

Ecology



Interdependence

*Mangrove roots
are home for fish.*

What Do You Think?

Ecosystems consist of living things that depend on each other to survive. How might these fish depend on mangrove roots? How do other interactions between organisms make this ecosystem function? Use information in this unit to help you make a claim with evidence to support your reasoning.

Ecology

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CITIZEN SCIENCE

Sharing Spaces

Florida provides living space for many kinds of birds. Ospreys are large birds of prey that eat mostly fish. They often nest on telephone poles and other man-made structures. Yellow-rumped warblers are small birds that live in trees and eat insects and berries.

1 Ask A Question

How can organisms affect each other and a whole ecosystem?

An ecosystem is made up of all the living and nonliving things in an environment. Ospreys and yellow-rumped warblers are part of the same ecosystem. With your teacher and your classmates, brainstorm ways in which ospreys and yellow-rumped warblers might affect each other.



Yellow-rumped warbler

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2 Think About It

Look at the photos of the ospreys in their environment. List at least two resources they need to survive and explain how the ospreys get them.

What are two ways nonliving things could affect yellow-rumped warblers?

3 Apply Your Knowledge

A List the ways in which yellow-rumped warblers and ospreys share resources.

B Yellow-rumped warblers live in Florida during the winter only. How might the warblers affect other organisms in the ecosystem if they stayed in Florida all year?

C Describe a situation that could negatively affect both the osprey population and the yellow-rumped warbler population.

Osprey nest

Take It Home!

Are ecologists looking for people to report observations in your community? Contact a university near your community to see if you can help gather information about plants, flowers, birds, or invasive species. Then, share your results with your class.

Introduction to Ecology

ESSENTIAL QUESTION

*How are
different parts
of the
environment
connected?*

By the end of this lesson, you should be able to analyze the parts of an environment.

This rain forest is an ecosystem. Hornbills are organisms in the ecosystem that use the trees for shelter.

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Lesson Labs

Quick Labs

- Condensation and Evaporation
- Greenhouse Effect
- Climate Determines Plant Life

Engage Your Brain

1 Describe In your own words, write a list of living or nonliving things that are in your neighborhood.



2 Relate Write a photo caption that compares the ecosystem shown above and the ecosystem shown on the previous page.

ACTIVE READING

3 Synthesize You can often define an unknown word or term if you know the meaning of its word parts. Use the word parts and sentence below to make an educated guess about the meaning of the term *abiotic factor*.

Word part	Meaning
<i>a-</i>	without
<i>bio-</i>	life

Example sentence

In an ecosystem, rocks are an example of an abiotic factor because they are not a living part of the environment.

abiotic factor:

Vocabulary Terms

- ecology
- biotic factor
- abiotic factor
- population
- species
- community
- ecosystem
- biome
- niche
- habitat

4 Apply As you learn the definition of each vocabulary term in this lesson, create your own definition or sketch to help you remember the meaning of the term.

The Web of Life

How are all living things connected?

Organisms need energy and matter to live. Interactions between organisms cause an exchange of energy and matter. This exchange creates a web of life in which all organisms are connected to each other and to their environment. **Ecology** is the study of how organisms interact with one another and with the environment.

Through the Living Environment

Each individual organism has a role to play in the flow of energy and matter. In this way, organisms are connected to all other organisms. Relationships among organisms affect each one's growth and survival. A **biotic factor** is an interaction between organisms in an area. Competition is one way that organisms interact. For example, different kinds of plants might compete for water in the desert.

This desert includes all of the organisms that live there, and all of the living and nonliving things that they need to survive.

This horse is a part of the living environment.



Through the Nonliving Environment

All organisms rely on the nonliving environment for survival. An **abiotic factor** is a nonliving part of an environment, such as water, nutrients, soil, sunlight, rainfall, or temperature. Some of these are resources that organisms need to grow and survive. For example, plants use sunlight, water, and soil nutrients to make food. Similarly, some organisms rely on soil or rocks for shelter.

Abiotic factors influence where organisms can survive. In a terrestrial environment, temperature and rainfall are important abiotic factors. In aquatic environments, the water's temperature, salt, and oxygen content are important abiotic factors. Changes in these basic abiotic factors affect where organisms can live and how many individuals are able to survive in the environment.

The rocks and air are parts of the nonliving environment.

ACTIVE READING

5 Explain Your Reasoning How does the environment determine where an organism can survive? Explain your reasoning.

Visualize It!

6 Categorize List the abiotic factors that are present in the photo.

7 Relate Choose one abiotic factor that you listed above and explain how the horse interacts with it.

Stay Organized!

What are the levels of organization in the environment?

The environment can be organized into different levels. These levels range from a single organism to all of the organisms and their surroundings in an area. The levels of organization get more complex as more of the environment is considered.

ACTIVE READING

8 Identify As you read, underline the characteristics of each of the following levels of organization.

Populations

A **population** is a group of individuals of the same species that live in the same place at the same time. A **species** includes organisms that are closely related and can mate to produce fertile offspring. The alligators that live in the Everglades form a population. Individuals within a population often compete with each other for resources.

Population

Individual

Ecosystem

Ecosystems

An **ecosystem** is a community of organisms and their nonliving environment. In an ecosystem, organisms and the environment exchange energy and other resources. For example, alligators need to live near a body of water such as a marsh or a pond. They eat animals, such as birds, that wade near the shoreline. The water also helps alligators keep a stable body temperature. All abiotic and biotic factors make up an ecosystem. Examples of ecosystems include salt marshes, ponds, and forests.

Community

Communities

A **community** is made up of all the populations of different species that live and interact in an area. The species in a community depend on each other for many things, such as shelter and food. For example, the herons shown here get energy and nutrients by eating other organisms. But organisms in a community also compete with each other for resources just as members of a population do.

Visualize It!

9 Identify This osprey is a predatory bird that is part of the Florida Everglades ecosystem. Identify individuals of one other population that you see.

10 Claims • Evidence • Reasoning Make a claim about how the osprey interacts with the population that you just identified. Provide evidence to support the claim and explain your reasoning.

Think Globally!

What is a biome?

Each ecosystem has its own unique biotic and abiotic factors. Some ecosystems have few plants and are cold and dry. Others have forests and are hot and moist. This wide diversity of ecosystems can be organized into categories. Large regions characterized by climate and communities of species are grouped together as **biomes**. A biome can contain many ecosystems. Major land biomes include tropical rain forest, tropical grassland, temperate grassland, desert, temperate deciduous forest, temperate rain forest, taiga, and tundra.

What characteristics define a biome?

All of the ecosystems in a biome share some traits. They share climate conditions, such as temperature and rainfall, and have similar communities.

Climate Conditions

ACTIVE READING

11 Identify As you read, underline the climate factors that characterize biomes.

Temperature is an important climate factor that characterizes biomes. For example, some biomes have a constant temperature. The taiga and tundra have cold temperatures all year. Tropical biomes are warm all year. In other biomes, the temperature changes over the course of a year. Temperate biomes have warm summers and colder winters. In some biomes, major temperature changes occur within a single day. For example, some deserts are hot during the day but cold at night.

Biomes also differ in the amount of precipitation they receive. For example, tropical biomes receive a lot of rainfall, while deserts receive little precipitation. The taiga and tundra have moist summers and dry winters.

This temperate rain forest gets a lot of rainfall. The organisms here have adapted to the wet climate.

i Think Outside the Book

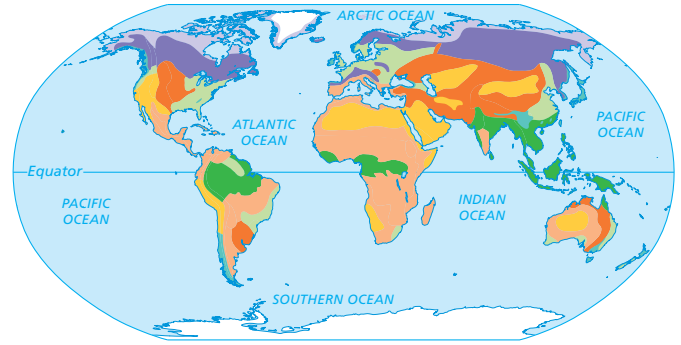
12 Claims • Evidence •

Reasoning Describe your climate and make a list of the living things that are found in natural undeveloped areas nearby. Research which biome has these features. Use evidence to make a claim about the biome you live in and support your reasoning. Look at a biome map to see if your claim matches the biome that is mapped for your location.

Communities of Living Things

Biomes contain communities of living things that have adapted to the climate of the region. Thus, ecosystems within the same biome tend to have similar species across the globe. Monkeys, vines, and colorful birds live in hot and humid tropical rain forests. Grasses, large mammals, and predatory birds inhabit tropical grasslands on several continents.

Only certain types of plants and animals can live in extreme climate conditions. For example, caribou, polar bears, and small plants live in the tundra, but trees cannot grow there. Similarly, the plant and animal species that live in the desert are also unique. Cacti and certain animal species have adaptations that let them tolerate the dry desert climate.

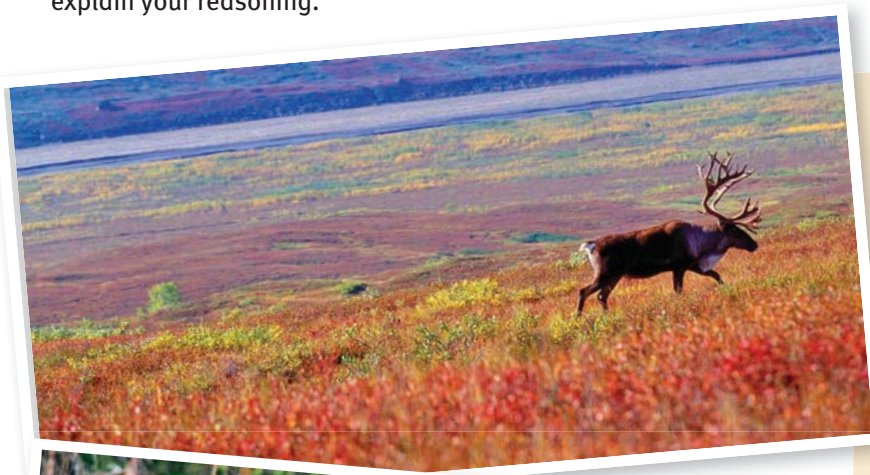


World biomes

- Desert
- Tropical grassland
- Temperate grassland
- Tropical rain forest
- Temperate deciduous forest
- Temperate rain forest
- Taiga
- Tundra

Visualize It!

13 Claims • Evidence • Reasoning The photos below show two different biomes. Use what you learned about the characteristics of biomes to compare these environments. Use evidence to support a claim for categorizing them as different biomes and explain your reasoning.



Compare: _____

Explain your reasoning: _____

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Home Sweet Home

What determines where a population can live?

Ecologists study the specific needs of different kinds of organisms and the role each species plays in the environment. Organisms that live in the same area have different ways of getting the resources they need.

Niche

Each population in an ecosystem plays a specific role. A population's **niche** (NICH) is the abiotic conditions under which individuals can survive and the role they play in the ecosystem. For example, one part of a shark population's niche is eating fish.

