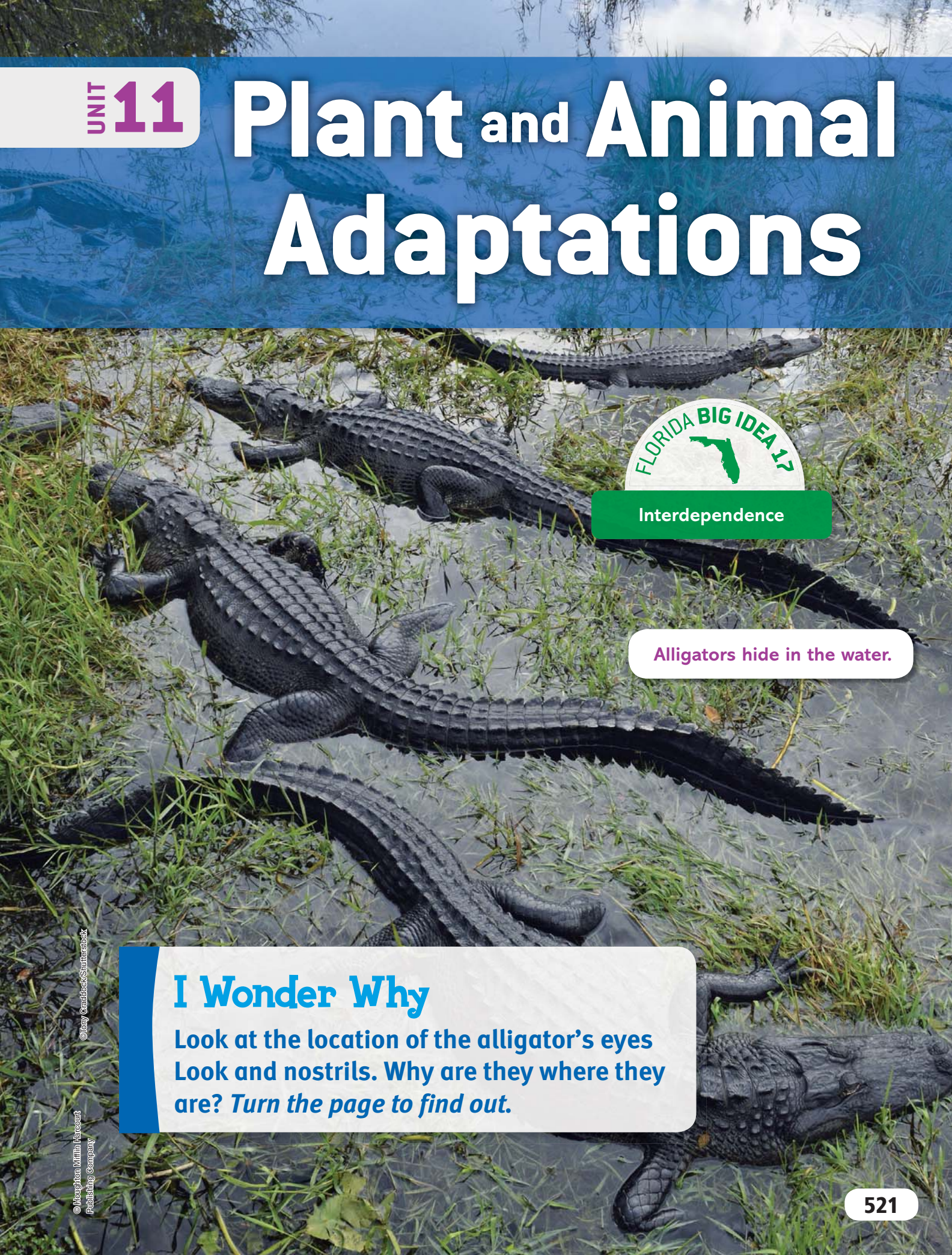
UNIT 11

Plant and Animal Adaptations



FLORIDA BIG IDEA 17

Interdependence

Alligators hide in the water.

I Wonder Why

Look at the location of the alligator's eyes and nostrils. Why are they where they are? *Turn the page to find out.*

Here's Why

Living things, including alligators, have characteristics that help them survive in their environment. The location of the alligator's eyes and nostrils allow it to see and breathe while nearly completely submerged.

Essential Questions and Florida Benchmarks

Science Notebook

Before you begin each lesson, write your thoughts about the Essential Question.

SC.5.L.17.1 Compare and contrast adaptations displayed by animals and plants that enable them to survive in different environments such as life cycles variations, animal behaviors and physical characteristics.

LESSON 1

ESSENTIAL **QUESTION**

What Is Adaptation?

Engage Your Brain

Find the answer to the following question in this lesson and record it here.

Watch out! Don't get bit by that... caterpillar? What type of adaptation does this caterpillar have?

_____

_____

_____

ACTIVE READING

Lesson Vocabulary

List the terms. As you learn about each one, make notes in the Interactive Glossary.

_____

_____

_____

Signal Words: Details

This lesson gives details about how living things are suited to where they live. Signal words link main topics to added details. For *example* and *for instance* are often used as signal words. Active readers look for signal words that link a topic to its details.

A Place to Call Home

Where are living things found on Earth? They can be found deep underground, high up in the air, and everywhere in between!

ACTIVE READING As you read this page, put a star next to the main idea of each paragraph.

Think about all the different kinds of living things on Earth. They each live in a different location. The place where a living thing lives is called its **habitat**. There are many different kinds of habitats. Some habitats are hot and dry. Other habitats are frozen. Still other habitats are found deep under the ocean.

All of a living thing's needs must be met within its habitat. Because of this, only certain kinds of living things can live in certain habitats. For example, an animal that has gills for breathing under water cannot live in a dry habitat. A plant that needs very little water cannot live in a wet habitat. As you look at the different types of habitats shown on this page and the next, ask yourself why each plant or animal is found in a certain kind of habitat.

Where Do I Live?

Write the type of habitat in which these animals are found.

_____ _____ _____ _____

Habitats on Earth

Each type of habitat is home to different plants and animals. Which type of habitat shown here is most similar to a habitat found where you live?

Adaptations

Living things have many similarities. They also have many interesting differences.

ACTIVE READING As you read this page, underline the definition of *adaptation*.

Deserts are home to many kinds of snakes. This is because snakes have characteristics that help them survive in a desert. For example, snakes have tough, scaly skin that keeps them from drying out.

A characteristic that helps a living thing survive is called an **adaptation**. Suppose an animal is born with a new characteristic. If this characteristic helps the animal survive, the animal is likely to reproduce and pass on the characteristic to its young. As long as the animal's habitat doesn't change, young that have this characteristic are also likely to survive and reproduce. Over time, the adaptation becomes more common in the population. In this way, populations of plants and animals become adapted to their habitats.

These rabbits live in very different habitats. Because of this, they have different adaptations.

An arctic hare lives in a cold habitat. It has thick fur to keep it warm and small ears that keep heat from being lost.

A jackrabbit lives in a hot habitat. Jackrabbits have large ears that help keep their blood cool.

Ostriches, rheas, and emus all live on different continents. Even though they live very far from each other, they look almost the same! Their habitats are very similar, and so they share similar adaptations. These birds are all adapted for running fast. Ostriches are the fastest flightless birds on Earth. They can reach speeds of 72 km/hr (45 mi/hr)!

▶ Vines and trees are both plants, but they are very different from each other. What adaptations can you see in these plants, and how do you think these adaptations help them survive?

____

____

____

____

____

____

Physical Fitness

Whether blending in or standing out, physical adaptations help organisms survive.

ACTIVE READING As you read the next two pages, circle signal words that alert you to details about the main idea.

The bright color of this rose attracts pollinators, but the thorns keep plant-eating animals away.

Can you see the owl in this picture? The owl is camouflaged to look like bark.

Some adaptations are differences in the bodies of plants and animals. These are called physical adaptations. For example, sharp teeth, webbed feet, and large eyes are physical adaptations.

Some physical adaptations protect living things from being eaten. For example, roses have sharp thorns that help keep their stems from being eaten. Other physical adaptations help to keep an animal hidden. This type of adaptation is called *camouflage* [KAM•uh•flazh]. Green lizards hiding in green grass are camouflaged.

Catching Flies

Bright coloring on an animal is often a warning that an animal is dangerous. Many animals know that paper wasps, like the one shown below, have a painful sting. The black and yellow hoverfly doesn't have a stinger. It is completely harmless. But because it looks like a wasp, animals will think twice before trying to eat it. This adaptation is called *mimicry*.

▶ Draw a line from the chameleon's tongue to the insect it would most likely eat.

paper wasp

hoverfly

house fly

Chameleons have many adaptations that help them catch insects. They have long, sticky tongues that capture an insect in the blink of an eye. They have eyes that move in all directions, helping them see not only food but also possible danger. They also have feet and a tail that wrap around branches, making them excellent climbers. With all of these adaptations, a tasty fly must look like a wasp to avoid being eaten by a chameleon!

Animals that hunt, such as eagles, have adaptations that help them catch food. Eagles have very good eyesight. They also have sharp claws on their feet, which they use to capture their food.

Many plants have adaptations that help spread their seeds. Some seeds can be carried by the wind. Other seeds are inside berries. When the berries are eaten, the seeds are carried to a new location.

On Your Best Behavior

The way living things act is called behavior. Some behaviors are adaptations that help animals survive.

ACTIVE READING As you read the paragraph below, circle examples of instinctive behavior and underline examples of learned behavior.

Some things that animals do seem to come naturally. Babies do not have to be taught how to cry. Spiders are not taught how to spin webs. Behaviors that animals know how to do without being taught are called **instincts**. Animals have to learn other types of behaviors. For example, a lion cub is not born knowing how to hunt. It learns to hunt by watching its mother. Raccoons learn to wash food by watching other raccoons.

Many animals have behaviors that help protect them from predators. When an octopus is frightened, it releases ink into the water. If the octopus is being attacked, the animal attacking it will not be able to see, and the octopus can escape.

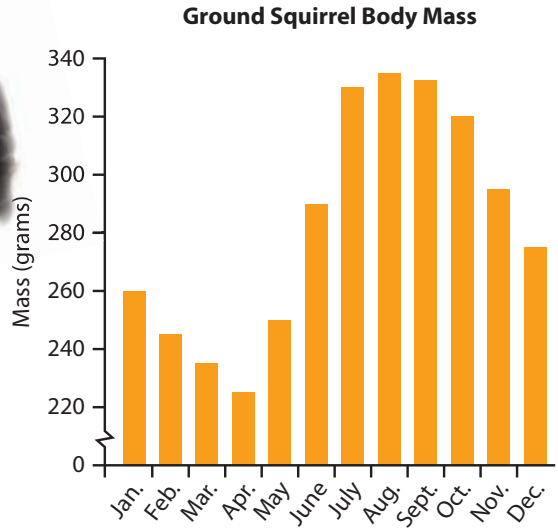
Some bats are *nocturnal*. This means they are active at night and sleep during the day. This allows bats to hunt insects that are active only at night.

Each year, millions of snow geese migrate south in autumn and north in spring.

