses its long sticky tongue to lap up the insects.

During a drought, the soil becomes dry and hard. What do you predict will happen to the armadillo population in an area where there is a prolonged drought and why?

- A The armadillo population will change over time because some individuals will leave the drought area and then others will move in.
- B The armadillo population will decrease because the dry, hard soil will make foraging difficult and there will be fewer insects to eat.
- C The armadillo population will increase because insects are more abundant when there is less moisture in the soil.
- D The armadillo population will stay the same because each individual can find ample food by locating and digging for insects deep underground.

Explain your choice.

TEKS 8.11(C) readiness**Explain your choice.**

- 2** The brown pelican is a native bird often seen on the Gulf Coast of Texas. Brown pelicans fly low over the water to search for fish. When a pelican spots a fish, the bird pulls in its wings, dives down into the water, and uses the pouch connected to the lower half of its bill to scoop up the fish.

Which is the most likely explanation of how a pelican's bill came to include a large pouch for catching fish?

- F** A pelican had an accident that stretched the lower half of its bill. This individual was able to capture larger fish, so it lived longer and produced more offspring. These offspring inherited the helpful trait and it became widespread in later generations.
- G** A pelican hatched with a mutation that made its lower bill soft and expandable. This bird was able to capture larger fish, so it lived longer and produced more offspring. Over many generations, more and more offspring inherited the helpful mutation.
- H** Several pelicans hatched with mutations that made their lower bills soft and expandable. These birds were able to capture more and larger fish, which allowed them to produce more offspring. Over a few generations, the whole species acquired the trait.
- I** Several pelicans survived a disease that left their lower bills soft and expandable. These birds were able to capture larger fish, so they survived and produced offspring with expandable bills. Over a few generations the whole species acquired the trait.

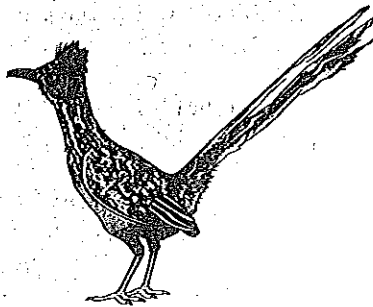
TEKS 8.11(C) readiness

3 Deanna and Juan are making a two-column table listing plant and animal traits that could become adaptations during a long-term environmental change. The example they are thinking about is a grassland environment that changes to a scrubland and then to a desert over hundreds of years.

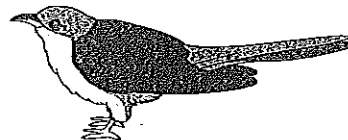
Which trait could they place in both columns of their table?

- A** ability to sense the environment and forage at night instead of during the day
- B** life cycle stages that include a dormant form requiring little water
- C** structures that can extend deep into the soil and reach underground water
- D** tissues that can store large amounts of extra water for long periods of time

4 These two Texas birds are both cuckoos. They live in different environments and have different adaptations.



Bird 1



Bird 2

Analyze the birds in the pictures. Which bird is best adapted for life in a treeless desert environment and why?

- F** Bird 1 because it has a crest on its head to focus sunlight on the head and a long tail for balance when standing or walking
- G** Bird 1 because it has long, broad feet to stand, walk, and run, and a strong, pointed bill for spearing prey
- H** Bird 2 because it has small, narrow feet to perch on branches and take flight and a sharp, curved bill for spearing prey
- I** Bird 2 because it has a striped tail and dark upper body for camouflage in shade and a thick pointed bill for digging

Explain your choice.

Explain your choice.

TEKS 8.11(C) readiness**Explain your choice.****5**

Before the year 1900, nearly one million ground-dwelling birds known as Attwater's prairie chickens lived on the coastal prairies of Texas and Louisiana. These prairies spread across 24,000 square kilometers of land and were covered with tall bunch grasses and other flowering plants. The prairie chickens fed on seeds, leaves, grasshoppers, and other insects. The feathered bodies of these ground-dwelling birds have a barred pattern of dark brown and white vertical stripes like that of a zebra.

Over the next hundred years, the coastal prairies shrank drastically as much of the land was used for farms, cities, and towns. Most of the remaining prairie changed into brushland because of fire suppression. By 1998, the population of Attwater's prairie chickens had decreased from one million to less than 500 birds.

Based on the passage, which best explains the decrease in the population of Attwater's prairie chickens between the years 1900–1998?

- A** The changes in the environment forced the birds to migrate into nearby pine forests to obtain food and hide from predators.
- B** The changes in the environment made it difficult for the birds to find food and also made them highly visible to predators.
- C** The changes in the environment made it difficult for the birds to find food and slowed their rate of reproduction.
- D** The changes in the environment made it easier for predators to kill the birds and only a few survivors were able to reproduce.

Check your answers.

If you missed 0-1, great job!

If you missed 2-3, not bad.

If you missed 4-5, review how short- and long-term environmental changes affect organisms and traits in subsequent populations.