A **habitat** is the place where an organism usually lives and is part of an organism's niche. The habitat must provide all of the resources that an organism needs to grow and survive. Abiotic factors, such as temperature, often influence whether a species can live in a certain place. Biotic factors, such as the interactions with other organisms that live in the area, also play a role. For example, the habitat of a shark must include populations of fish it can eat.

Two populations cannot occupy exactly the same niche. Even small differences in habitats, roles, and adaptations can allow similar species to live together in the same ecosystem. For example, green and brown anoles sometimes live on the same trees, but they avoid competition by living in different parts of the trees.

14 Relate How is a habitat like a person's address? How is a niche like a person's job?

Visualize It!

15 Claims • Evidence • Reasoning

Describe the prairie dog's niche. How does it find shelter and impact the environment? Summarize evidence to support the claim and explain your reasoning.



Prairie dogs dig burrows in grassy plains. They eat plants and are hunted by predators such as owls and foxes.

Lizard Invasion

Green anole lizards (*Anolis carolinensis*) have been part of the South Florida ecosystem for a long time. Recently, a closely related lizard, the nonnative brown anole (*Anolis sagrei*), invaded the green anoles' habitat. How do they avoid competing with each other for resources?

Home Base

Green anoles live on perches throughout a tree. Brown anoles live mainly on branches that are close to the ground. If they have to share a tree, green anoles will move away from perches close to the ground. In this way, both kinds of anoles can live in the same tree while avoiding competition with each other.



Intrusive Neighbors

Although brown and green anoles can coexist by sharing their habitats, they do not live together peacefully. For example, brown anoles affect green anoles by eating their young.

i Extend

16 Describe How do green and brown anoles avoid competition? Draw a picture of a tree showing both green and brown anoles living in it.

17 Research What are other examples of two species dividing up the parts of a habitat?

18 Claims • Evidence • Reasoning Make a claim about what would happen if the habitats of the two species overlapped. Present your evidence to support your reasoning in a format such as a short story, a music video, or a play.

Visual Summary

To complete this summary, circle the correct word. You can use this page to review the main concepts of the lesson.

Ecology is the study of the biotic and abiotic factors in an ecosystem, and the relationships between them.

Ecology and Ecosystems

19 In a desert ecosystem, the sand is a(n) *biotic / abiotic* factor, and a lizard eating an insect is a(n) *biotic / abiotic* factor.

Every organism has a habitat and a niche.

20 Horses that live in the desert feed on other organisms that live there, such as low, dry shrubs. In this example, the desert is a *habitat / niche* and the horses' feeding behavior is part of a *habitat / niche*.

The environment can be organized into different levels, including populations, communities, and ecosystems.

21 Populations of cacti, together with sand and rocks, are included in a desert *community / ecosystem*.

Biomes are characterized by climate conditions and the communities of living things found within them.

22 Biomes are *large / small* regions that *make up / contain* ecosystems.

23 Claims • Evidence • Reasoning Name a biotic factor in the desert ecosystem above and make a claim about the effect on the horses if it were removed from the ecosystem. Cite evidence to support your claim and explain your reasoning.

Vocabulary

1 Explain how the meanings of the terms *biotic factor* and *abiotic factor* differ.

2 In your own words, write a definition for *ecology*.

3 Explain how the meanings of the terms *habitat* and *niche* differ.

Key Concepts

4 Compare What is the relationship between ecosystems and biomes?

5 Explain Within each biome, how can the environment be organized into levels from complex to simple?

6 Explain Your Reasoning How do the populations in a community depend on each other? Explain your reasoning.

7 Identify What factors determine where a population can live?

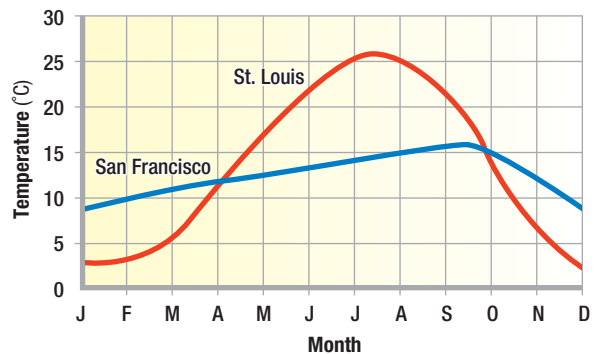
Critical Thinking

8 Claims • Evidence • Reasoning What might happen in a tropical rain forest biome if the area received very little rain for an extended period of time? Summarize evidence that supports the claim and explains your reasoning.

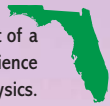
9 Claims • Evidence • Reasoning Owls and hawks both eat rodents. They are also found in the same habitats. Since no two populations can occupy exactly the same niche, make a claim about how owls and hawks coexist. Summarize evidence that supports the claim and explains your reasoning.

Use this graph to answer the following question.

Average Monthly Temperatures



10 Interpret What is the difference in average temperature between the two cities in July?



Kenneth Krysko

ECOLOGIST

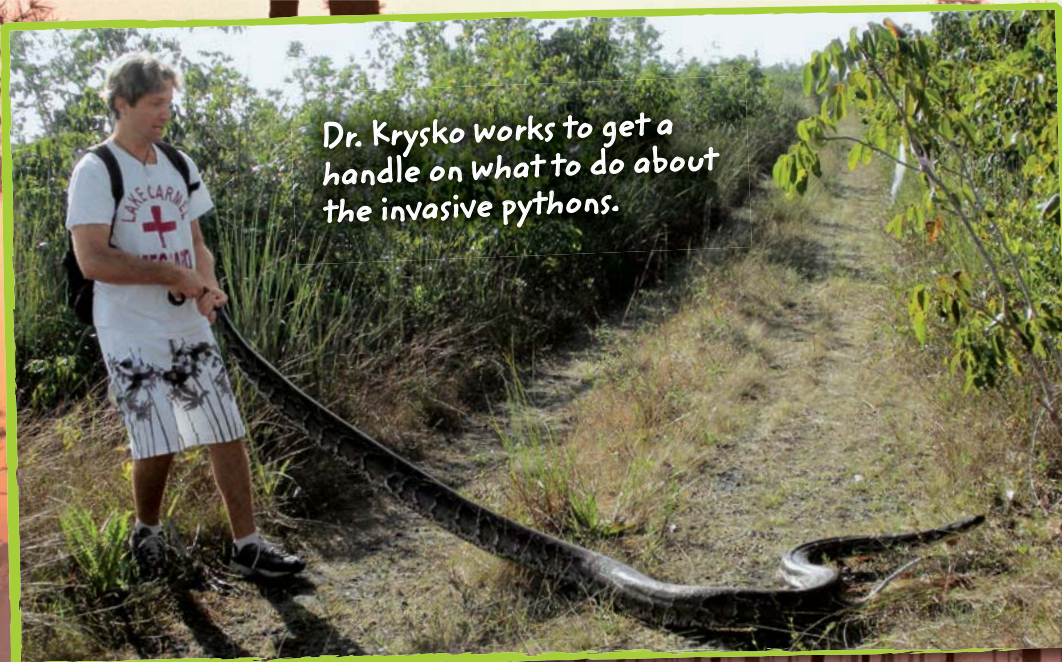


Snakes have fascinated Dr. Kenneth Krysko since he was four years old. Now he is an ecologist specializing in herpetology—the study of snakes. You can often find him in the Florida Everglades looking for Burmese pythons. He tracks these pythons to help limit the effect they have on Florida ecosystems.

Burmese pythons can grow to be 6 meters long. They are native to southeast Asia and were illegally brought to Florida as pets. Many owners released them into the wild when the snakes grew too large. The snakes breed well in Florida’s subtropical climate. And they eat just about any animal they can swallow, including many native species. Dr. Krysko tracks down

these invasive pythons. Through wildlife management, molecular genetics, and other areas of study, he works with other scientists to search for ways to reduce the python population.

Dr. Krysko studies many other invasive species, that is, nonnative species that can do harm in Florida ecosystems. He shares what he learns, including ways to identify and deal with invasive species with other ecologists. Along with invasion ecology, he has done research in reproduction and conservation biology. Dr. Krysko also works as a collections manager in the herpetology division at the Florida Museum of Natural History.



Dr. Krysko works to get a handle on what to do about the invasive pythons.

© Dorling Kindersley/Getty Images; (b) © Dr. Kenneth Krysko

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JOB BOARD

Park Naturalist

What You'll Do: Teach visitors at state and national parks about the park's ecology, geology, and landscape. Lead field trips, prepare and deliver lectures with slides, and create educational programs for park visitors. You may participate in research projects and track organisms in the park.

Where You Might Work: State and national parks

Education: An advanced degree in science and teacher certification

Other Job Requirements: You need to be good at communicating and teaching. Having photography and writing skills helps you prepare interesting educational materials.

Conservation Warden

What You'll Do: Patrol an area to enforce rules, and work with communities and groups to help educate the public about conservation and ecology.

Where You Might Work: Indoors and outdoors in state and national parks and ecologically sensitive areas

Education: A two-year associate's degree or at least 60 fully accredited college-level credits

Other Job Requirements: To work in the wild, good wilderness skills, map-reading, hiking, and excellent hearing are useful.

PEOPLE IN SCIENCE NEWS

Phil McCrory



Saved by a Hair!

Phil McCrory, a hairdresser in Huntsville, Alabama, asked a brilliant question when he saw an otter whose fur was drenched with oil from the Exxon Valdez oil spill. If the otter's fur soaked up oil, why wouldn't human hair do the same? McCrory gathered hair from the floor of his salon and performed his own experiments. He stuffed hair into a pair of pantyhose and tied the ankles together. McCrory floated this bundle in his son's wading


pool and poured used motor oil into the center of the ring. When he pulled the ring closed, not a drop of oil remained in the water! McCrory's discovery was tested as an alternative method for cleaning up oil spills. Many people donated their hair to be used for cleanup efforts. Although the method worked well, the engineers conducting the research concluded that hair is not as useful as other oil-absorbing materials for cleaning up large-scale spills.

Roles in Energy Transfer


ESSENTIAL QUESTION

How does energy flow through an ecosystem?

By the end of this lesson, you should be able to relate the roles of organisms to the transfer of energy in food chains and food webs.



Energy is transferred from the sun to producers, such as kelp. It flows through the rest of the ecosystem.



This fish also needs energy to live. How do you think it gets this energy? From the sun like kelp do?



SC.7.L.17.1 Explain and illustrate the roles of and relationships among producers, consumers, and decomposers in the process

of energy transfer in a food web.

Lesson Labs

Quick Labs

- Yeast Action
- Pyramid of Energy

Exploration Lab

- Food Webs

Engage Your Brain

1 Describe Most organisms on Earth get energy from the sun. How is energy flowing through the ecosystem pictured on the opposite page?

2 Predict List two of your favorite foods. Then, explain how the sun's energy helped make those foods available to you.

ACTIVE READING

3 Synthesize You can often define an unknown word if you know the meaning of its word parts. Use the word parts and sentences below to make an educated guess about the meaning of the words *herbivore* and *carnivore*.

Word part	Meaning
-vore	to eat
herbi-	plant
carni-	meat

Example sentence

A koala bear is an herbivore that eats eucalyptus leaves.

herbivore:

Example sentence

A great white shark is a carnivore that eats fish and other marine animals.

carnivore:

Vocabulary Terms

- producer
- decomposer
- consumer
- herbivore
- carnivore
- omnivore
- food chain
- food web

4 Apply As you learn the definition of each vocabulary term in this lesson, create your own definition or sketch to help you remember the meaning of the term.