DO THE MATH

Interpret Data in a Bar Graph

Ground squirrels hibernate. They must eat a lot during the spring, summer, and fall to store up enough energy to survive hibernation. Study the graph below.



About how much mass does a ground squirrel have in March?

During which month do ground squirrels start to hibernate? How do you know?

Some animals move to different locations at certain times of the year to find food, reproduce, or escape very cold weather. This instinctive behavior is called *migration*. Many birds, butterflies, and some bats migrate long distances.

Other animals hibernate. *Hibernation* is a long period of inactivity that is like sleeping. But hibernation is not the same as sleeping. When an animal hibernates, its body processes slow down and it stays inactive for months. Can you imagine taking a three-month nap?

The way that animals act toward other animals of the same type is called *social behavior.* Honeybees have very complex social behavior. They communicate using movements called the "waggle dance." A bee that finds food will return to the hive and do a waggle dance. The pattern of the dance gives other bees a lot of information! The dance communicates which direction to go, how far away the food is, how much food there is, and even what kind of food it is!

The Circle of Life

All living things grow and develop. The way that living things develop can be an adaptation.

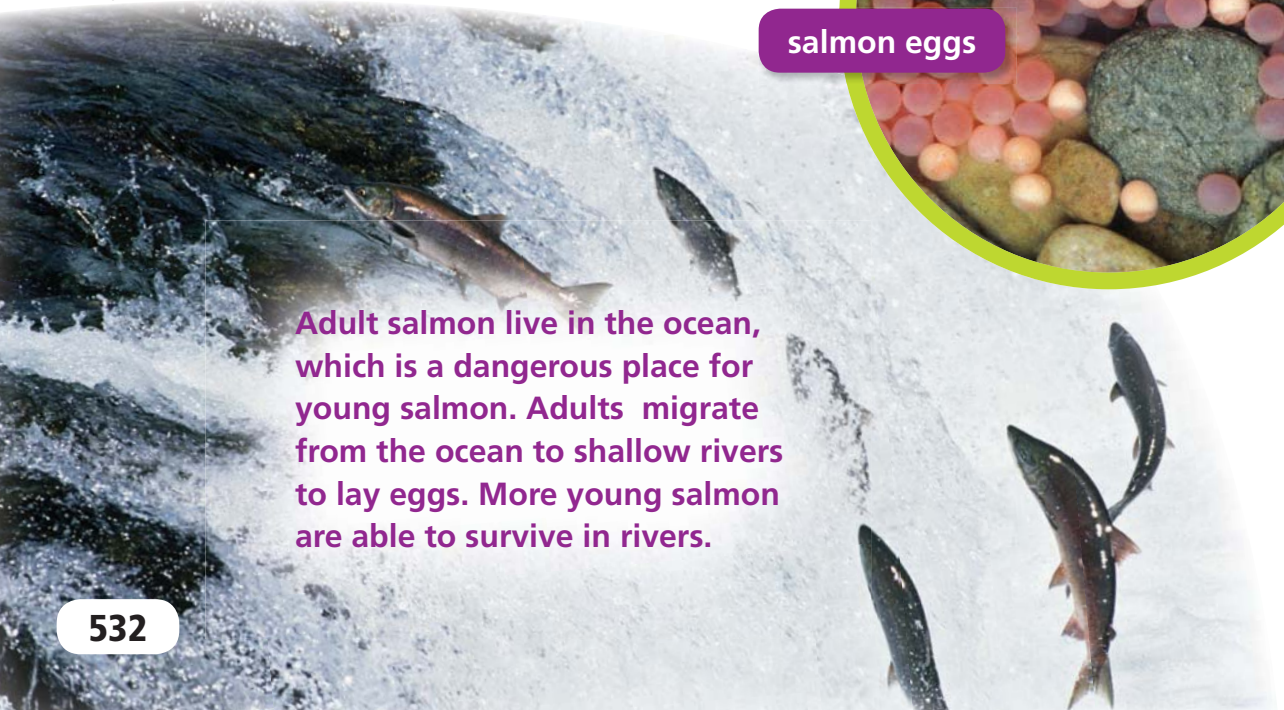
ACTIVE READING Circle two different examples of organisms whose life cycles keep adults and young from competing for food.

Living things go through stages of growth and development called a *life cycle*. A living thing's life cycle is related to its habitat. Because of this, differences in life cycles are a type of adaptation.

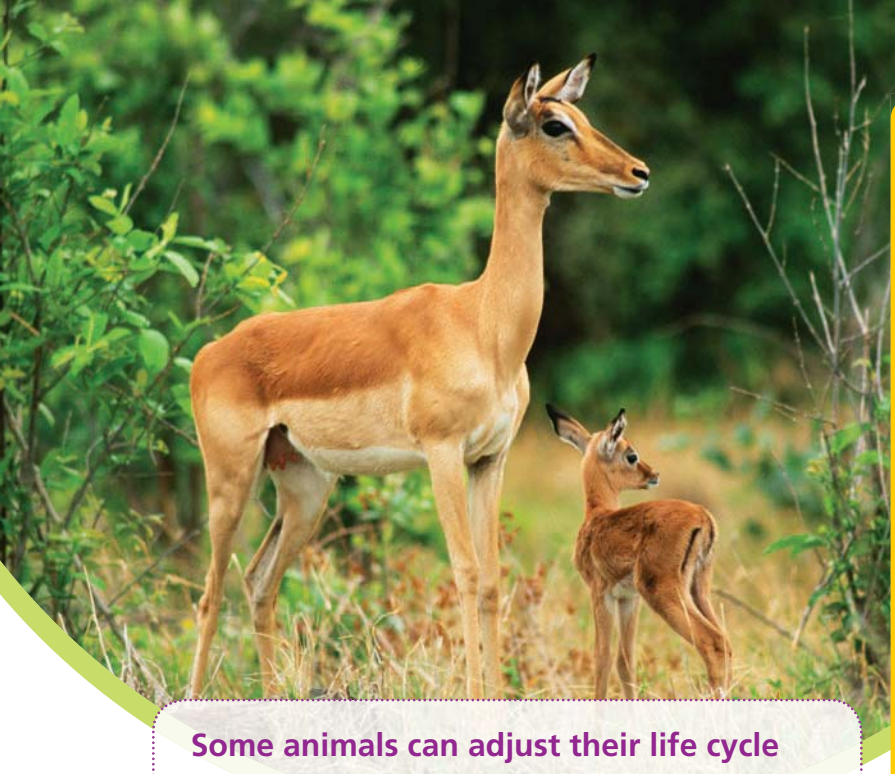
Most frogs are adapted to live near water. A frog's life cycle starts when its eggs are laid in water. When the eggs hatch, tadpoles emerge. Tadpoles live in water until they grow legs and lungs. At this point, they are ready to live on land. In places where water tends to dry up quickly, tadpoles develop more quickly. This difference, or variation, in frog life cycles helps tadpoles survive.

Tadpoles and adult frogs live in different places, and they eat different foods. This is another kind of adaptation. Adult frogs and tadpoles don't compete with each other for food. This helps more frogs survive. Many other living things have similar adaptations. For example, caterpillars eat plant leaves and adult butterflies sip nectar from flowers.

salmon eggs



Adult salmon live in the ocean, which is a dangerous place for young salmon. Adults migrate from the ocean to shallow rivers to lay eggs. More young salmon are able to survive in rivers.



Some animals can adjust their life cycle to changes in their habitat. In a very dry year, a pregnant impala can wait up to a month, until rain falls, to give birth. This life cycle variation helps make sure there is enough food and water for the young impalas to survive.

A female impala has one or two calves and then spends months feeding and protecting them. A female salmon lays thousands of eggs and then returns to the ocean. What are some advantages of each type of life cycle?

luna moth caterpillar

adult luna moth

It does not rain very often in the desert. When it does rain, the seeds of desert wildflowers, such as those shown below, immediately begin to grow. The plants bloom, make new seeds, and complete their whole life cycle within a few weeks! Explain how the life cycle of desert wildflowers helps them survive in the desert.

Sum It Up »

The outline below is a summary of the lesson. Complete the outline.

I. Habitats: The place where a living thing lives is called its habitat. Earth has many different types of habitats.

A. Example: _____

B. Example: _____

C. Example: _____

D. Example: _____

II. Adaptations: A characteristic that helps a living thing survive is called an adaptation. Kinds of adaptations include:

A. Physical Adaptations

1. Example: _____

_____

2. Example: _____

_____

B. Behavioral Adaptations

1. Example: _____

_____

2. Example: _____

_____

C. Life Cycle Adaptations

1. Example: _____

_____

2. Example: _____

_____

(br) Carnemolla/iStockPhoto.com

Name _____

Vocabulary Review

1 Use the words in the box to complete each sentence.

1. An adaptation that helps a living thing hide in its environment is called _____.
2. The place where an animal lives is its _____.
3. An animal that is active at night is described as being _____.
4. All of the stages a living thing goes through as it develops are called its _____.
5. An example of _____ is birds flying south for the winter.
6. An _____ is any characteristic that helps an animal survive.
7. _____ is a behavior that causes an animal to be inactive for a long period of time.
8. A behavior that an animal doesn't learn is an _____.

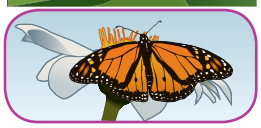
adaptation	camouflage	habitat	hibernation
instinct	life cycle	migration	nocturnal

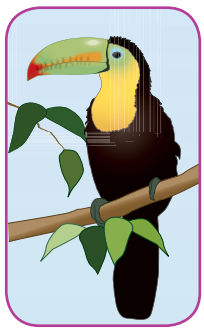
Apply Concepts

2 Draw a picture of three habitats described in this lesson. Underneath each drawing, label the habitat.

_____ _____ _____

3 Circle the camouflaged animal.





4 In winter, ground squirrels retreat into burrows and do not come out until spring. Circle the term that bests describes this behavior.

Communication *Hibernation*
Migration *Nocturnal hunting*

5 A narrow-mouthed frog's eggs do not hatch into tadpoles. Instead, they hatch directly into tiny frogs. What type of habitat would you expect the narrow-mouthed frog to live in? Explain your answer.

_____

_____

_____

Take It Home! See *ScienceSaurus*® for more information about animals.

Name _____

ESSENTIAL **QUESTION**

Why Do Bird Beaks Differ?

EXPLORE

Birds have adapted to eat different kinds of food. Because of this, there are many different kinds of beaks. In this activity, you'll investigate which beaks work best for each kind of food.

Materials

- chopsticks
- dropper
- large pliers
- needle-nose pliers
- slotted spoon
- forceps
- shredded lettuce in a bowl of water
- juice in a graduated cylinder
- rice in plastic foam
- gummy worms in sand
- sunflower seeds
- walnuts

Before You Begin—Preview the Steps

1. Look at the tools you will use to model beaks. Discuss how you use each tool and how each tool is different.
2. Place one of your food choices next to the beak that you think will work best to "eat" the food.
CAUTION: Do not eat any of the foods in this investigation.
3. Try to "eat" each type of food using each of the different tools.
4. Record your observations.

Set a Purpose

Why do you think different birds have beaks with different shapes?

Write a statement summarizing what you plan to investigate.

Think About the Procedure

What will you be modeling in this investigation?

