CHAPTER 8

Living Things and

Getting Ready...

- Why do you think an insect that does not sting would look almost identical to an insect that *does* sting?
- Is a desert in Africa similar to a desert in Australia?
- Can you think of a reason why polar bears live in the Arctic but not in the desert?

Figure 8.1 In winter, the fur of short-tailed weasels is white. In summer, their fur is brown. Why do you think their fur colour changes?

All living things have a place to call home, and they have characteristics that help them to survive in their homes. The short-tailed weasel in Figure 8.1 lives in many parts of Nova Scotia. Its slender body allows it to burrow under logs and into the snow in search of mice, voles, and hares. What makes Nova Scotia a good home for short-tailed weasels? A weasel's winter fur is white, but the colour is different in summer. How might the change in colour be a clue to how weasels survive?

Each different natural area in the world has its own weather patterns, animals, and plants. For example, the animals and plants that live in a hot, dry desert are very different from those that live in a cool, wet rainforest. Nova Scotia has different types of natural areas, from tidal pools full of marine creatures to forests of red spruce and balsam fir, to freshwater wetlands, or bogs, with mosses, turtles, and carnivorous plants!

In this chapter, you will study how plants and animals are adapted to the places in which they live. You will also learn about how scientists study changes and adaptations in living things.

Their Adaptations

What You Will Learn

In this chapter, you will learn

- how living things have certain features and behaviours that help them survive in their environment
- where various plants and animals can survive, based on differences in temperature and amount of rainfall between geographic regions
- how changes to the environment can affect living things

Why It Is Important

- Investigating plants and animals that we are unfamiliar with can help us appreciate and learn new things about plants and animals with which we are familiar.
- Environmental change is natural, and there are always consequences for organisms when changes to their living spaces occur. Some of these consequences may benefit the organisms, and some may not.

Skills You Will Use

In this chapter, you will

- model ways that different kinds of birds all find enough to eat in the same small area
- develop a model of an organism that is able to hide in a particular environment
- compare the features of plants living in different areas

Could this polar bear survive in Nova Scotia?

Starting Point ACTIVITY 8–A

Home, Sweet Home

Have you ever wondered what it would be like to live in the Arctic, in a desert, or in the ocean? What challenges would you face?

What to Do Group Work

1. With a partner, write down the headings: Arctic, Desert, and Ocean. Using your own knowledge, list some of the plants or animals that live in each of these places.
2. Choose one organism from two different lists.
3. Use a chart to compare and contrast what is similar and what is different about the two organisms you and your partner chose.
4. Repeat steps 2 and 3. Be sure to include an organism from the third list.

What Did You Find Out?

1. What characteristics might help each organism survive?
2. Could the organisms you chose survive in each others' homes? Explain.
3. Describe the type of habitat that is found in the Arctic, the desert, and the ocean. Include information on the temperature and the general amount of rain or snow.
4. Write a paragraph, draw a picture, or act out a scene that describes or shows how you might survive in the Arctic, the desert, and the ocean.

Section 8.1 Adaptations

Key Terms

- adaptations
- physical adaptations
- camouflage
- mimicry
- behavioural adaptations
- hibernation
- migration

Plants and animals are constantly challenged by the world around them. When they are hunting, searching for food, or even sleeping, they are challenged by other organisms or by hostile environmental conditions. They may also have difficulty finding food or mates. In order to survive, organisms have developed special protective characteristics over time. These characteristics are known as adaptations.

Adaptations are features that make an organism well-suited to its surroundings. They may be physical characteristics that affect structure or appearance, or behavioural characteristics that affect the way an organism acts. They give an organism a better chance of surviving and reproducing in a particular environment. It is important to note that adaptations are *inherited* characteristics. This means that they are passed on from one generation to the next. An organism already has all of its special adaptations when it is born.

Figure 8.2 This clownfish is adapted to live among the tentacles of the sea anemone. The stinging tentacles of anemones do not harm clownfish. Since other fish avoid the tentacles, clownfish can live among anemones, safe from predators.

Physical Adaptations

Adaptations that affect the way an organism looks are called **physical adaptations**. Physical adaptations include the structure of physical features, such as the long, pointy front teeth of a cat and the needle-like fur of a porcupine. Physical adaptations also include the colouring of skin, fur, and body coverings. You saw an example of this at the start of the chapter. The weasels in Figure 8.1 have white fur that blends in with the snow in winter, making it harder for their prey to see them. In spring, they grow a new, darker pelt. This is an inherited characteristic that helps the weasels survive.