Get Energized!

How do organisms get energy?

Energy is all around you. Chemical energy is stored in the bonds of molecules and holds molecules together. The energy from food is chemical energy in the bonds of food molecules. All living things need a source of chemical energy to survive.

Think Outside the Book

5 Apply Record what you eat at your next meal. Where do you think these items come from, before they reach the market?

ACTIVE READING

6 Identify As you read, underline examples of producers, decomposers, and consumers.

Producers Convert Energy Into Food

A **producer**, also called an autotroph, uses energy to make food. Most producers use sunlight to make food in a process called photosynthesis. The sun powers most life on Earth. In photosynthesis, producers use light energy to make food from water, carbon dioxide, and nutrients found in water and soil. The food contains chemical energy and can be used immediately or stored for later use. All green plants, such as grasses and trees, are producers. Algae and some bacteria are also producers. The food that these producers make supplies the energy for other living things in an ecosystem.

Decomposers Break Down Matter

An organism that gets energy and nutrients by breaking down the remains of other organisms is a **decomposer**. Fungi, such as the mushrooms on this log, and some bacteria are decomposers. Decomposers are nature's recyclers. By converting dead organisms and animal and plant waste into materials such as water and nutrients, decomposers help move matter through ecosystems. Decomposers make these simple materials available to other organisms.



This plant is a producer. Producers make food using light energy from the sun.



These mushrooms are decomposers. They break down the remains of plants and animals.

(l) ©Jason Edwards/National Geographic/Getty Images; (r) ©jallebug/Alamy

Consumers Eat Other Organisms

A **consumer** is an organism that eats other organisms. Consumers use the energy and nutrients stored in other living organisms because they cannot make their own food. A consumer that eats only plants, such as a grasshopper or bison, is called an **herbivore**. A **carnivore**, such as a badger or this wolf, eats other animals. An **omnivore** eats both plants and animals. A *scavenger* is a specialized consumer that feeds on dead organisms. Scavengers, such as the turkey vulture, eat the leftovers of the meals of other animals or eat dead animals.



This wolf is a consumer. It eats other organisms to get energy.

Consumers

Visualize It!

7 List Beside each image, place a check mark next to the word that matches the type of consumer the animal is.



Name: Moose
What I eat: grasses, fruits

What am I?
 herbivore
 omnivore
 carnivore



Name: Hedgehog
What I eat: leaves, earthworms, insects

What am I?
 herbivore
 omnivore
 carnivore



Name: Komodo dragon
What I eat: insects, birds, mammals

What am I?
 herbivore
 omnivore
 carnivore

8 Claims • Evidence • Reasoning Make a claim about how carnivores might be affected if the main plant species in a community were to disappear. Summarize evidence to support the claim and explain your reasoning.

Energy Transfer

How is energy transferred among organisms?

Organisms change energy from the environment or from their food into other types of energy. Some of this energy is used for the organism's activities, such as breathing or moving. Some of the energy is saved within the organism to use later. If an organism is eaten or decomposes, the consumer or decomposer takes in the energy stored in the original organism. Only chemical energy that an organism has stored in its tissues is available to consumers. In this way, energy is transferred from organism to organism.

ACTIVE READING

- 9 Claims • Evidence • Reasoning** When a grasshopper eats grass, only some of the energy from the grass is stored in the grasshopper's body. Make a claim about how the grasshopper uses the rest of the energy. Summarize evidence to support the claim and explain your reasoning. How does the grasshopper use the rest of the energy?
-
-



This tree gets its energy from the sun.

10 Identify By what process does this tree get its energy?



This ant eats plants like the mesquite tree, and other insects.

11 Apply What type of energy is this ant consuming?

Energy Flows Through a Food Chain

A **food chain** is the path of energy transfer from producers to consumers. Energy moves from one organism to the next in one direction. The arrows in a food chain represent the transfer of energy, as one organism is eaten by another. Arrows represent the flow of energy from the body of the consumed organism to the body of the consumer of that organism.

Producers form the base of food chains. Producers transfer energy to the first, or primary, consumer in the food chain. The next, or secondary, consumer in the food chain consumes the primary consumer. A tertiary consumer eats the secondary consumer. Finally, decomposers recycle matter back to the soil.

Visualize It!

The photographs below show a typical desert food chain. Answer the following four questions from left to right based on your understanding of how energy flows in a food chain.

This hawk eats the lizard. It is at the top of the food chain.



13 Predict If nothing ever eats this hawk, what might eventually happen to the energy that is stored in its body?

This lizard eats mostly insects.



12 Apply What does the arrow between the ant and the lizard represent?

World Wide Webs

How do food webs show energy connections?

Few organisms eat just one kind of food. So, the energy and nutrient connections in nature are more complicated than a simple food chain. A **food web** is the feeding relationships among organisms in an ecosystem. Food webs are made up of many food chains.

The next page shows a coastal food web. Most of the organisms in this food web live in the water. The web also includes some birds that live on land and eat fish. Tiny algae called phytoplankton form the base of this food web. Like plants on land, phytoplankton are producers. Tiny consumers called zooplankton eat phytoplankton. Larger animals, such as fish and squid, eat zooplankton. At the top of each chain are top predators, animals that eat other animals but are rarely eaten. In this food web, the killer whale is a top predator. Notice how many different energy paths lead from phytoplankton to the killer whale.

ACTIVE READING

- 14 Identify** Underline the type of organism that typically forms the base of the food web.

Visualize It!

- 15 Apply** Complete the statements to the right with the correct organism names from the food web.

Energy flows up the food web when _____ eat puffins.

Puffins are connected to many organisms in the food web.

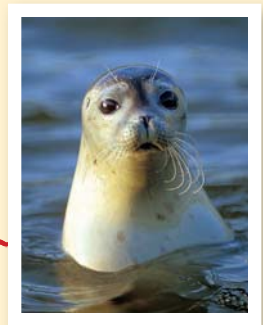
Puffins get energy by eating _____ , _____ , and _____ .

Food Web

The top predator is shown at the top of the food web. What is the top predator in this food web?



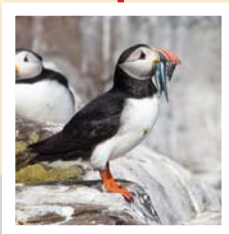
Killer whale



Seal



Gull



Puffin



Cod



Squid



Herring



Sand lance



Zooplankton



Phytoplankton

Consumers can eat producers and other consumers.

Producers, such as these phytoplankton, form the base of the food web.

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How are organisms connected by food webs?

All living organisms are connected by global food webs. Global food webs include webs that begin on land and webs that begin in the water. Many organisms have feeding relationships that connect land- and water-based food webs. For example, algae might be eaten by a fish, which might then be eaten by a bird.

Food webs that start on land may also move into the water. Many insects that eat plants on land lay their eggs in the water. Some fish eat these eggs and the insect larvae that hatch from them. Because the global food webs are connected, removing even one organism can affect many organisms in other ecosystems.

18 Claims • Evidence • Reasoning

Gulls don't eat herring but they are still connected by the food web. Make a claim about how gull populations might be affected. Use evidence to support the claim and explain your reasoning.

Visualize It!

Imagine how these organisms would be affected if herring disappeared from the food web. Answer the questions starting at the bottom of the page.



16 Identify Put a check mark next to the organisms that eat herring.

17 Claims • Evidence • Reasoning

With no herring to eat, how might the eating habits of cod change? Summarize evidence to support the claim and explain your reasoning.

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WHY IT MATTERS

Dangerous Competition

EYE ON THE ENVIRONMENT

Sometimes species are introduced into a new area. These invasive species often compete with native species for energy resources, such as sunlight and food.

Full Coverage

The kudzu plant was introduced to stop soil erosion, but in the process it outgrew all the native plants, preventing them from getting sunlight. Sometimes it completely covers houses or cars!



Destructive Zebras

The zebra mussel is one of the most destructive invasive species in the United States. They eat by filtering tiny organisms out of the water, often leaving nothing for the native mussel species.



Across the Grass

The walking catfish can actually move across land to get from one pond to another! As a result, sometimes the catfish competes with native species for food.

i Extend

19 Claims • Evidence • Reasoning Make a claim about how competition between invasive and native species might affect a food web. Summarize evidence to support the claim and explain your reasoning.

20 Describe Give an example of competition for a food resource that may occur in an ecosystem near you.

21 Illustrate Provide an illustration of your example of competition in a sketch or a short story. Be sure to include the important aspects of food webs that you learned in the lesson.

Visual Summary

To complete this summary, circle the correct word. You can use this page to review the main concepts of the lesson.

Energy Transfer in Ecosystems

Food Web

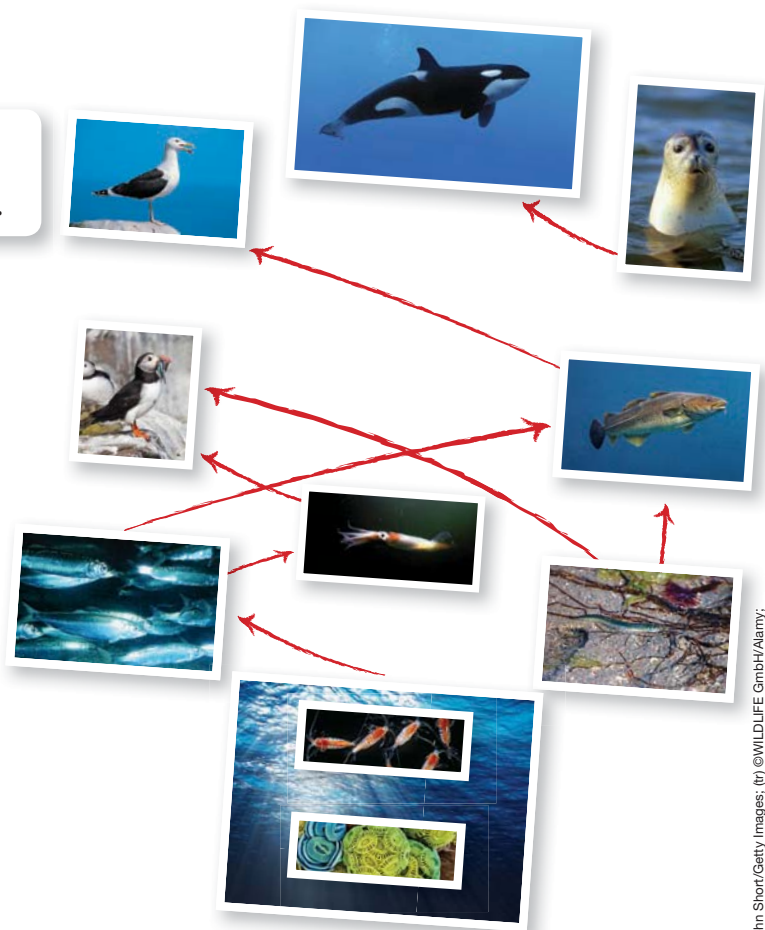
Organisms get energy in different ways.