Name _____

Record Your Data

In the space below, make a table in which you record your observations.

Draw Conclusions

Did some beaks work for more than one kind of food? What might this suggest about the bird's ability to survive?

_____

_____

_____

Did one kind of beak work for eating all of the different foods?

_____

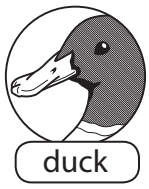
_____

Claims • Evidence • Reasoning

1. Based on your model, which bird's beak would be best for eating flower nectar? Which beaks would be best for picking insects out of wood and worms out of sand?

2. A toucan is a bird that eats very large, tough tropical fruit. Write a claim about how you expect a toucan's beak to look. Explain your reasoning.

3. Look at the bird beaks below. Based on your model, make a claim about which tool in the investigation was most similar to each of the beaks. Explain your reasoning.



4. Think of other questions you would like to ask about how adaptations relate to the food an animal eats.

ESSENTIAL **QUESTION**

What Are Some Adaptations to Life on Land?

Engage Your Brain

Find the answer to the following question in this lesson and record it here.

Is that a pine cone with eyes? No, it's a pangolin! Pangolins have strong claws for climbing and digging, and their strong tail wraps around objects. Where might you find a pangolin?

_____

_____

_____

ACTIVE **READING**

Lesson Vocabulary

List the terms. As you learn about each one, make notes in the Interactive Glossary.

_____

_____

_____

_____

Visual Aids

This lesson has many photographs of animals and plants that live on land. Active readers pause their reading to review the photographs and captions and decide how the information in them adds to what is provided in the running text.

Take a Walk in the Woods

Forests are habitats filled with trees. Many living things call forest habitats their home.

ACTIVE READING As you read this page, circle the types of organisms found in a forest.

Some of the largest forests in the United States are temperate forests. Temperate forests have warm summers and cold winters. Trees that grow in a temperate forest have wide leaves that absorb a lot of sunlight. Many kinds of plants grow beneath the trees. These plants are adapted to live with less light than plants that are not shaded. Vines, such as ivy, climb the trees to reach light.

Many animals live in a forest. Some of them have adaptations that help them climb or live in trees. Birds are common in forests. Many forest birds have feet that help them perch on branches. Insects are also common in forests. Many of them have special mouth parts that let them bore into wood. These insects can live under a tree's bark. Woodpeckers are adapted to eat insects that burrow into wood.

Describe the Temperate Forest	Describe Adaptations for Living Here

Woodpeckers eat insects that live in trees. They use their hard, pointy beak to drill holes in the tree.

Young deer, called fawns, have spots on their fur. When a fawn is curled up on the forest floor, the spots help camouflage it.

Most trees in temperate forests are *deciduous*. Their leaves change color as nights become longer in the fall. They lose their leaves before winter begins to help prevent water loss in the cold, dry air. Before the leaves fall, deciduous trees pull important nutrients from the leaves into the trunk and stems. When the weather becomes warmer in spring, the trees sprout new leaves.

Rain, Rain Every Day

Deep in the jungles live amazing plants and animals that can't be found anywhere else on Earth.

Buttress roots form walls at the base of trees. This helps keep the tree from falling over in shallow soil.

ACTIVE READING As you read this page and the next, underline plant adaptations and circle animal adaptations.

Tropical rain forests, often called jungles, are warm and rainy all year. As a result, many different kinds of plants live there. The tallest trees reach out over the top of the forest to get sunlight. Another layer of trees spreads below those giants. With so many trees, not much light reaches the forest floor. A third layer of plants live close to the ground. These are adapted to low light. Some plants, called *epiphytes* [EP•ih•fyts], have adapted to reach light by living in the trees.

Daily rain washes dirt into rivers. As a result, the soil is very thin in a tropical forest. Because their roots cannot grow very deep, large trees in tropical forests have special adaptations that help keep them from falling over. Some trees have roots that grow down from the branches to prop the tree up. Other trees have roots that make walls that spread out around the tree.

Describe the Tropical Forest	Describe Adaptations for Living Here

A howler monkey's calls are very loud. They can be heard up to four kilometers away! This helps howler monkeys communicate in a dense tropical forest.

This plant is an epiphyte. It gets the water it needs from the air and rain. Living in the trees allows it to get enough sunlight.

Many different types of animals live in a tropical forest. Larger animals such as jaguars, monkeys, and sloths live in and around the trees. Jaguars have sharp claws to climb trees and to hunt. Sloths and pangolins have long arms and strong claws that they use to hang from branches. Monkeys are able to grip branches with their hands, feet, and sometimes even their tails!

Many animals in a tropical forest are brightly colored. Some bright colors warn predators that the colorful animal is poisonous. For other animals, bright colors help them find their family in the dimly lit forest environment.

Epi- means "on top of" and *–phyte* means "plant." Using this information, write your own definition for *epiphyte.*

Fields of Gold

African hyenas are dog-like hunters and scavengers. They have powerful, bone-crushing jaws and live in packs with complex social behavior.

In some habitats, there is not enough rain for many trees to grow. What grows in place of trees?

ACTIVE READING As you read this page and the next, underline the types of animals that eat plants. Circle the types of animals that eat meat.

Grasses are the main plant life in a **grassland**. Grasslands receive less rain than forests, which is why few trees grow in grasslands. Grassland fires are common.

The long, narrow leaves of grasses keep them from losing very much water. Grasses have large root systems in which energy is stored. This helps them grow back quickly after a fire or after they've been eaten. Plant eaters in African grasslands, shown here, include elephants, zebras, giraffes, and gazelles. They have flat teeth that help them chew grass.

Many grassland animals are very fast runners. Gazelles and cheetahs are two of the fastest animals on earth. Grassland hunters have long legs, sharp teeth and claws, and powerful jaws. This helps them chase down and capture their prey. Lions' golden color helps them blend with the grass. Smaller insect-eating animals, such as meerkats, live in burrows in African grasslands. Eagles and vultures are meat eaters that search for food from far overhead. Their keen eyesight helps them spot food from high above the ground.

Describe the Grasslands	Describe Adaptations for Living Here

In North America, grasslands are also known as prairies. Bison, shown below, were once very common on the prairies. Like elephants and zebras, bison have flat teeth that help them chew grass. Bison also have more than one stomach. This helps them digest the tough fibers in grass.

Coyotes also live in prairies. They hunt small animals such as rabbits and prairie dogs. These small animals have strong front paws that help them dig. Since there are few hiding places in grasslands, living underground in burrows helps protect these animals from grassland hunters.

Thorny trees called acacias are found in African grasslands. Giraffes eat the leaves of these trees. Their mouths are tough, so the thorns don't bother them. A giraffe's long neck helps it reach leaves high up in a tree.

Some Like It Dry

Some habitats get almost no rain all year. Few plants and animals can live in such dry places.

ACTIVE READING As you read this page, circle signal words that alert you to details about the main idea.

Sandy. Rocky. Dusty. DRY! These words describe a **desert**, which is a place that receives very little rain. Lack of water makes a desert a hard place to survive. Some deserts are very cold. Other deserts are the hottest places on Earth. Plants and animals must have special adaptations to live in deserts.

Many desert plants, such as these Arizona cactuses, have thick bodies that store a lot of water. Their stems and leaves have a tough, waxy coating. They often have very small leaves. This helps keep water from escaping into the dry air.

Desert animals also have adaptations that help them conserve water. For example, many animals in hot deserts are nocturnal. They sleep during the heat of the day and only come out at night, when the desert is much cooler.

Describe the Desert	Describe Adaptations for Living Here

In the North African and Middle Eastern deserts, camels are common animals. Camels have wide feet for walking on sand. They are able to drink large amounts of water and go a long time without drinking. Camels store all of their fat in their humps. This helps their bodies cool more easily. A camel's long lashes protect its eyes from blowing sand. A camel can also close its nostrils during a sandstorm to keep sand out of its lungs.

This American sidewinder rattlesnake is adapted to move over the smooth desert sand. It takes sideways "steps" with its body, so that it doesn't slip in the sand.

DO THE MATH

Make a Bar Graph

Deserts that are very hot during the day often cool down quickly after sunset. This happens because there is no cloud cover to trap the heat. In the Sahara, in Africa, daytime temperatures may reach as high as 55 °C (131 °F). The temperature may drop to 10 °C (50 °F) at night. Plot this information on a bar graph below.

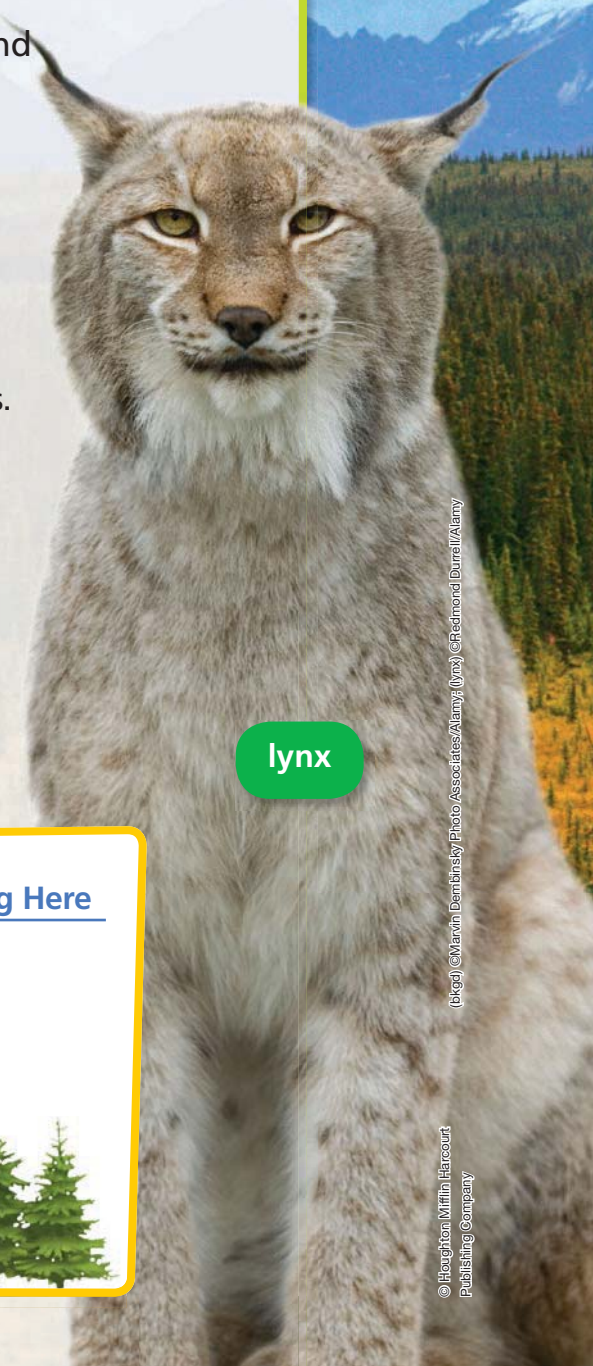
Some Like It Cold

A tropical forest isn't the only place where trees are green all year round. Some trees are tough enough to stay green even when they're covered with ice!

ACTIVE READING As you read this page, find and underline the meanings of *conifer* and *taiga*.