You have physical adaptations as well. For example, your skin has sweat glands that help you keep a constant body temperature, no matter how hot or cold it is. When it is hot, sweat glands release water onto your skin. The water evaporates and, as a result, you become cooler. When it is cold, sweat glands do not release water, and you stay dry and warm. As you read more about adaptations in this section, see if you can think of how organisms you are familiar with are adapted to their unique surroundings.

Figure 8.3 There are dozens of ways in which living things are adapted to their surroundings. How many adaptations can you think of that help a beaver live and survive in and around streams and rivers?

READING Check

Is your sense of smell an adaptation that helps you survive? Explain your answer.

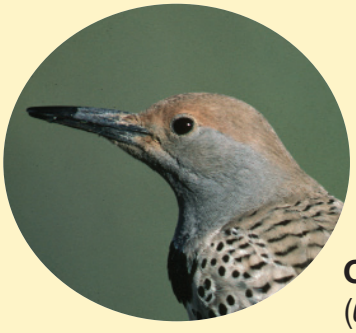
Find Out ACTIVITY 8-B

Picky Eaters

Many different types of birds can survive together in a small area because of the food choices they make. In this activity, you will compare different tools and predict how the shape of a bird's beak influences what it eats.

A. bald eagle (*Haliaetus leucocephalus*)

B. northern cardinal (*Cardinalis cardinalis*)



C. northern flicker (*Colaptes auratus*)

D. robin (*Turdus migratorius*)

Safety Precautions

- Never eat anything in the science lab.
- If you have any food allergies, inform your teacher before the class begins this activity.

What You Need

1 gummy worm	tongs	scissors
1 jelly bean	clothespin	
1 chocolate chip	tweezers	
4 sunflower seeds (in the shell)		

What to Do

1. Use the scissors to pick up each of the food items. Use the scissors to crack open a sunflower seed. Record your observations using sketches and notes.
2. Repeat step 1 using the tongs, tweezers, and clothespin.

What Did You Find Out?

1. Which tool best picked up the jellybean, the sunflower seed, the gummy worm, and the chocolate chip?
2. Which tool was the best at cracking a sunflower seed?
3. Do any of the tools resemble any of the birds' beaks in the pictures?
4. What natural foods do you think each of the birds in the pictures usually eats?
5. Do you think all birds can use their beaks to eat any type of food? Explain your answer.
6. How do differences in beak types help a variety of birds find enough food to survive in a geographical area that they share?

Adaptations for Protection

Some types of physical adaptations are very specific. For example, an organism's ability to blend into its surroundings is called **camouflage**. Camouflage hides animals while they wait for food to pass by or when predators are near. Can you see an organism in Figure 8.4? The sand-like pattern and colour on the fish in the photograph make it blend in with the sand on the ocean floor where it lives. This physical adaptation prevents it from becoming an easy meal.

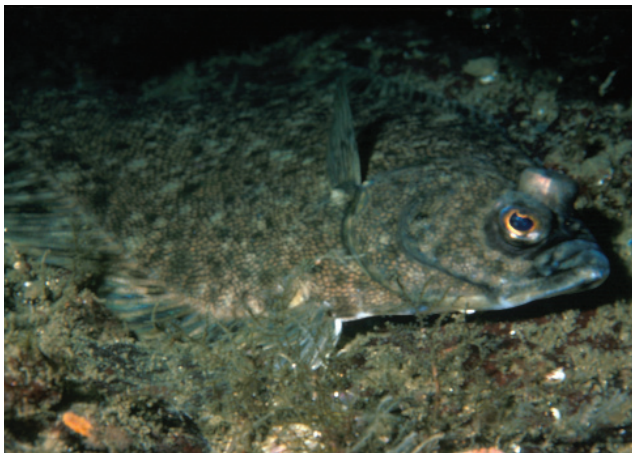


Figure 8.4 This fish's colouration makes it hard to see on the sand.

Other organisms camouflage themselves by mimicking the shape of something, possibly even another organism. Looking like something else—a natural object, or an organism that stings or tastes bad—is a physical adaptation called **mimicry**. Have you ever been stung by a bee or wasp? This experience would have taught you to avoid buzzing, black-and-yellow-striped insects, such as the yellow-jacket wasp shown in Figure 8.5(A). Animals that eat insects avoid wasps too. Insects with the bright colouration of the yellow-jacket wasp tend to sting. However, there are insects that have the same colouration as yellow-jacket wasps, such as the fly in Figure 8.5(B), which do *not* sting. Looking like an animal that *does* sting can help the fly to avoid being eaten by predators.

READING Check

How is mimicry an adaptation that helps organisms survive?