- Producers make their own food.
- Consumers eat other living organisms.
- Decomposers break down dead organisms.

22 *Herbivores, carnivores, and omnivores are three types of producers / consumers / decomposers.*

Food chains and food webs describe the flow of energy in an ecosystem.

23 *All food chains start with producers / consumers / decomposers.*



24 Claims • Evidence • Reasoning Predict the effects on global food webs if the sun's energy could no longer reach Earth. Use evidence to support the claim and explain your reasoning.

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(cl) ©Doug Allard/The Image Bank/Getty Images; (cc) ©Jeff Rotman/Photo

Vocabulary

Fill in the blanks with the term that best completes the following sentences.

- 1 _____ is the primary source of energy for most ecosystems.
- 2 A _____ eats mostly dead matter.
- 3 A _____ contains many food chains.
- 4 _____ is the process by which light energy from the sun is converted to food.

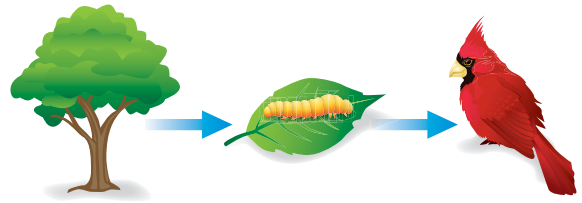
Key Concepts

- 5 **Describe** What are the roles of producers, consumers, and decomposers in an ecosystem?

- 6 **Explain Your Reasoning** What types of organisms typically make up the base, middle, and top of a food web? Explain your reasoning.

- 7 **Describe** Identify the two types of global food webs and describe how they are connected.

Use the figure to answer the following questions.



- 8 **Apply** Describe the flow of energy in this food chain. Be sure to use the names of the organisms and what role they serve in the food chain (producer, consumer, or decomposer). If an organism is a consumer, identify whether it is an herbivore, carnivore, or omnivore.

- 9 **Apply** What do the arrows represent in the figure above?

Critical Thinking

- 10 **Claims • Evidence • Reasoning** Give an example of a decomposer, and make a claim about what would happen if decomposers were absent from a forest ecosystem. Summarize evidence to support the claim and explain your reasoning.

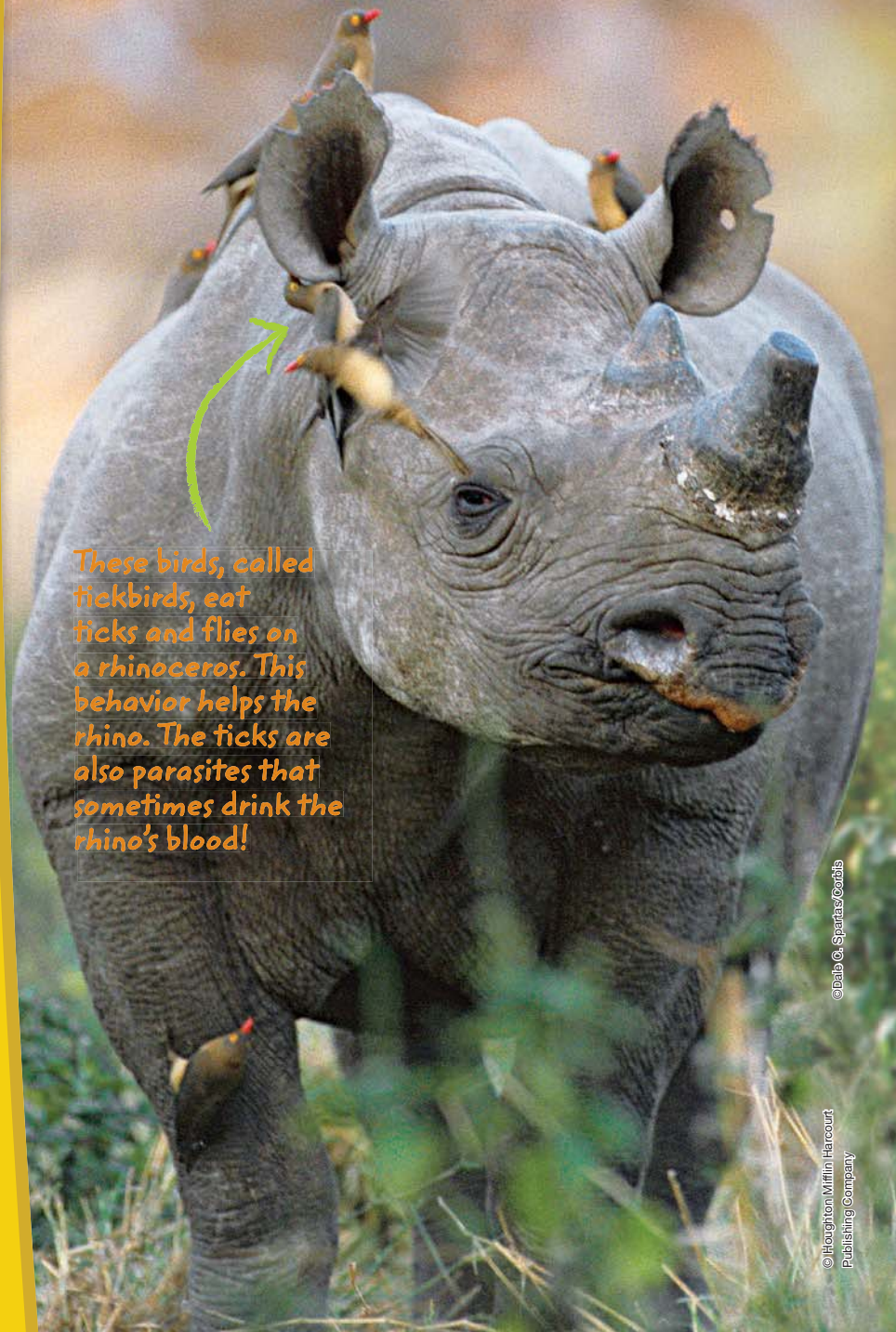
- 11 **Claims • Evidence • Reasoning** How would a food web be affected if a species disappeared from an ecosystem? Summarize evidence to support your claim and explain your reasoning.

Interactions in Communities

ESSENTIAL QUESTION

How do organisms interact?

By the end of this lesson, you should be able to predict the effects of different interactions in communities.



These birds, called tickbirds, eat ticks and flies on a rhinoceros. This behavior helps the rhino. The ticks are also parasites that sometimes drink the rhino's blood!



SC.7.N.1.1 Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions. **SC.7.L.17.2** Compare and contrast the relationships among organisms such as mutualism, predation, parasitism, competition, and commensalism.



Lesson Labs

Quick Labs

- What Organisms Does an Environment Support?
- Measuring Species Diversity
- Biodiversity All Around Us

Exploration Lab

- How Do Populations Interact?
- Change in Populations



Engage Your Brain

1 Predict Check T or F to show whether you think each statement is true or false.

- | | | |
|--------------------------|--------------------------|--|
| T | F | |
| <input type="checkbox"/> | <input type="checkbox"/> | Different animals can compete for the same food. |
| <input type="checkbox"/> | <input type="checkbox"/> | Parasites help the organisms that they feed on. |
| <input type="checkbox"/> | <input type="checkbox"/> | Some organisms rely on each other for necessities such as food or shelter. |
| <input type="checkbox"/> | <input type="checkbox"/> | Organisms can defend themselves against predators that try to eat them. |

2 Explain Draw an interaction between two living things that you might observe while on a picnic. Write a caption to go with your sketch.

ACTIVE READING

3 Synthesize You can often define an unknown word if you know the meaning of its word parts. Use the word parts and sentence below to make an educated guess about the meaning of the word *symbiosis*.

Word part	Meaning
bio-	life
sym-	together

Example sentence

The relationship between a sunflower and the insect that pollinates it is an example of *symbiosis*.

symbiosis:

Vocabulary Terms

- predator
- prey
- symbiosis
- mutualism
- commensalism
- parasitism
- competition

4 Apply As you learn the meaning of each vocabulary term in this lesson, create your own definition or sketch to help you remember the meaning of the term.

Feeding Frenzy!

How do predator and prey interact?

Every organism lives with and affects other organisms. Many organisms must feed on other organisms in order to get the energy and nutrients they need to survive. These feeding relationships establish structure in a community.

ACTIVE READING

5 Identify As you read, underline examples of predator-prey adaptations.

*This lion is a predator.
The warthog is its prey.*



Predators Eat Prey

In a predator-prey relationship, an animal eats another animal for energy and nutrients. The **predator** eats another animal. The **prey** is an animal that is eaten by a predator. An animal can be both predator and prey. For example, if a warthog eats a lizard, and is, in turn, eaten by a lion, the warthog is both predator and prey.

Predators and prey have adaptations that help them survive. Some predators have talons, claws, or sharp teeth, which provide them with deadly weapons. Spiders, which are small predators, use their webs to trap unsuspecting prey. Camouflage (CAM•ah•flaj) can also help a predator or prey to blend in with its environment. A tiger's stripes help it to blend in with tall grasses so that it can ambush its prey, and the wings of some moths look just like tree bark, which makes them difficult for predators to see. Some animals defend themselves with chemicals. For example, skunks and bombardier beetles spray predators with irritating chemicals.

Adaptations of Predators and Prey

Most organisms wouldn't last a day without their adaptations. This bald eagle's vision and sharp talons allow it to find and catch prey.

sharp talons



© Kevn Scharf/Corbis

© Houghton Mifflin Harcourt Publishing Company

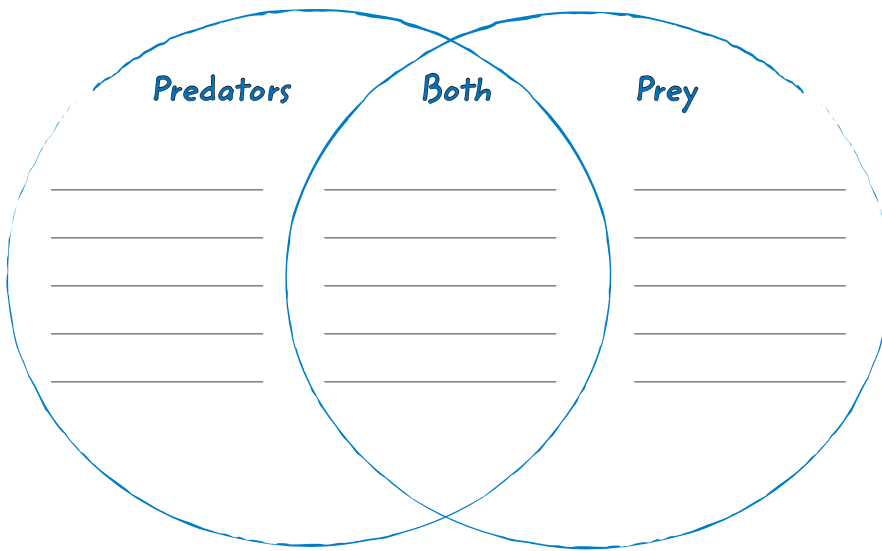
Predators and Prey Populations Are Connected

Predators rely on prey for food, so the sizes of predator and prey populations are linked together very closely. If one population grows or shrinks, the other population is affected. For example, when there are a lot of warthogs to eat, the lion population may grow because the food supply is plentiful. As the lion population grows, it requires more and more food, so more and more warthogs are hunted by the lions. The increased predation may cause the warthog population to shrink. If the warthog population shrinks enough, the lion population may shrink due to a shortage in food supply. If the lion population shrinks, the warthog population may grow due to a lack of predators.