Pines, firs, and spruces are evergreen trees—they stay green all year long. They live in the **taiga** [TY•guh], a far northern habitat with very cold winters and short, warm summers. Trees called conifers are common in the taiga. *Conifers* are evergreen trees that grow seeds inside of cones.

Conifers are well adapted to the taiga. They have pointed tops and flexible branches. This helps them shed snow and allows them to bend without breaking when they're weighed down with ice. They are also dark green in color. This helps them absorb more light from the sun. In addition, the cones that contain seeds are hard. This helps protect the seeds inside from harsh weather and hungry animals.



lynx

(bkgd) ©Marvin Dembinsky Photo Associates/Alamy; (lynx) ©Redmond Durrell/Alamy

Describe the Taiga	Describe Adaptations for Living Here

Most conifers have needle-like leaves.

Animals that live in the taiga have many cold-weather adaptations. Animals such as wolverines and lynxes have thick fur coats. The color of their fur helps camouflage them among the trees.

During the summer, many birds live in the taiga. These birds feed on berries and insects that are abundant during the summer months. Most of these birds migrate south in autumn. This helps the birds avoid the harsh winter months when few berries and insects can be found. The birds that stay in the taiga during the winter have thick layers of feathers. These feathers insulate the birds from the cold.

A moose grows a thicker coat of fur for the long winter.

This crossbill's beak is adapted to open pine cones. The bird can then eat the seeds hidden inside the cones.

Life on Ice

This arctic willow plant has very fuzzy leaves. The fuzz stops snow from collecting on the leaves.

Some habitats are winter wonderlands all year long!

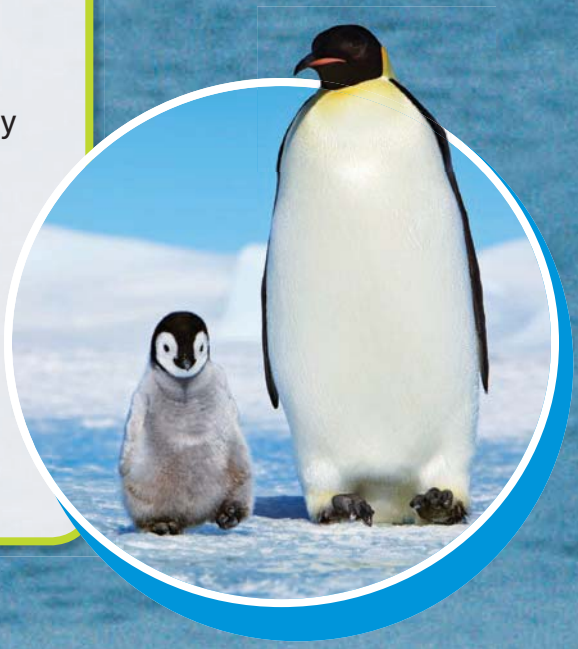
ACTIVE READING Look at the photos and read the captions on this page and the next page. Place a star next to the animal that changes color.

Habitats that are near the North Pole and South Pole are called **polar** habitats. In some areas, called the *tundra,* snow on the surface of the ground melts during the summer. The ground below stays frozen, but the thin layer of soil on top is just enough to allow plants to grow. These plants must grow and reproduce before the ground freezes again in late summer. The arctic willow, shown above, is one example of this kind of plant. It is a small, woody plant that is dormant all winter. When summer arrives it sprouts furry leaves , grows flowers, and makes seeds all in a few short months.

In places closest to the poles, the ground is always fozen. No plants can survive here. Plantlike organisms called *lichens* [LY•kuhns] live on the rocks. Many animals, including reindeer, eat lichens in polar habitats.

Describe Polar Habitats	Describe Adaptations for Living Here

Polar habitats that are covered with ice year-round are home to many animals. Penguins, like the emperor penguins shown here, live near the South Pole. They are excellent swimmers and dive for fish in the icy ocean. These amazing hunters have thick layers of fat and a layer of water-proof feathers.



Polar bears live near the North Pole. They hunt seals and are excellent swimmers. Both polar bears and seals can close their nostrils. This keeps water from entering their noses when they swim.

A willow ptarmigan has white feathers in winter. This camouflages the bird in the snow. The feathers on its legs and feet help to keep it warm.

In the summer, ptarmigans shed their white feathers and grow brown feathers. This camouflages them against the brown soil and tundra plants.

Sum It Up »

Read the summary statements below. Each one is incorrect. Change the part of the summary in blue to make it correct.

(1) Most of the trees in a temperate forest stay green in winter.

(2) Many animals in a tropical forest are very loud so that they can hide from predators.

(3) A habitat dominated by grass is called a taiga.

(4) Desert plants have waxy stems and tiny leaves so that they can use more water.

(5) Many birds in the taiga become nocturnal before the winter comes.

(6) Animals that live in polar habitats often have black fur for camouflage.

Brain Check

Name _____

Vocabulary Review

1 Draw lines to match the words in the column on the left to the correct picture on the right.

1. polar
2. conifer
3. deciduous
4. desert
5. epiphyte
6. grassland
7. taiga

A

B

C

D

E

F

G

Apply Concepts

2 Beside the picture of each living thing, write the name of the habitat where it would be found and two adaptations it has that help it survive in that habitat.

Habitat: _____

Adaptations: _____

_____

Habitat: _____

Adaptations: _____

_____

Habitat: _____

Adaptations: _____

_____

Habitat: _____

Adaptations: _____

_____

3 How is a camel adapted for life in the desert?

_____

_____

_____

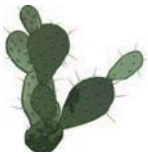
_____

4 Write the adaptation from the list next to the animal that it belongs with.

_____

_____

_____



_____

_____

_____

furry leaves

strong beak

loud call

camouflage

waxy leaves

buttress roots

Take It Home! Research an animal that lives in a habitat you learned about in this lesson. Draw the animal in its habitat. Label your drawing with at least three adaptations the animal has for surviving in its habitat.

SC.5.L.17.1 Compare and contrast adaptations displayed by animals and plants that enable them to survive in different environments such as life cycles variations, animal behaviors and physical characteristics.

Meet the Environment Detectives

Erika Zavaleta

Erika Zavaleta is an ecologist in California. She studies the links between the environment and people. Cities grow and climates change. These changes make it hard for some plants and animals to survive. Part of Erika Zavaleta's job is figuring out good ways for people, plants, and animals to live in harmony.

Recently, Erika Zavaleta has studied oak trees. Fires and other disasters can kill a whole forest of these trees. She is studying the best ways to help new trees grow after such a disaster.

Peter & Rosemary Grant

Peter and Rosemary Grant study animal adaptation. On the Galápagos Islands off the coast of South America, they study how birds called finches change over time. They are most interested in changes in the birds' beaks. The Grants have found that beak shape and size change when the environment changes.

During severe droughts many birds die of starvation. When the only seeds remaining on the ground are large, hard seeds, only the birds with the biggest beaks can crack them. They survive and the small-beaked birds die. The next year, the big-beaked birds produce big-beaked young like themselves.

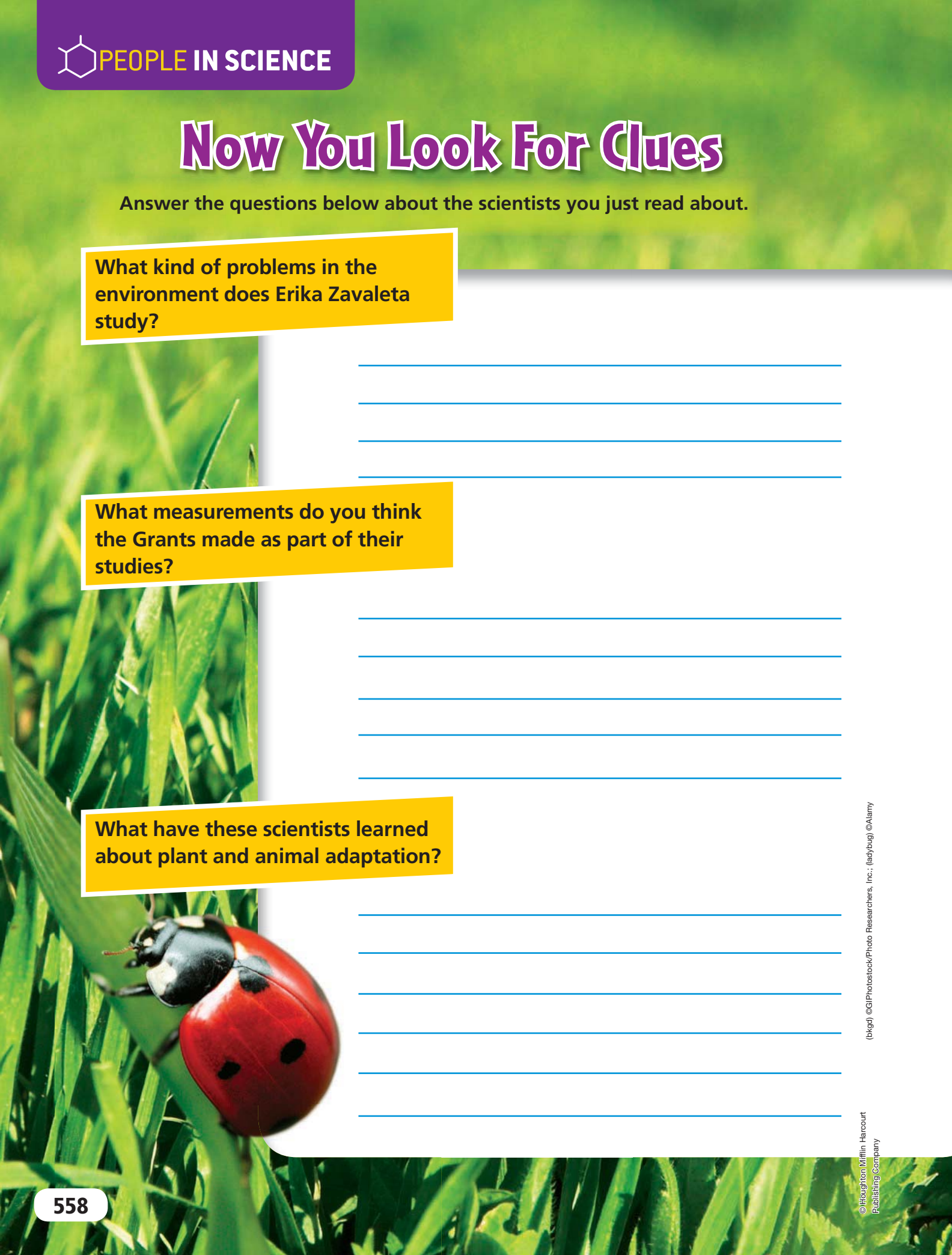
Now You Look For Clues

Answer the questions below about the scientists you just read about.

What kind of problems in the environment does Erika Zavaleta study?

What measurements do you think the Grants made as part of their studies?

What have these scientists learned about plant and animal adaptation?



ESSENTIAL **QUESTION**

What Are Some Adaptations to Life in Water?

Engage Your Brain

Find the answer to the following question in this lesson and record it here.