A yellow-jacket wasp B non-stinging fly

Figure 8.5 The colouration of the non-stinging fly mimics that of the stinging wasp. This is a type of camouflage called mimicry.

SKILLCHECK
- Identify the Problem
- Decide on Design Criteria
- Plan and Construct
- Evaluate and Communicate

Camouflage Creature

Challenge

Create a 3-D model of a creature or object that will be camouflaged in your classroom.

Materials

containers of your choice, such as milk jugs, food containers, and boxes
small items of your choice, such as pins, buttons, string, pipe cleaners, and craft sticks
art supplies

Design Specifications

A. Your model must be at least 20 cm long.

B. Your model must be three-dimensional.

C. Your model must be camouflaged in its environment.

Plan and Construct Group Work

1. With a partner, choose the area in your classroom where your model will be placed. For example, you might choose a bulletin board, a plant, or a piece of furniture.
2. Draw a labelled sketch of your model, indicating what materials you will use.
3. Obtain your teacher's approval, and then construct your model.
4. Improve your model until you are satisfied with the way it looks and you feel confident that it will be camouflaged in the location you have selected.
5. Place your model in the location you have chosen.
6. Challenge your classmates to find your model.

Evaluate

1. Was your model well camouflaged in the location you chose? Explain.
2. What changes could you make to your model so that it is better camouflaged?
3. Where in your classroom would your model be the least camouflaged? Explain your answer.
4. How is camouflage important for animals?

Type of Adaptation

- Structural (physical)

Examples:

A The bladderwort plant floats on ponds in Nova Scotia. It is carnivorous and uses tiny traps, called bladders, to capture insects and other small aquatic animals. These bladders on the branched, underwater leaves of the plant help it to obtain nutrients that it needs to survive.

B Animals that are active at night or live in very dark places often have structural adaptations that help them find food in the dark. Owls, such as the great horned owl have large eyes, a very flexible neck, and excellent hearing. These adaptations help the owl obtain food.

Type of Adaptation

- Camouflage (physical)

Examples:

A The American bittern lives in parts of Nova Scotia. This bird stands still and silent by the edges of ponds, waiting for fish to swim by. The stripes on the underside of the bittern's neck and the colours of its feathers camouflage the bird, making it less visible to its prey.

B Many lizards, such as this eastern short-horned lizard, live in a dry, sandy environment where they are well camouflaged. The lizard's light coloured, bumpy hide blends in seamlessly with its desert surroundings.

Type of Adaptation

- Mimicry (physical)

Examples:

A Thorn bugs are hard to see because their shape mimics the thorns on a plant. Predators avoid them because they look like the other thorns on the plant.

B Walking stick insects look just like a branch or twig. They spend the daytime on a branch in a deep motionless sleep so that their movement does not give away their location. Most predators do not see the insects because of this excellent mimicry.

Behavioural Adaptations

Not all adaptations are physical. As noted earlier, an organism may also have behavioural adaptations. **Behavioural adaptations** are habits and activities of organisms that are important for survival. For example, grizzly bears, like the one in Figure 8.6, hibernate for part of the winter. **Hibernation** is

Figure 8.6 In parts of Canada where it gets very cold, grizzly bears hibernate for part of the winter. Hibernation is a behavioural adaptation.

a period of time when animals are much less active and use a lot less energy than usual. During hibernation, the body temperature drops, and the heart rate and other body processes slow down. Hibernation gives animals a better chance of surviving in winter, when there isn't very much food available.

Migration is the movement of animals from one region to another in response to a change in seasons. Many animals, including many mammals, birds, and insects, often migrate when there are changes in temperature or the number of hours of daylight, which means that less food will be available. Migration is another type of behavioural adaptation. Behavioural adaptations are not always as dramatic as hibernation or migration. A snake moving under a rock to seek shade from the hot sun and a group of honeybees beating their wings to cool their hive are also examples of behavioural adaptations.

READING Check

Choose one plant and one animal. What is one adaptation that makes them well-suited to their surroundings?

Type of Adaptation

- Behavioural

Examples:

A Reptiles need an outside source of heat to maintain their body temperature. As a result, snakes hibernate each winter. They spend the season in underground dens. During this time, they shut down many body functions. This behavioural adaptation protects the reptiles from cold temperatures.

B Each year, monarch butterflies make the long journey from their summer homes in North America to their winter home in Mexico, where they find warmer temperatures and a greater food supply.

INVESTIGATION 8-D

SKILLCHECK
- Problem Solving
- Questioning
- Interpreting Observations
- Compare and Contrast

Matching Adaptations

Plants and animals have physical and behavioural adaptations that help them live in their particular surroundings. In this investigation, you will match a plant or animal with either its adaptation or the survival benefit it provides.