This lion is hunting down the antelope. If most of the antelope are killed, the lions will have less food to eat.

6 Compare Fill in the Venn diagram to compare and contrast predators and prey.



Think Outside the Book

7 Claims • Evidence •

Reasoning Choose a predator and think about what it eats and how it hunts. Then do one of the following:

- Write a nomination for the predator to be “Predator of the Year.” Summarize evidence to support the nomination and explain your reasoning.
- Draw the predator and make a claim about adaptations that help it hunt. Use evidence to support the claim and explain your reasoning.



Visualize It!

8 Claims • Evidence • Reasoning Make a claim about how this insect’s appearance might help keep it from getting eaten. Summarize evidence to support the claim and explain your reasoning.

Living Together

What are the types of symbiotic relationships?

A close long-term relationship between different species in a community is called **symbiosis** (sim•bee•OH•sis). In symbiosis, the organisms in the relationship can benefit from, be unaffected by, or be harmed by the relationship. Often, one organism lives in or on the other organism. Symbiotic relationships are classified as mutualism, commensalism, or parasitism.

ACTIVE READING

9 Identify As you read, underline examples of symbiotic relationships.

Mutualism

A symbiotic relationship in which both organisms benefit is called **mutualism**. For example, when the bee in the photo drinks nectar from a flower, it gets pollen on its hind legs. When the bee visits another flower, it transfers pollen from the first flower to the second flower. In this interaction, the bee is fed and the second flower is pollinated for reproduction. So, both organisms benefit from the relationship. In this example, the mutualism benefits the bee and the two parent plants that are reproducing.



Commensalism

A symbiotic relationship in which one organism benefits while the other is unaffected is called **commensalism**. For example, orchids and other plants that often live in the branches of trees gain better access to sunlight without affecting the trees. In addition, the tree trunk shown here provides a living space for lichens, which do not affect the tree in any way. Some examples of commensalism involve protection. For example, certain shrimp live among the spines of the fire urchin. The fire urchin's spines are poisonous but not to the shrimp. By living among the urchin's spines, the shrimp are protected from predators. In this relationship, the shrimp benefits and the fire urchin is unaffected.

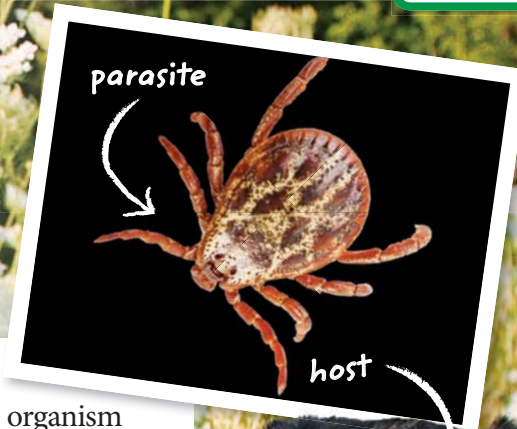


10 Compare How does commensalism differ from mutualism?

i Think Outside the Book

12 Claims • Evidence • Reasoning

Observe and take notes about how the organisms in your area interact with one another. Imagine what would happen if one of these organisms disappeared. Write down three effects that you can think of. Cite evidence to support your claims and explain your reasoning.



Parasitism

A symbiotic relationship in which one organism benefits and another is harmed is called **parasitism** (PAR•uh•suh•tiz•uhm). The organism that benefits is the *parasite*. The organism that is harmed is the *host*. The parasite gets food from its host, which weakens the host. Some parasites, such as ticks, live on the host's surface and feed on its blood. These parasites can cause diseases such as Lyme disease. Other parasites, such as tapeworms, live within the host's body. They can weaken their host so much that the host dies.

11 Summarize Using the key, complete the table to show how organisms are affected by symbiotic relationships.

Symbiosis	Species 1	Species 2
Mutualism	+	
	+	0
Parasitism		

Key + organism benefits
 0 organism not affected
 - organism harmed

Let the Games Begin!

Why does competition occur in communities?

In a team game, two groups compete against each other with the same goal in mind—to win the game. In a biological community, organisms compete for resources. **Competition** occurs when organisms fight for the same limited resource. Organisms compete for resources such as food, water, sunlight, shelter, and mates. If an organism doesn't get all the resources it needs, it could die.

Sometimes competition happens among individuals of the same species. For example, different groups of lions compete with each other for living space. Males within these groups also compete with each other for mates.

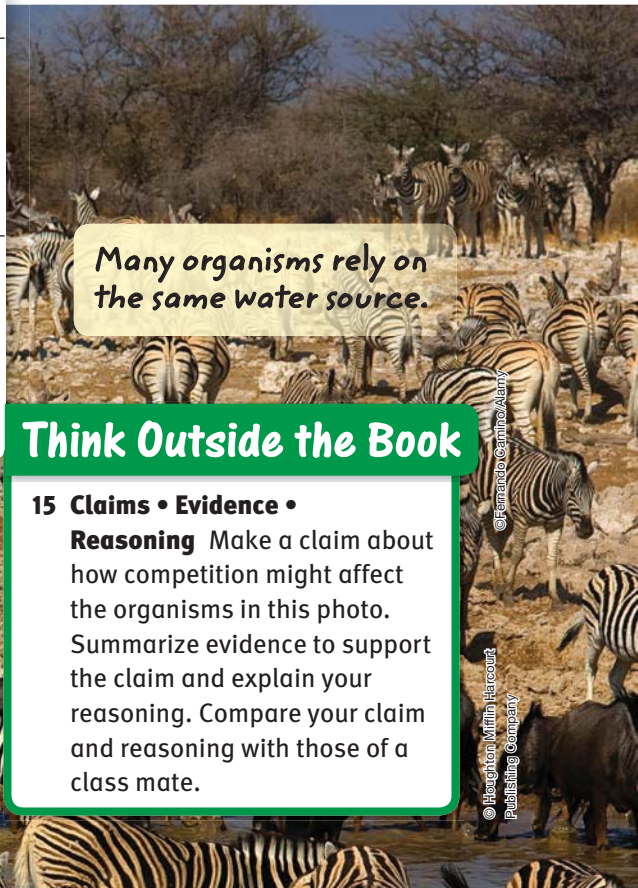
Competition can also happen among individuals of different species. Lions mainly eat large animals, such as zebras. They compete for zebras with leopards and cheetahs. When zebras are scarce, competition increases among animals that eat zebras. As a result, lions may steal food or compete with other predators for smaller animals.

ACTIVE READING

13 Identify Underline each example of competition.

14 Predict In the table below, fill in the missing cause and effect of two examples of competition in a community.

Cause	Effect
<i>A population of lions grows too large to share their current territory.</i>	
	<i>Several male hyenas compete to mate with the females present in their area.</i>



Many organisms rely on the same water source.

Think Outside the Book

15 Claims • Evidence •

Reasoning Make a claim about how competition might affect the organisms in this photo. Summarize evidence to support the claim and explain your reasoning. Compare your claim and reasoning with those of a class mate.

Strange Relationships

Glow worms? Blind salamanders? Even creepy crawlers in this extreme cave community interact in ways that help them meet their needs. How do these interactions differ from ones in your own community?

A Blind Hunter
Caves are very dark and, over generations, these salamanders have lost the use of their eyes for seeing. Instead of looking for food, they track prey by following water movements.



Guano Buffet
Cave swiftlets venture out of the cave daily to feed. The food they eat is recycled as bird dung, or guano, which piles up beneath the nests. The guano feeds many cave dwellers, such as insects. As a result, these insects never have to leave the cave!



(clockwise from top left) © Getty Images; © Eric and David Hocking/Corbis; (4) © Dante Panella/Photo Researchers, Inc.; (5) © AP Photo Library/Photo Researchers, Inc.



Sticky Traps
Bioluminescent glow worms make lines of sticky beads to attract prey. Once a prey is stuck, the worm pulls in the line to feast.

i Extend

16 Claims • Evidence • Reasoning Make a claim about the type of relationship illustrated in two of the examples shown above. Summarize evidence to support the claim and explain your reasoning.

18 Create Illustrate two of the interactions you just described by doing one of the following:

- make a poster
- write a play
- write a song
- draw a graphic novel

17 Research Name some organisms in your community and the interactions they have.

Visual Summary

To complete this summary, fill in the blanks with the correct word or phrase. You can use this page to review the main concepts of the lesson.

Organisms interact in feeding relationships.



19 *Predators eat*

Organisms interact in symbiosis—very close relationships between two species.

Mutualism:

Commensalism:

Parasitism:

20 *A parasite gets nourishment from its*

Interactions in Communities

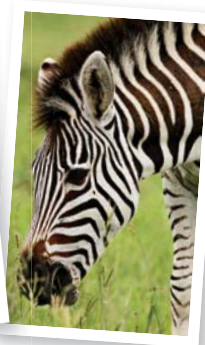
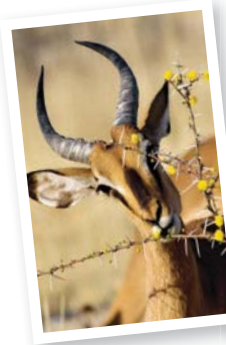
Organisms interact in competition.

21 *Organisms compete for resources such as*

Competition can occur between:

Members of the same species

Members of different species



22 Claims • Evidence • Reasoning Make a claim about how interactions can be both beneficial and harmful to the organisms in a community. Summarize evidence to support the claim and explain your reasoning.

Vocabulary

Fill in the blank with the term that best completes the following sentences.

- 1 A** _____ is an animal that kills and eats another animal, known as prey.
- 2** A long-term relationship between two different species within a community is called _____.
- 3** _____ occurs when organisms fight for limited resources.

Key Concepts

Fill in the table below.

Example	Type of symbiosis
4 Identify Tiny organisms called mites live in human eyelashes and feed on dead skin, without harming humans.	
5 Identify Certain bacteria live in human intestines, where they get food and also help humans break down their food.	

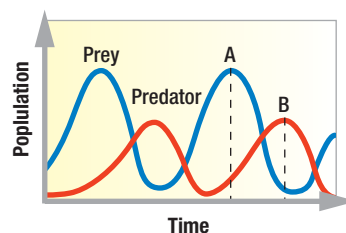
- 6 Claims • Evidence • Reasoning** Think of an animal, and list two resources that it might compete for in its community. Make a claim about what adaptations the animal has to compete for these resources. Cite evidence to support the claim and explain your reasoning.

- 7 Claims • Evidence • Reasoning** Make a claim about the relationship between the size of a predator population and the size of a prey population. Cite evidence to support the claim and explain your reasoning.

Critical Thinking

Use this graph to answer the following question.

Predator and Prey Populations Over Time



- 8 Explain Your Reasoning** At which point (A or B) on this graph would you expect competition within the predator population to be the highest? Explain your reasoning.

- 9 Claims • Evidence • Reasoning** Think of a resource, and predict what happens to the resource when competition for it increases. Summarize evidence that explains your reasoning and supports the claim.