Can you spot the sea horse? Pygmy sea horses are adapted to blend with their brightly colored habitat. Where would you find a pygmy sea horse like this one?

_____

_____

_____

ACTIVE **READING**

Lesson Vocabulary

List the terms. As you learn about each one, make notes in the Interactive Glossary.

_____

_____

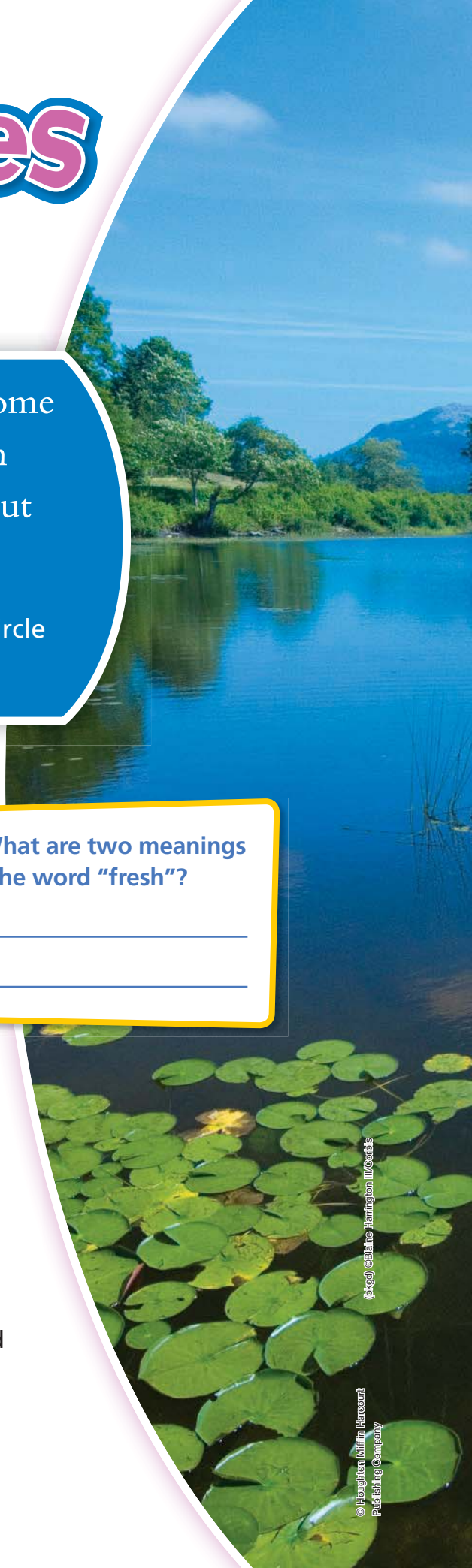
Problem-Solution

You can think of differences in habitats as problems, or challenges. You can think of adaptations as solutions to these problems. Active readers keep track of problems and solutions as they read. This helps them stay focused on the way information is organized.

Life in Lakes and Ponds

There are many kinds of water habitats. Some are salty and some are not. Water found on Earth that is not salty is called *fresh water*, but ocean water is just as "fresh."

ACTIVE READING As you read the text below, circle the descriptions of the three zones of a lake.



Ponds and lakes are examples of freshwater habitats. Lakes and ponds are wide bodies of water that do not flow very much. These habitats are divided into zones. The zone close to the shore has many living things in it. Many kinds of water plants grow near the shore. Their roots grow in the soil at the bottom, but the water is shallow enough that their leaves get plenty of sunlight. Other plants, such as water lilies and water hyacinth, float near the shore. Many animals, including ducks, snails, and fish, eat water plants.

Further away from the shore is the open-water zone. Floating plants and plantlike organisms called algae can grow here. But the water is usually too deep for non-floating plants to reach light. The deep part of a lake or pond, where light does not reach, is called the deep-water zone. No plants can grow here. Catfish, worms, and bacteria are found in the deep-water zone. They feed on dead plants and animals that fall down from above.

▶ **What are two meanings for the word "fresh"?**

_____

_____

A snapping turtle has webbed feet that help it swim through the water.

Water lilies have air-filled pockets in their leaves. This helps them float on the surface of the water.

Catfish spend much of their time in the dark near the bottom of a pond or lake. Their whiskers are adapted to sense chemicals, which helps catfish find food in the dark.

▶ Which living thing shown on this page has an adaptation that helps it find food in the dark?

_____

Go with the Flow

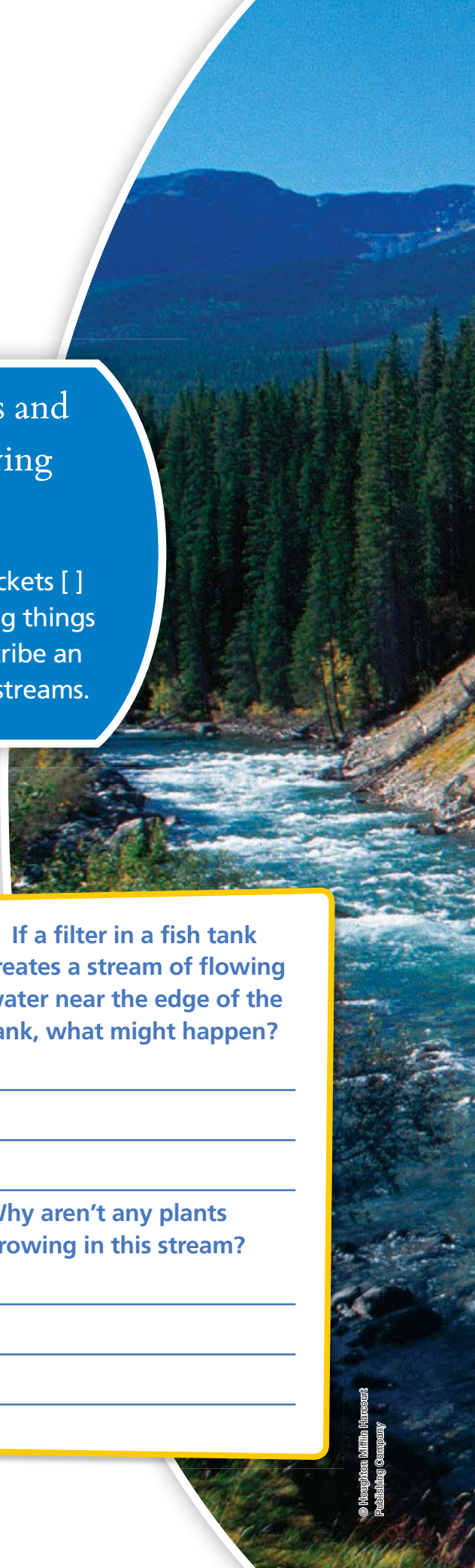
Unlike lakes and ponds, the water in rivers and streams is always on the move. How do living things keep from being washed away?

ACTIVE READING As you read this page, put brackets [ ] around the sentences that describe a challenge for living things in rivers and streams. Underline the sentences that describe an adaptation that living things have for life in rivers and streams.

The kind of living things found in a river or stream depends on how fast the water is moving. The faster the water moves, the harder it is for living things to make a home. Because of this, fast-moving streams are often clear. Very few plants and animals live there.

In places where the water slows down, more living things will be found. Many plants can grow near the banks of rivers and streams. Tiny plants called mosses make a fuzzy green carpet on rocks in and around rivers and streams. Mosses have hair-like structures that cling to rocks. This keeps them in place. Insects also live in flowing water. They can often be found floating on the surface, clinging to plants, or living under rocks in shallow water.

Of course, many fish are also found in rivers and streams. Fish must constantly swim upstream so that they are not carried away by the current.



▶ **If a filter in a fish tank creates a stream of flowing water near the edge of the tank, what might happen?**

_____

_____

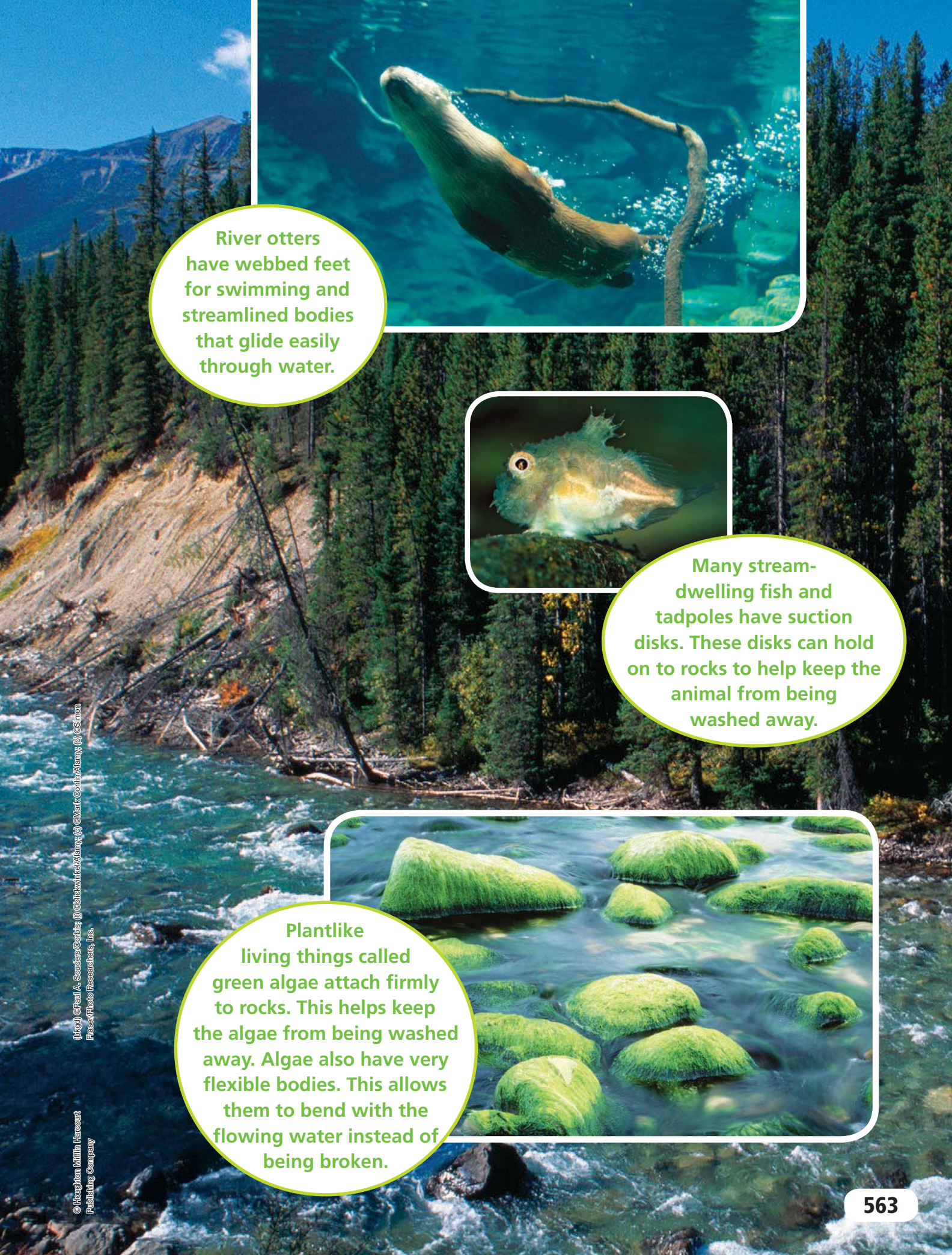
_____

Why aren't any plants growing in this stream?

_____

_____

_____



River otters have webbed feet for swimming and streamlined bodies that glide easily through water.

Many stream-dwelling fish and tadpoles have suction disks. These disks can hold on to rocks to help keep the animal from being washed away.

Plantlike living things called green algae attach firmly to rocks. This helps keep the algae from being washed away. Algae also have very flexible bodies. This allows them to bend with the flowing water instead of being broken.

Soggy Bogs

What do a bog beast and a swamp creature have in common? These imaginary creatures are adapted to live in muddy, wet habitats.

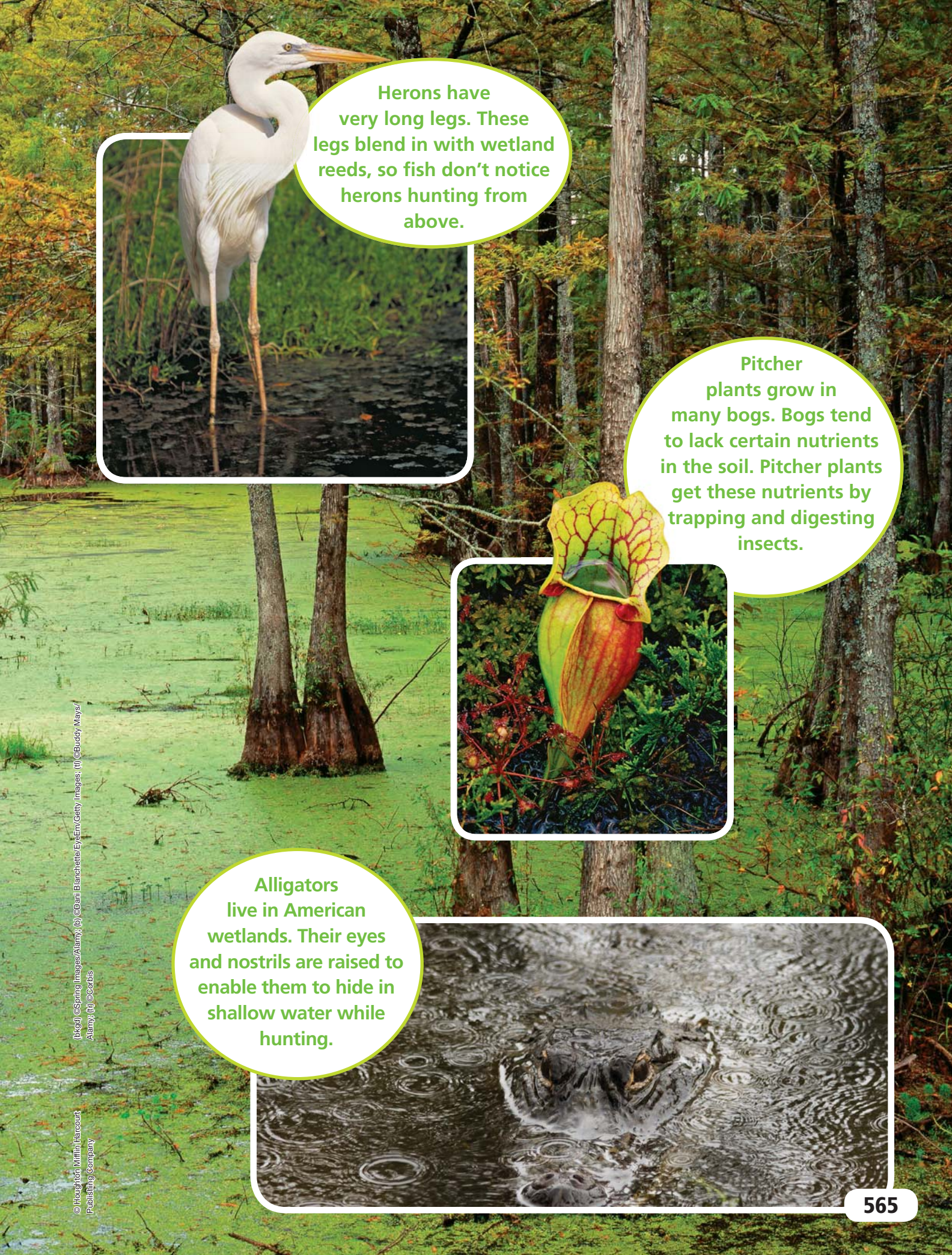
ACTIVE READING Underline the phrases that explain why wetlands are important habitats.

A **wetland** is an area of land covered by a shallow layer of water for most of the year. Bogs, swamps, and marshes are three types of wetlands. Bogs tend to be covered in a layer of thick mud. Swamps, like the one shown here, are forested wetlands. The trees often have roots both above and below the water. *Marshes* are wetlands without trees. Grasses and reeds are common marsh plants. Wetland plants have special tissues that carry air from the plant's leaves to its roots. Marshes on ocean coasts are covered with salt water. Plants here also have adaptations to get rid of excess salt.

Wetlands are very important habitats. Many kinds of birds make their nests in wetlands. Migrating water birds use shore wetlands as rest areas on their journeys to spend winter in warmer habitats. Wetlands are also home to many different kinds of plants and animals, such as carnivorous plants, insects, fish, snakes, alligators, frogs, and even giant water rodents!

▶ **Circle the two birds' feet that are best adapted for living in a wetland.**

(bkgd) ©Spring Images/Nany



Herons have very long legs. These legs blend in with wetland reeds, so fish don't notice herons hunting from above.

Pitcher plants grow in many bogs. Bogs tend to lack certain nutrients in the soil. Pitcher plants get these nutrients by trapping and digesting insects.

Alligators live in American wetlands. Their eyes and nostrils are raised to enable them to hide in shallow water while hunting.

Between a Rock and a Hard Wave

One of the harshest habitats on Earth is found on the edge of the ocean along coastlines.

ACTIVE READING As you read this page, underline challenges faced by living things in the intertidal zone. Circle adaptations for living in the intertidal zone.

The place where the ocean meets the coast is called the **intertidal zone**. Every day the tide comes in and covers the intertidal zone in salt water. Then the tide goes out and the intertidal zone is exposed to air and bright sunlight. Between high tide and low tide, the intertidal zone is constantly bashed by waves. Living things in the intertidal zone have adaptations that protect their bodies from being crushed, washed away, or dried out. Seaweed, sea stars and sea urchins, barnacles, clams and oysters, tube worms, and anemones [uh•**NEM**•uh•neez] call the intertidal zone home.

▶ **Put an *H* next to what the sea anemone and clam look like during high tide. Put an *L* next to what they look like during low tide.**

Sea stars have structures on their arms that act like suction cups. This helps sea stars anchor themselves to rocks so they don't get washed away when waves batter the shore.

Serpulas are marine worms. They live in hard tubes that protect their fragile bodies. When the tide is out, the worms retreat into the tubes.

Seaweeds have strong, flexible bodies that can endure constant waves. They attach to rocks to keep from being washed away. Many have air pockets that help the tops of the seaweed float and stay in the sunlight when the tide is in.

Out to Sea

The ocean is the largest habitat on Earth! Life can be found all the way from its edges down to its deepest depths.

ACTIVE READING Read the text below and circle the names of the two major zones of the ocean.

Coral reefs are found near many coasts. They are filled with a great diversity of sea life.

Like lakes, the ocean can be divided into zones. Light reaches the top zone, known as the photic [FOH•tik] zone. Close to shore, corals and seaweeds live. Colorful fish and pygmy sea horses blend with brightly colored coral reefs. In the open ocean, floating seaweed and tiny plantlike organisms use the sun to make food. The photic zone is also full of animal life, including jellyfish, squid, fish and sharks, dolphins, and whales.

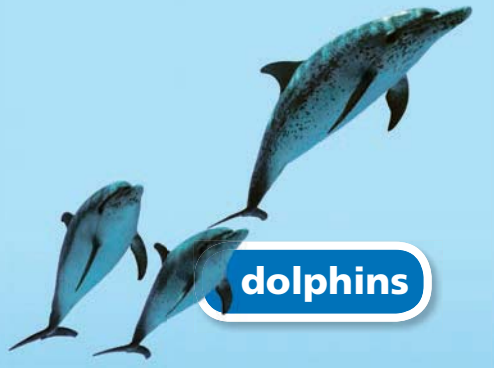
Underneath the sunlit zone is the part of the ocean where light does not reach. This part is called the aphotic [ay•FOH•tik] zone. It is very dark and very cold. Some animals move back and forth between the photic and aphotic zones.

The ocean floor is covered with mountains, valleys, and canyons, much like on land. There are undersea volcanoes and hot springs called vents. Hot water full of minerals shoots out of these deep-sea vents. Many living things depend on the heat and use the minerals to make food. Animals living here are very different from other ocean animals. Their bodies are adapted to living under extreme water pressure. Most cannot

▶ Match each zone with its description.

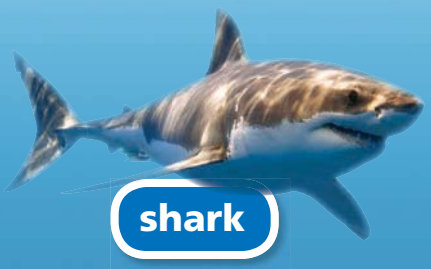
APHOTIC ZONE	Seaweeds and corals live here.
DEEP OCEAN FLOOR	Mid-ocean level where no light reaches.
PHOTIC ZONE	Animals that glow are found here.

Large floating mats of a seaweed called sargassum provide a safe habitat for many animals, including young sea turtles.



dolphins

Jellyfish float in the open ocean, catching fish that accidentally wander into their tentacles.



shark

Some marine tube worms live near the hot vents at the bottom of the ocean. They filter tiny organisms out of the water for food.

Deep-sea fish live in total darkness. Some have adaptations that allow them to produce light. They use this light to lure food or find mates.