- 10 Claims • Evidence • Reasoning** Identify a community near where you live, such as a forest, a pond, or your own backyard. Think about the interactions of the organisms in this community. Describe an interaction and identify it as predation, mutualism, commensalism, parasitism, or competition. Summarize evidence that supports the claim and explains your reasoning.



Florida Populations



This injured sea turtle is being treated at the Turtle Hospital in Marathon, Florida.

Sea Turtles

Every summer, Florida becomes home to about 50,000 new residents who are famous for their hard shells and amazing swimming skills. Five species of sea turtles, including the loggerhead and leatherback turtles, make nests on the beaches of Florida in May. Two months later, their eggs hatch. The newborn turtles, or hatchlings, emerge from their nests and make their way to the water. The turtles stay in the Gulf Stream for a few years. Hatchlings are vulnerable to fish and seabirds, but even adult sea turtles must watch out for sharks. While their hard shells protect them from most predators, many turtles are injured every year through contact with human beings. Outboard motors can damage a turtle's shell. Fishing nets can trap turtles and drown them. Humans also hunt female turtles for their meat. Human development and construction threaten the habitats of sea turtles. Laws are in place to help protect the declining sea turtle population.

Social Studies Connection

Loggerhead turtles, the most common sea turtle in Florida, usually nest along the east coast of Florida. The hatchling loggerheads migrate to the Gulf Stream. The table shows data collected from a tracking device placed on a loggerhead turtle. Plot the points on the map to see the route the turtle followed.

Tracking Data for Loggerhead Turtle Migration

Date	Latitude (°N)	Longitude (°W)
February 6	33	79
February 13	36	74
February 17	38	67
February 23	42	59
March 10	40	49



Wild iguana



Iguanas on the Loose!

You don't have to go to a zoo or a pet store to see an iguana. Sometimes you can find them in the middle of town! Iguanas are not native to Florida. People originally brought iguanas to Florida as pets. Over time, many were released or escaped, and iguanas now live and reproduce in the wild.

Iguana trappers have been used to capture iguanas, but this reptile population has become harder to control. Florida's subtropical climate is a favorable ecosystem for iguanas. Wild adult iguanas are large and powerful. They do not have many natural predators—alligators, dogs, raccoons, and some birds of prey are the only species that seem to threaten them.

Iguanas pose hazards to humans in several ways. Iguanas can cause structural damage to buildings by burrowing into their foundations. In addition, their wastes contain the salmonella bacteria, which pose a health risk to humans.

Iguanas do not respond well to sudden drops in temperature. At low temperatures, an iguana's metabolism slows down and the iguana appears frozen. However, once the weather warms up, it returns to its regular state. During a cold snap, it seems like it's raining iguanas in Florida as these "frozen" reptiles fall out of trees. Because hundreds of thousands of iguanas live in Florida, you could get caught in an iguana storm!

Managing Deer

They are about the size of a medium-sized dog, but otherwise look like a deer. Tiny Key deer are unique to one of Florida's ecosystems. And they very nearly disappeared! In the 1930s, the Key deer population was very low. Poaching and hunting meant that only about 50 Key deer were alive. With careful wildlife and habitat management, the current Key deer population is now at 300, but is still considered endangered. A larger population of Key deer means a healthier Florida ecosystem. The endangered Florida panther is a predator of Key deer. So when the Key deer population shrinks, the panther population is also threatened.

Take It Home

You are part of a campaign to protect endangered animals of Florida like the leatherback sea turtle, Key deer, or Florida panther. Research one of these animals and create a profile page or blog post about it. Include links to websites for more information on your endangered animal.

Key deer



Florida's Ecosystems

ESSENTIAL QUESTION

How do limiting factors affect Florida's ecosystems?

By the end of this lesson, you should be able to explain how limiting factors affect the native populations in Florida's ecosystems.

Human activity near beaches may keep animals such as this leatherback sea turtle from reproducing.



SC.7.N.1.1 Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions. **SC.7.L.17.3** Describe and investigate various limiting factors in the local ecosystem and their impact on native populations, including food, shelter, water, space, disease, parasitism, predation, and nesting sites.

Lesson Labs

Quick Labs

- Life in Moving Water
- Changes in the Intertidal Zone

1 Predict Check T or F to show whether you think each statement is true or false.

- | T | F | |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | Florida has many different land and water ecosystems. |
| <input type="checkbox"/> | <input type="checkbox"/> | The plants and animals in Florida's ecosystems do not change. |
| <input type="checkbox"/> | <input type="checkbox"/> | Populations can be limited by a nonliving factor, such as water. |
| <input type="checkbox"/> | <input type="checkbox"/> | Coral reefs along the coast of Florida are home to many different animals. |

2 Model Make a sketch of an ecosystem that you have visited or are familiar with. Label the plants and animals you know.

ACTIVE READING

3 Synthesize Learning where a word comes from can help you understand what it means. Use the origin of the word *estuary* to guess the meaning of the term.

Word origin	Meaning
<i>aestus</i>	tide

Example sentence

The estuaries that form where the Mississippi River meets the Gulf of Mexico are rich in life.

estuary:

Vocabulary Terms

- limiting factor
- native species
- introduced species
- wetland
- coral reef
- estuary

4 Apply As you learn the definition of each vocabulary term in this lesson, make a sketch that shows the meaning of the term or an example of that term. Write your own definition of the term next to your sketch.

Pushing THE LIMIT

What limits the size of populations?

ACTIVE READING

5 Identify As you read, underline the limiting factors that might affect organisms in an ecosystem.

Populations of organisms don't grow forever. When the environment cannot support more individuals, a population will stop growing. A **limiting factor** is an environmental factor that keeps a population from reaching its full potential size. Imagine a habitat that has enough water to support 1,000 armadillos but only enough food for 500. Only 500 armadillos can live in the habitat. In this example, food is the limiting factor.

Limiting Factors

Both living and nonliving environmental factors can limit the size of a population. The amount of food often limits the size of populations. If there are too many individuals, some will starve. If there were more food, populations likely would grow. Water, light, nutrients, shelter, and living space also can limit populations. So can predators, parasites, and diseases.

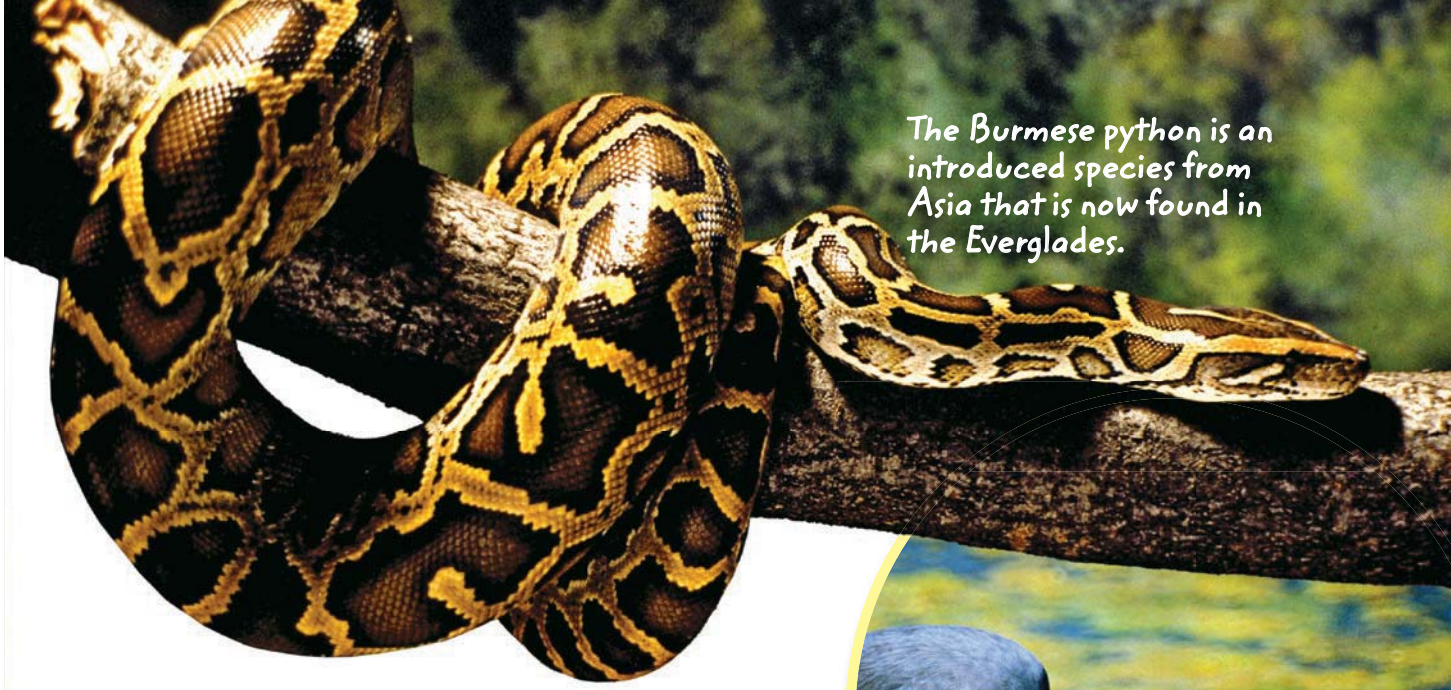
One factor limits a population at a time. Suppose the area that had only enough food for 500 armadillos suddenly had enough food for 2,000 armadillos, but only enough water for 1,000 armadillos. The population still couldn't grow to 2,000 armadillos. Water would keep the population at 1,000 armadillos. In this case, water is the limiting factor.

6 Explain Your Reasoning For each limiting factor listed below, choose an animal or plant and predict how that limiting factor might affect the population of the organism. Explain your reasoning.

Birds, such as these wood storks, need space for nests. If there aren't enough nesting sites, bird populations won't grow.



<i>Limiting factor</i>	<i>How does the limiting factor affect a population?</i>
Space	
Food	
Light	



The Burmese python is an introduced species from Asia that is now found in the Everglades.

What are introduced species?

Species that naturally live in an ecosystem are called **native species**. On the other hand, **introduced species** are species that have been brought to an ecosystem by human actions. Some introduced species were brought to new places on purpose. Others traveled in vehicles or on other animals. Escaped or released pets can also start new populations in the wild.

Many introduced species are successful because they do not have predators, parasites, or diseases in the new habitat. Some introduced species may be better competitors for resources than native species. Introduced species may eat native species. As a result, introduced species often are limiting factors.

Many species have been introduced to Florida. For example, Burmese pythons from Asia are now found in the Everglades. Many of these pythons were pets. In the wild, they eat many native animals, such as wading birds, deer, and even alligators! By eating these animals, pythons compete with native predators for food.



Little blue herons are just one of the many native species that Burmese pythons eat.

7 Cause and Effect Use the diagram below to describe how the Burmese python affects Florida's ecosystems.

Cause

Effect:

Effect:

Land, HO!

What are Florida's land ecosystems?

Many species live in Florida's land ecosystems—forests, prairies, beaches, and dunes. Some native species are found nowhere else on Earth. Introduced plants and animals can threaten native species. Different factors limit populations in these ecosystems.