Oceans in Peril

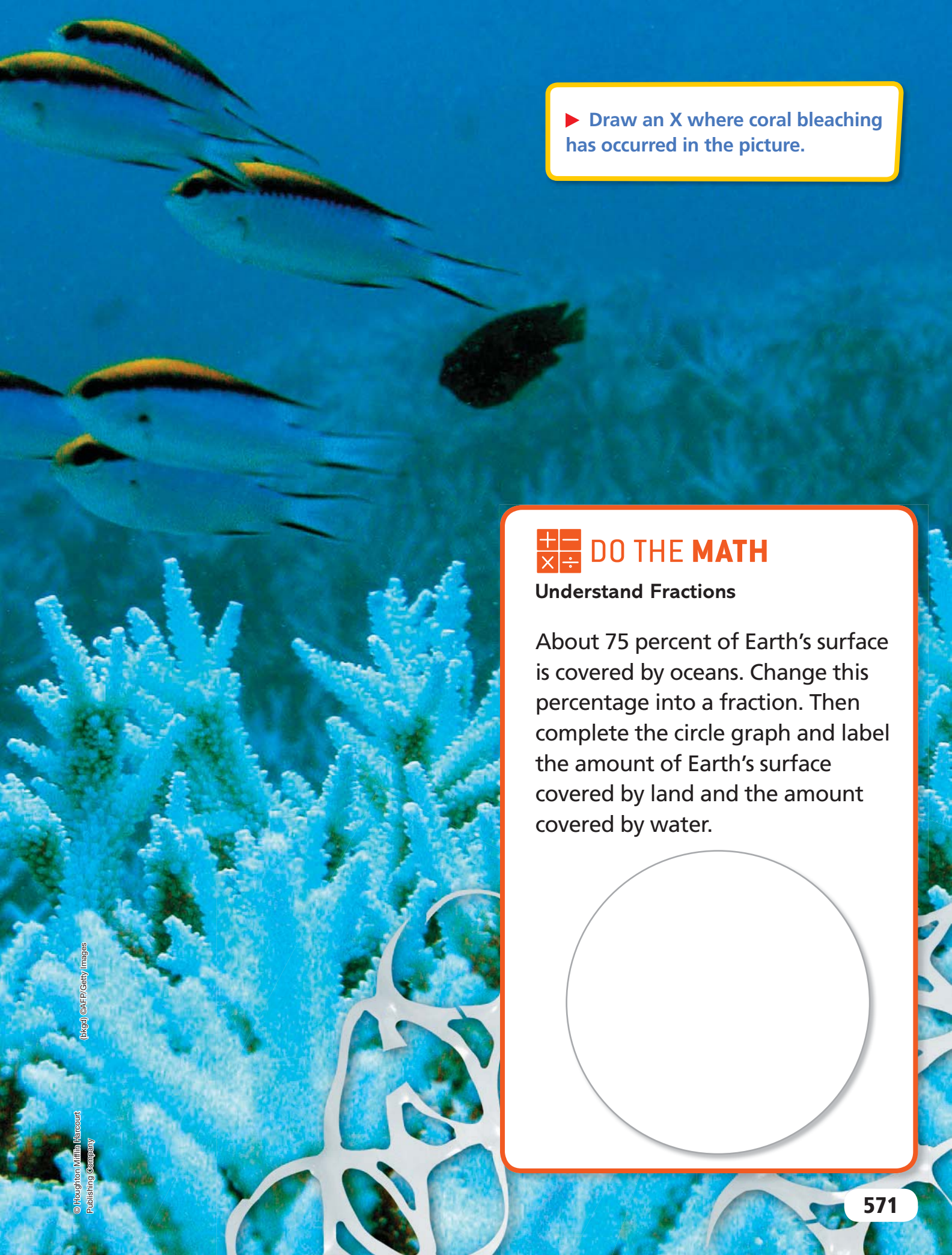
Most living things are very well adapted to their habitats. When their habitats change, living things can be put in danger.

ACTIVE **READING** As you read this page, find and underline three problems sea life faces.

Today, many changes are taking place in ocean habitats. Large areas of coral reef are losing their color, a process called *coral bleaching*. Many bleached patches are dying. Possible reasons for coral bleaching include rising water temperatures and ocean pollution.

People take too many fish out of the sea. Animals that depend on these fish for food do not have enough to eat. The fish that are left cannot reproduce fast enough to rebuild their population. It is possible that the fish we and many other animals depend on for food could become extinct.

Some countries dump their garbage in the ocean. This harms sea life. Chemicals from the trash are harmful. Living things in the ocean easily get caught in trash, such as the plastic rings used to package drink cans. Recently, a giant patch of garbage has been discovered floating in the middle of the ocean. Ocean currents have brought garbage from many countries to one area, and now the Great Pacific Garbage Patch is about twice the size of the state of Texas!



▶ Draw an X where coral bleaching has occurred in the picture.

DO THE **MATH**

Understand Fractions

About 75 percent of Earth's surface is covered by oceans. Change this percentage into a fraction. Then complete the circle graph and label the amount of Earth's surface covered by land and the amount covered by water.

Sum It Up »

Read the summary statements. Then match each statement with the correct image.

1. Many animals in wetlands have adaptations that allow them to blend with grasses while they hunt for food.

_____

2. Seaweed such as sargassum lives near the surface of the ocean.

_____

3. Because rivers and streams flow, plants that live in them must have adaptations that keep them from floating away.

_____

4. Many animals living in lakes and ponds have webbed feet to help them swim.

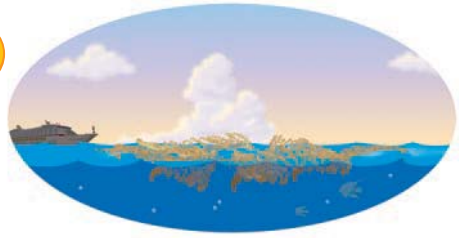
_____

5. In intertidal areas, many animals have protective shells or casings that they retreat into during low tide.

_____

A 

B 

C 

D 

E 

Brain Check

LESSON 4

Name _____

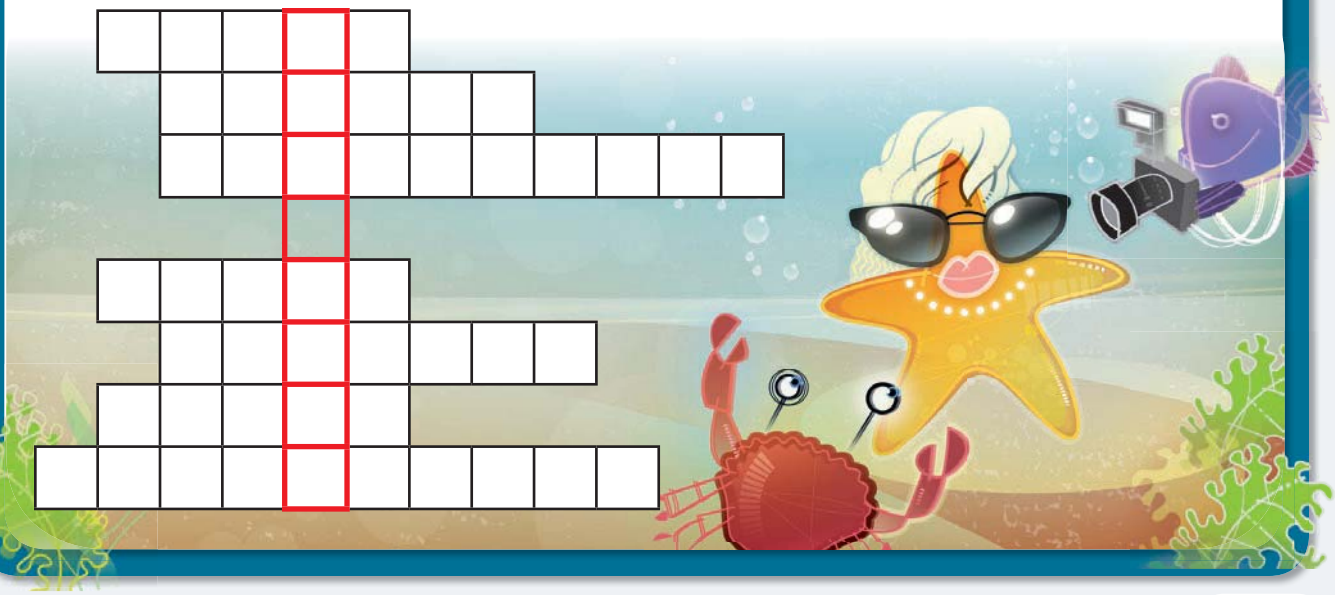
Vocabulary Review

1 Use words from the lesson to complete each sentence.

1. The ocean has salt water, but rivers and streams have __ __ __ __ __ water.
2. Animals that live at the edge of the ocean are adapted to life in the __ __ __ __ __ __ __ __ __ __ zone.
3. A swamp and a bog are both examples of a __ __ __ __ __ __ __.
4. An area of land with many grasses and reeds that is covered by water is known as a __ __ __ __ __.
5. About 75% of Earth's surface is covered by __ __ __ __ __ __.
6. A reef may lose its color due to __ __ __ __ __ bleaching.
7. The many rows of sharp, jagged teeth on some sharks is an example of an __ __ __ __ __ __ __ __ __ __ for catching food.

Figure out how to place the answers in the boxes below so that the letters in the red boxes answer the riddle.

Riddle: Who am I? You may have seen my latest blockbuster movie. It's playing now in underwater theaters. I am a __ __ __ __ __ __ __ __.



Apply Concepts

2 What adaptations would a plant living in a river need that a plant living in a pond would not need?

_____

_____

_____

3 Circle the animal that is best adapted to live in an intertidal zone.




4 What type of habitat does this bird most likely live in? Explain your answer.

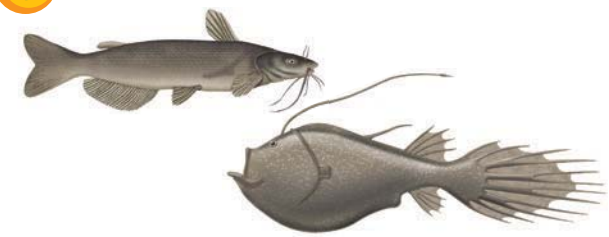
_____

_____

_____

_____

5 How are these two fish similar?



_____

_____

Take It Home! Walk with your family at a local body of water. Observe living things in the water and list the living things that you see. Talk with your family about how these living things are adapted to their habitat.

SC.5.N.1.1 Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic observations, experiments requiring the identification of variables, collecting and organizing data, interpreting data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

S.T.E.M.

ENGINEERING & TECHNOLOGY

How It Works:

Tracking Wildlife

Tracking animals helps scientists learn the animals' patterns of movement. Researchers fit animals with a variety of devices that send back information. Mammals often wear tracking collars. Toads can wear tracking belts. Fish can swallow tiny devices that work inside their bodies!

Tracking devices are attached to marine animals with glue or suction cups. The collars send signals to GPS satellites, enabling scientists to locate and track the collars over time.

This lion is fitted with a GPS collar. Sometimes collars like these also have cameras that send back video.

TROUBLESHOOTING

Describe how an animal's body, its movement, and its environment determine the design of a tracking device.

_____

_____

_____

S.T.E.M. continued

Animal tracking devices help scientists understand the behaviors of animals within their natural habitats.

Choose an animal. Draw a diagram of how a tracking device might be attached to the animal. Explain how the device is attached and what information it captures.

Research an animal species that has been studied using a tracking device. Which kind of device was used? What kind of data did it gather, and what did scientists learn about the species?