ACTIVE READING

8 Summarize After you read each heading, list organisms and limiting factors in the land ecosystems described.



In prairies, fires aid the growth of grasses and keep out trees.

Prairies

Plants such as grasses, sedges, and rushes dominate Florida's prairies. Fire is an important limiting factor on prairies. Fires keep trees from growing. Fires also cause new growth in grasses. Herbivores, which are animals that eat plants, can limit plant populations on prairies.

Who lives here?

What are limiting factors here?

Forests

Longleaf pines, mangroves, cypress, and cabbage palms can be found in Florida's forests. Light, space, and nutrients limit tree and plant populations. Many animals live in forests. Predators such as Florida panthers limit the populations of animals such as deer. Fire is also a limiting factor in forests. Although some species are harmed by fire, other species rely on it. Fire returns nutrients to the soil. A few species, such as sand pines, release seeds only after a fire.

Who lives here?

What are limiting factors here?

In forests, such as this cypress forest, light can be a limiting factor.



On beaches, many animals live in tunnels in the sand.



Beaches

Beaches are found where land meets water. Most beaches in Florida are sandy. Animals, such as clams and crabs, live under the sand. Birds eat these animals and organisms that wash up on the beach. So, birds can limit populations of some animals. Beaches are nesting sites for sea turtles and birds. Development can decrease the space available for nests.

Who lives here?

What are limiting factors here?

Dunes are threatened by human activity.



Dunes

Blowing sand forms dunes along beaches. Low-growing plants that can survive being sprayed with salt water grow here. They hold sand in place, allowing other plants to grow. Steep slopes limit plant growth. Big trees can't grow on dunes. Sand doesn't provide enough support for roots. Dunes are important for nesting birds. Development can limit the space and resources available to organisms. It also damages the plants that hold sand in place.

Who lives here?

What are limiting factors here?

9 Claims • Evidence • Reasoning Make a claim about why fires are important to prairies but not important to dunes. Summarize evidence to support the claim and explain your reasoning.

Gator COUNTRY

What are Florida's freshwater ecosystems?

ACTIVE READING

10 Identify As you read, underline factors that limit populations in Florida's freshwater ecosystems.

Freshwater ecosystems are very important in Florida. They include lakes, ponds, rivers, streams, and wetlands. Water is a limiting factor in many of these ecosystems. Freshwater ecosystems have different water depths, speeds of water flow, and types of organisms. They provide food and drinking water for people. People also use them for activities such as boating and swimming.

Florida has many rivers, canals, and lakes.



A lake near Wekiwa Springs, Florida

Lakes and Ponds

Lakes and ponds are standing bodies of water. So, water flows very little if at all. Some plants float on top of the water. Other plants grow in shallow areas, where they can get light and air. If the amount of oxygen in lakes and ponds is low, it can limit populations. When there is enough oxygen, ponds and lakes support many kinds of fish. Introduced fish, such as walking catfish, and introduced plants, such as water hyacinth, can be found in many lakes and ponds in Florida.

Rivers and Streams

Rivers and streams have flowing water. They carry nutrients that are important to the ecosystems that they flow into. Rivers and streams are home to many organisms, including the endangered manatee. Shelter is often a limiting factor in rivers and streams. Rocks provide hiding places from predators. Rocks also shelter organisms from currents that would sweep them away.

Wetlands

The Florida Everglades are wetlands. A **wetland** is an area where land is covered by water for at least part of the year. Water flows slowly in wetlands. Many birds, fish, reptiles, and mammals live in wetlands. Wetland plants help remove wastes and pollution from water. Nutrients limit plant populations. Low oxygen levels and drying up of wetlands can limit fish. Animals and trees rely on *hammocks*, which are areas that are dry most of the year.

Think Outside the Book

11 Apply With a partner, work together to make lists of the animals and plants in a local freshwater ecosystem. Then, identify how water moves through the ecosystem.

Development limits space and can pollute wetlands.

Sawgrass covers the Everglades. Cypress trees dominate other wetlands.

The Everglades are home to many bird species, including osprey, great blue herons, and white ibis.

Hammocks provide dry spots for alligators and other animals.

Visualize It!

12 Claims • Evidence • Reasoning Make claims about how the organisms in this image rely on water to survive. Summarize evidence to support the claim and explain your reasoning.

Just Add SALT!

What are Florida's marine ecosystems?

The marine, or saltwater, ecosystems of Florida include coral reefs, estuaries (ES•choo•ehr•eez), salt marshes, and mangrove swamps. Florida's marine ecosystems support many species. They provide food and recreation for people. Florida's marine ecosystems are at risk from development and pollution. Both can limit populations.

ACTIVE READING

13 Identify As you read, underline the limiting factors in the ecosystem described.

Coral Reefs

One of the most diverse marine ecosystems is the coral reef. A **coral reef** grows in waters that are warm, shallow, and clear. Coral reefs are made up of the skeletons of tiny animals called *corals*. Tiny protists live inside coral bodies and give coral reefs their color. These protists use light to produce food, which corals can use. Because they need light to grow, water depth and sunlight limit the growth of the protists and coral in reefs.

Reefs are home to many kinds of fish, sea turtles, and other animals such as crabs, shrimps, anemones, urchins, and starfish. A reef may be home to thousands of species. So, space is often a limiting factor. High temperatures and polluted water from land can also limit populations of corals and other reef animals.

Visualize It!

14 Claims • Evidence • Reasoning Make a claim about what limiting factors are present in this coral reef ecosystem. Use evidence to support the claim and explain your reasoning.

Many species of plants and animals live in estuaries.



Grasses dominate salt marshes.



Mangrove populations are limited by nutrients, water, and temperature.



Estuaries

Many streams and rivers flow into the ocean, forming estuaries. An **estuary** is an area where fresh water mixes with salt water. Both grasses and seagrasses grow in estuaries. Many fish lay eggs here, and plants provide shelter for young fish. Birds, turtles, alligators, and many other animals live in estuaries.

Many organisms rely on the nutrients provided by estuaries. So, nutrients are a limiting factor. Populations also are limited by water movement and salt levels in the water. Some species need high salt levels whereas other species, such as alligators, need lower levels.

Salt Marshes

Salt marshes are found along the coast. Grasses and other plants, such as sedges and rushes, live in these areas. Salt marshes are occasionally flooded by tides. This flooding can limit plant populations. Plants do not grow where water is too deep or the ground is wet for too long. Salt levels and nutrients can also limit plants and animals in salt marshes. If oxygen levels in water get too low, they limit the populations of fish and other species.

Mangrove Swamps

Mangrove swamps are found in areas that are flooded by tides and also receive freshwater runoff. They are dominated by mangrove trees. Mangroves need nutrients to survive. Mangroves cannot survive low temperatures. So, temperature also limits mangrove populations.

Mangrove roots often reach below the water. They shelter small fish from predators. For organisms that live in mangrove swamps, the amount of time the area is wet or dry is a limiting factor. Salt levels also limit populations in mangrove swamps.

15 Compare What limiting factors do estuaries, salt marshes, and mangrove swamps have in common?

Visual Summary

To complete this summary, fill in the blanks with the correct word or phrase. You can use this page to review the main concepts of the lesson.

Populations are limited by living and nonliving factors.



16 The Burmese python is a(n) _____ species in the Florida Everglades.

Marine habitats include coral reefs, estuaries, salt marshes, and mangrove swamps.



19 A(n) _____ is an area where fresh water meets salt water.

Florida's Ecosystems

Florida's land ecosystems include forests, prairies, dunes, and beaches.



17 In forests, sunlight is a(n) _____ for plants on the forest floor.

Freshwater ecosystems include lakes, ponds, rivers, streams, and wetlands.



18 The Florida Everglades are an example of a(n) _____.

20 Claims • Evidence • Reasoning Predict what might happen to a native fish species if an introduced fish species that ate the same food was released in a pond. Summarize evidence to support the claim and explain your reasoning.

(t) ©John Mitchell/Photo Researchers, Inc.; (l) © Richard Broadwell/Alamy; (f) © Cameron Davidson/Alamy

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Vocabulary

Fill in the blanks with the terms that best complete the following sentence.

- 1 A(n) _____ is a species that naturally lives in an ecosystem.
- 2 A(n) _____ is an ecosystem that is covered with water for at least part of the year.
- 3 A(n) _____ is an ecosystem found in warm, clear salt water.
- 4 _____ keep populations from reaching their full potential size.

Key Concepts

- 5 **Explain Your Reasoning** A population of birds has nesting sites for 500 birds and food for 400 birds. What is the limiting factor for this population? Explain your reasoning.

- 6 **Claims • Evidence • Reasoning** Imagine a new species of bird was introduced to the same area as a population of native birds. Make a claim about the effect the introduced species might have on the native species. Summarize evidence to support the claim and explain your reasoning.

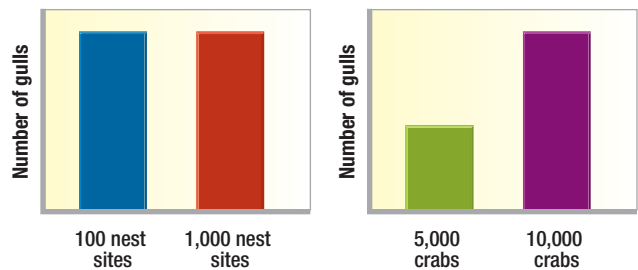
- 7 **Explain** What characteristics of estuaries make them good places for fish to lay their eggs?

Critical Thinking

- 8 **Explain Your Reasoning** Choose an ecosystem near you. List three organisms in the ecosystem and describe limiting factors for each of them. Explain your reasoning.

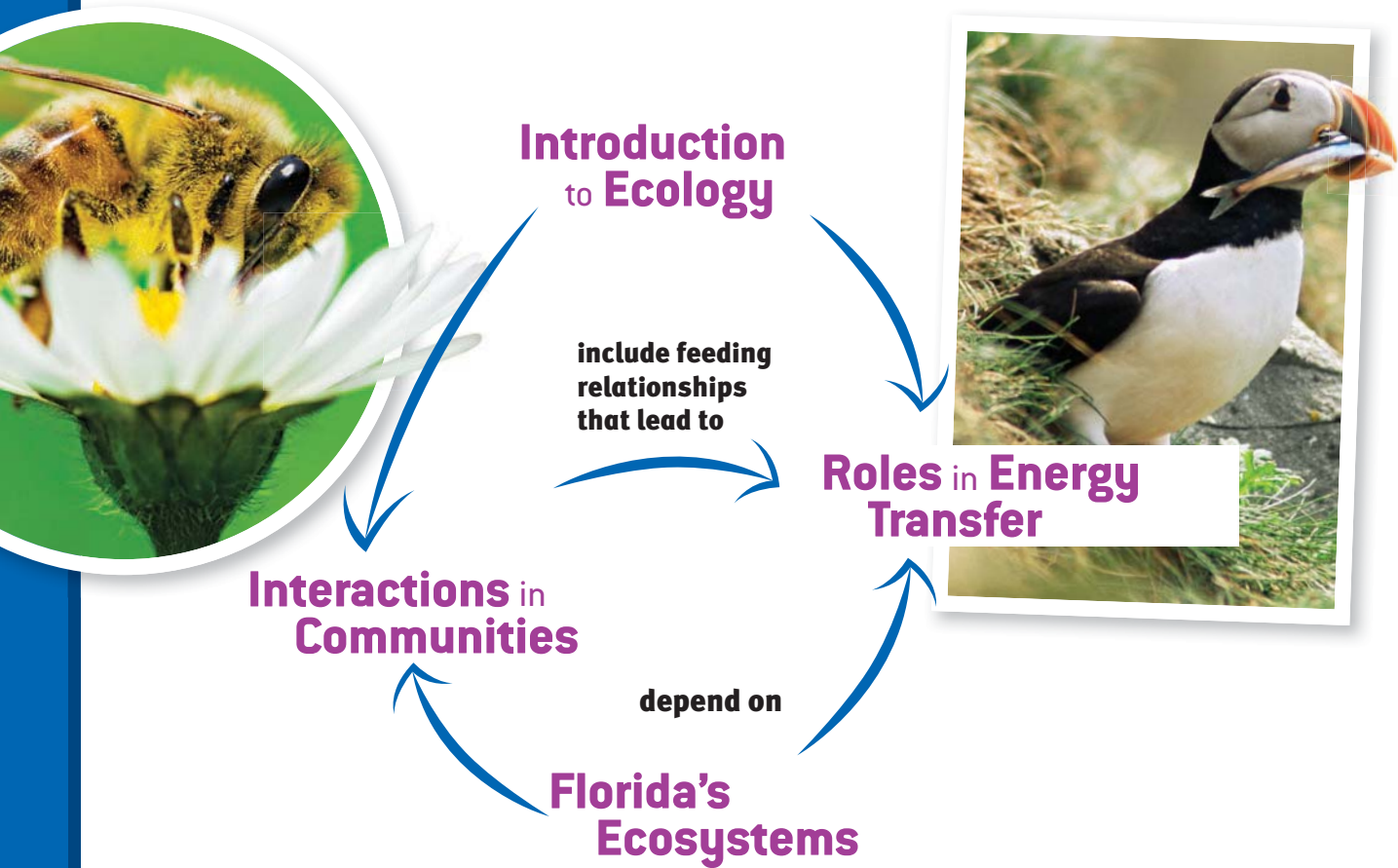
The graphs below show how the size of a gull population is affected by nesting sites and crabs, which gulls eat. Use the graphs to answer the questions that follow.

Limiting Factors That May Affect Gull Populations



- 9 **Support Your Claim** What factor limits the gull population, nesting sites or crabs? Use evidence to support your claim.

- 10 **Claims • Evidence • Reasoning** Make a claim about what would happen to the gull population if there were only 10 nest sites. Summarize evidence to support the claim and explain your reasoning.



1 Interpret The Graphic Organizer above shows that Florida's ecosystems depend on the transfer of energy. Give an example of an energy transfer in a Florida ecosystem.

2 Claims • Evidence • Reasoning Make a claim about whether organisms compete for abiotic resources. Summarize evidence to support the claim and explain your reasoning.

3 Describe Name a feeding relationship within one of Florida's land ecosystems.

4 Explain Your Reasoning How could introduced species disrupt existing feeding relationships? Explain your reasoning.

(l) ©Jason Hosking/Getty Images; (r) ©Doug Allan/The Image Bank/Getty Images



Name _____

Vocabulary

Check the box to show whether each statement is true or false.

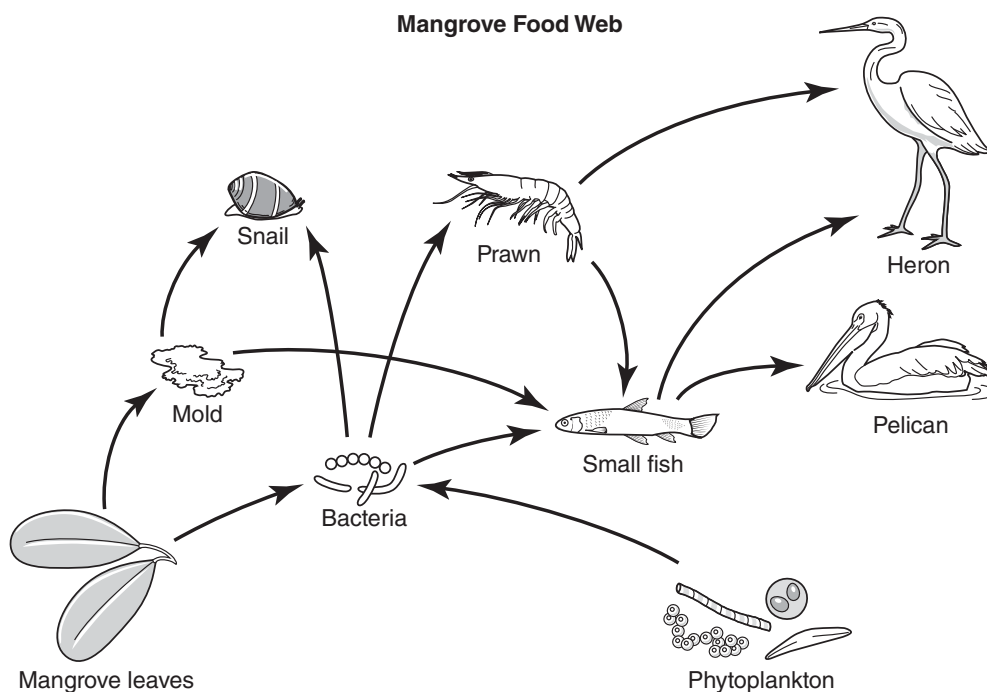
T	F	
<input type="checkbox"/>	<input type="checkbox"/>	1 <u>Competition</u> occurs when organisms try to use the same limited resource.
<input type="checkbox"/>	<input type="checkbox"/>	2 A <u>habitat</u> is the role of a population in its community, including its environment and its relationship with other species.
<input type="checkbox"/>	<input type="checkbox"/>	3 A <u>food chain</u> is the feeding relationships among all of the organisms in an ecosystem.
<input type="checkbox"/>	<input type="checkbox"/>	4 A <u>limiting factor</u> is an environmental factor that increases the growth of a population.

Key Concepts

Identify the choice that best completes the statement or answers the question.

- 5 Remoras are small fish that attach to sharks but do not harm them. When sharks tear prey apart, remoras eat the leftovers. What relationship do remoras have with sharks?
- A mutualism
 - B parasitism
 - C commensalism
 - D predator-prey
- 6 Ecosystems have producers, decomposers, and consumers. Carnivores and scavengers are both types of consumers in an ecosystem. Which of the following is a characteristic of scavengers that makes them different from carnivores?
- F Scavengers eat only plant materials.
 - G Scavengers are omnivores that always eat live animals.
 - H Scavengers are omnivores that eat dead plants and animals.
 - I Scavengers are able to produce their own food when no other food is available.

- 7 Mangrove swamps are found along the southern coasts of Florida. A mangrove swamp contains an ecosystem of many organisms living among the large roots of the mangrove trees. This food web shows some of the relationships in that ecosystem.



According to the food web, which organism is a producer in the mangrove swamp?

- A** crab **C** pelican
B mold **D** phytoplankton
- 8 Ecological environments can be divided into different levels of organization. From the following choices, identify the correct order from largest to smallest.
- F** ecosystem, population, community, individual
G community, ecosystem, population, individual
H ecosystem, community, population, individual
I individual, population, community, ecosystem

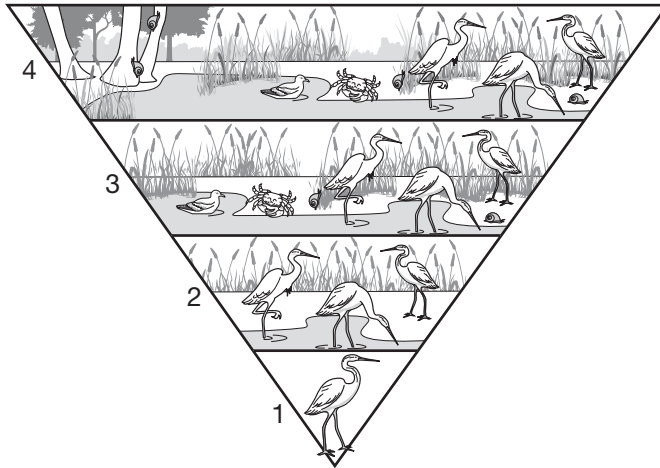
Name _____

- 9** Cogongrass, a non-native species of grass, grows in many areas of Florida. Its roots can spread quickly underground. Cogongrass thrives where fires allow it to spread. Which of the following is a negative effect that cogongrass could have on other organisms in its habitat?
- A** It provides places for animals in the habitat to hide.
 - B** It provides a new source of food for animals in the habitat.
 - C** It replaces native plants that animals depend on for food or shelter.
 - D** It contributes nutrients to the soil in the habitat so that soil organisms can grow.
- 10** Honeybees are important pollinators of flowers. Mites that live in the bodies of bees can attack honeybee colonies. Some birds, amphibians, and insects eat honeybees. Which of the following relationships is **not** included in the description above?
- F** parasitism
 - H** commensalism
 - G** mutualism
 - I** predator-prey
- 11** Earth's environments include both biotic and abiotic factors that living things need to survive. Large mangrove ecosystems are found along the coastlines in Florida. Which of the following are both abiotic factors in the mangrove ecosystem?
- A** water and pelican
 - C** pelican and crab
 - B** sun and rocks
 - D** snail and water
- 12** The Florida panther used to live in forests, prairies, and swamps over most of the southeastern United States. Now, it lives only in the southern tip of Florida, south of the Caloosahatchee River. Based on this information, what is the **most likely** cause of the decline of the Florida panther population?
- F** the unintentional introduction of a larger predator
 - G** the break-up of the panther's natural habitat by human settlement
 - H** the weakening of species due to inbreeding
 - I** competition for territory between panthers

Critical Thinking

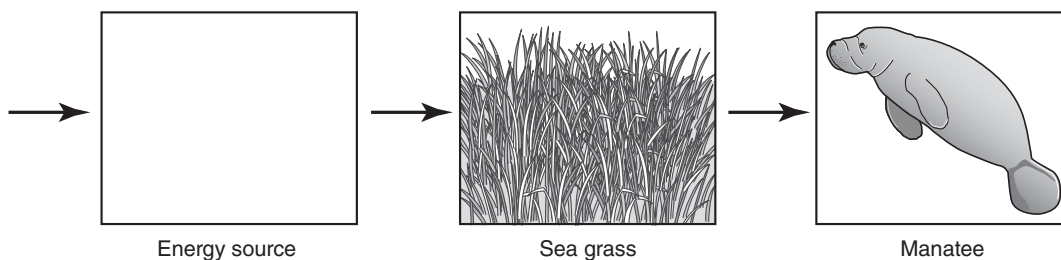
Answer the following questions in the space provided.

- 13 Use the diagram to help you answer the following question.



There is a sudden decrease in the food availability for wading birds. Make a claim about how the different levels of organization shown in the diagram will be affected. Summarize evidence to support your claim and explain your reasoning.

- 14 The diagram below shows how a manatee gets its energy.



What provides the energy for the sea grass, the manatee, and most life on Earth?

What role does the sea grass play in this food chain? _____

According to this diagram, what type of consumer is the manatee? _____