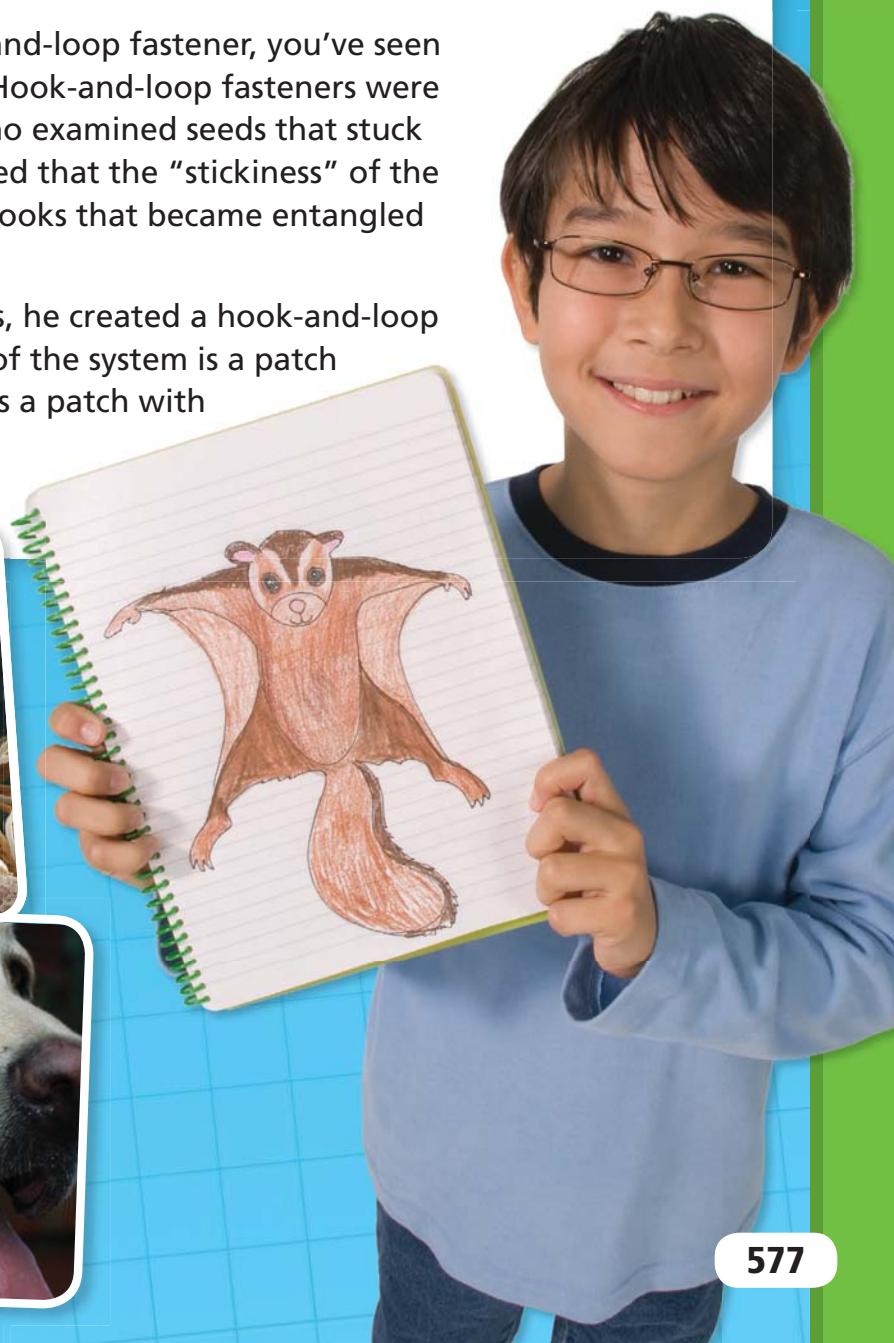
ENGINEERING DESIGN CHALLENGE

Make a Process: Mimicking an Adaptation

There's a branch of engineering that's based on imitating adaptations. It's called biomimicry.

If you've ever used a hook-and-loop fastener, you've seen an example of biomimicry. Hook-and-loop fasteners were invented by an engineer who examined seeds that stuck to his dog's fur. He discovered that the "stickiness" of the pod was produced by tiny hooks that became entangled with the hair.

Based upon his observations, he created a hook-and-loop fastening system. One half of the system is a patch with hooks. The other half is a patch with tiny loops that get snagged on the hooks.



What to Do:

1. Learn more about biomimicry. In the chart, list three examples of products that are based upon natural adaptations.

Natural Adaptation	Product

2. For each example, use two pages in your Science Notebook. On the left side page, describe the plant or animal adaptation. On the right side page, describe the product based on that adaptation.

3. Find out more about other plant and animal adaptations. From what you learn, brainstorm new products that are based on biomimicry.

4. For each product you propose, use the two-page layout that you followed in Step 2.

5. Discuss your ideas with classmates. Use their feedback to choose and improve one of your designs. Identify the natural adaptation on which you based your design.

6. Draw your final design below.

7. Keep a record of your work in your Science Notebook.

UNIT 11 Benchmark Review

Name _____

Vocabulary Review

Use the terms in the box to complete the sentences.

desert
adaptations
habitats

1. An area that gets very little precipitation is classified as a _____.

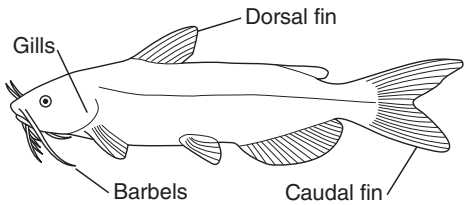
2. Animals that have white fur often live in cold, snowy _____.

3. An organism's _____ help it survive in its environment.

Science Concepts

Fill in the letter of the choice that best answers the question.

4. Catfish can live in rivers and lakes where the water is not very clear. The following picture shows a catfish.



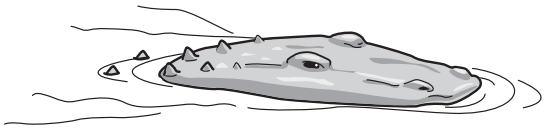
What do the barbels most likely help the catfish do in muddy water?

(A) grab objects
(B) sense objects
(C) dig holes
(D) breathe better

5. Rivers and streams are sometimes fast moving. What adaptations would help plants live in swiftly moving water?

(F) stiff stems and broad leaves
(G) shallow roots and long stems
(H) thin leaves and large flowers
(I) flexible stems and the ability to cling to rocks

6. The picture shows an alligator that lives in the Florida Everglades.



What advantage does this swimming position give the alligator?

(A) It keeps its skin from drying out.
(B) It keeps it away from muddy water.
(C) It keeps it mostly hidden under water, but the alligator can still see prey.
(D) It keeps its body temperature from getting too high.

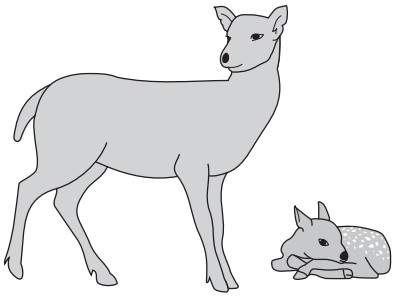
7. Sharks can smell very small amounts of substances in ocean water. What does this adaptation **most likely** let sharks do?

(F) sense water temperature
(G) find a place to lay eggs
(H) find a safe place to hide
(I) find food that is far away

8. Compared to other marine habitats, very few kinds of fish live on the ocean floor. To live in the deep ocean, what condition do fish need to be adapted for?

Ⓐ lack of food
Ⓒ high pressure
Ⓑ low salt levels
Ⓓ lots of light

9. The following picture shows a mother deer and her baby, called a fawn.



The markings on the fawn's fur are different from the markings on the mother. How does the pattern in the fawn's fur help it survive?

Ⓕ It helps the fawn stay warm in cool weather.

Ⓖ It helps the fawn stay cool in warm weather.

Ⓗ It helps the fawn blend in with the forest background.

Ⓘ It helps the fawn stand out against a forest background.

10. Bryce drew the picture on the right. It is a tree commonly found in a tropical forest.

How do buttress roots help this tree survive in the ecosystem in which it lives?

Ⓐ They keep the tree from freezing during a very cold winter.

Ⓑ They help support the tree in shallow soil so it does not fall over.

Ⓒ They help the tree make sugars from carbon dioxide and sunlight.

Ⓓ They help the tree reach deep into sandy soil for nutrients and groundwater.

11. A pitcher plant is a carnivorous plant—a plant that traps and digests insects. The American pitcher plant lives in bogs.

Insects that fall into the slippery opening of the pitcher plant get trapped inside. The plant digests the insect and absorbs the nutrients. Which of the following is a characteristic of bogs that pitcher plants are adapted to?

Ⓕ Bogs get little sunlight, so plants compete with insects for sunlight.

Ⓖ Bog soil is low in nutrients so some plants are adapted to digest insects.

Ⓗ Bogs are filled with plant-eating insects that plants need to defend against.

Ⓘ Bogs get little rain, so plants need to store water to live through dry periods.

Name _____

12. Camouflage is coloring or texture that helps a living thing blend in with its environment. Which describes an animal with camouflage that is best suited for a grassland ecosystem?

Ⓐ solid, dark black

Ⓑ solid, bright white

Ⓒ light brown, vertical stripes

Ⓓ bright, colorful patterns

13. A ptarmigan is a bird that walks on the ground. Ptarmigan feet are completely covered with tiny white feathers.

How are the ptarmigan's feet adapted for living in its environment?

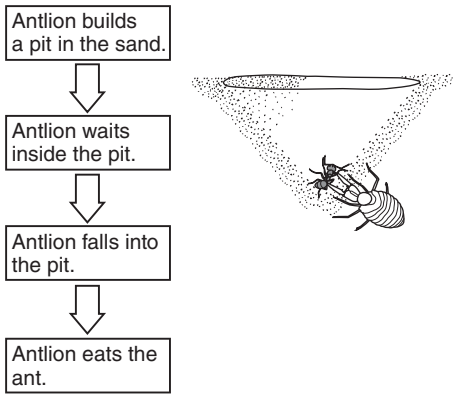
Ⓕ The feathers help keep its feet warm in the cold.

Ⓖ The feathers keep fish from noticing the ptarmigan's feet in marshes.

Ⓗ The feathers help the ptarmigan walk quietly so it can sneak up on prey.

Ⓘ The feathers help protect the ptarmigan's feet from sharp cactus spines.

14. The diagram below shows how an antlion catches its food.



What does the diagram suggest about the antlion?

Ⓕ The antlion is not adapted to its habitat.

Ⓖ The antlion has a diet of both plants and animals.

Ⓗ The antlion survives by hunting and chasing food.

Ⓘ The antlion has behavioral adaptations for its environment.

15. Which behavioral adaptation below allows the alligator to control its body temperature?

Ⓐ Alligators mate in April and May.

Ⓑ The alligator basks in the sunlight.

Ⓒ Alligators lay between 20 and 50 eggs at one time.

Ⓓ The alligator eats turtles, small mammals, and birds.

Apply Inquiry and Review the Big Idea

Write the answers to these questions.

16. The coloring of the rough green snake allows it to blend in with its background. Make a claim about what type of adaptation the rough green snake's color is. Support your claim with evidence and explain your reasoning.

17. Many desert plants, such as the welwitschia, have long central roots called taproots. Taproots grow deep underground to reach groundwater. Explain how a taproot is a useful adaptation for a desert ecosystem.

18. It is estimated that fewer than 100 Florida panthers are still living. Florida now has a protected habitat for the panther. Make a claim about how protecting the habitat will affect the panther population. Provide reasoning to support your claim.