How are this lynx (*Lynx canadensis*) and this snowshoe hare (*Lepus americanus*) adapted to their surroundings?

Think About It

Examine the following table.

Plant or Animal	Adaptation	Survival Benefit
Woodpecker		Reaches insects in trees
Snail	Hides in hard shell	
Seal		Maintains body temperature in cold water
Sea Anemone		Protection from predators
Eagle	Sharp claws	
Grizzly Bear	Hibernates in winter	

What to Do

1. For each plant or animal listed, fill in the missing information.

Analyze

1. Which of the adaptations listed in the table are physical adaptations? Which are behavioural?

2. Adaptations help organisms survive. Would a grizzly bear survive if it could not hibernate in winter? Explain your reasoning.

Conclude and Apply

3. Research one plant or animal from the list below and determine its physical and/or behavioural adaptations. Describe the conditions in which your plant or animal lives (e.g., temperature, rain- or snowfall). Present your findings in a written report, poster, display, or any other means approved by your teacher.

Plants
- Indian pipe
- Spotted Knapweed
- Thistle
- Touch-Me-Not

Animals
- Great blue heron
- Little brown bat
- Red fox
- Viceroy butterfly

Section 8.1 Summary

Adaptations are physical features or behaviours that increase an organism's chances of surviving in its surroundings.

- Adaptations are inherited characteristics.
- Physical adaptations are features of structure or appearance that give organisms a better chance of surviving in their surroundings.
- Camouflage refers to physical adaptations that help organisms hide from other organisms.
- Mimicry is a type of camouflage; it allows organisms to gain protection by copying the colouration and/or shape of other organisms or objects.
- Hibernation and migration are examples of behavioural adaptations.

Check Your Understanding

1. Give an example of a plant adaptation.
2. What are the differences between physical and behavioural adaptations? Provide an example of each.
3. How are some organisms, such as an aquatic plant or a polar bear, able to survive in very harsh environments?
4. Domestic dogs can be very small (like lap dogs) or very big (like Irish wolfhounds). Almost all domestic cats have a mass between 6 kg and 10 kg. Why do you think domestic cats are all about the same size, while dogs can vary so much in size? Explain your answer.
5. Like other birds that perch, robins have feet with three front toes, one long back toe, and a specialized tendon that automatically locks their back toes around a branch when they land. Describe two other adaptations that help birds survive.
6. You are an ecologist studying wildlife populations. You notice many lynx tracks in a large section of forest isolated from human development. In a smaller section of the same type of forest, close to human development, you see no signs of lynx.
   (a) What might be the reason for this?
   (b) How might you test your explanation?

Key Terms

adaptations
physical adaptations
camouflage
mimicry
behavioural adaptations
hibernation
migration

Section 8.2 Adaptations and Change

Key Terms

biomes

extinct

Palm trees or cacti (singular: cactus) do not grow in Nova Scotia, just as caribou cannot be found in Mexico. Plants, animals and other organisms are adapted to the specific conditions of their habitat—the area in which they live—such as climate (average weather patterns), altitude (height above sea level), and available food and shelter.

The pitcher plant (Figure 8.7) lives in wetlands, or bogs, of Nova Scotia and other parts of Canada. This plant is best suited to the moist conditions in these wet, mucky places. Its food—small insects that are caught in the liquid inside the plant's cup—lives in these areas, too. Pitcher plants would not survive in the dry grasslands of Saskatchewan.

Many widely separated land regions in the world have similar climates and similar (though not the same) types of plants and animals. Each of these large land regions, or **biomes**, has its own distinct climate, soil, plants, and animals. In Canada, there are four major land regions: tundra, boreal forest, temperate forest, and grassland. All of Nova Scotia falls within the broad category of temperate forest. Within Nova Scotia, though, there is a variety of habitats, including forests of sugar maple, yellow birch, and beech; mudflats and sandy beaches; and rocky, barren areas with very little vegetation, such as the high-altitude Cape Breton Highlands.

Figure 8.7 The pitcher plant is a carnivorous (animal-eating) plant. It is well-adapted to living in wetlands.

Find Out ACTIVITY 8-E

Where in the World?

A huge variety of organisms lives in Canada. Their characteristics give clues to the biomes in which they are found. Each of the four major biomes of Canada has its own set of environmental conditions.

groundhog (*Marmota monax*)

mountain goat (*Oreamnos americanus*)

banana slug (*Ariolimax columbianus*)

painted turtle (*Chrysemys picta*)

What You Need

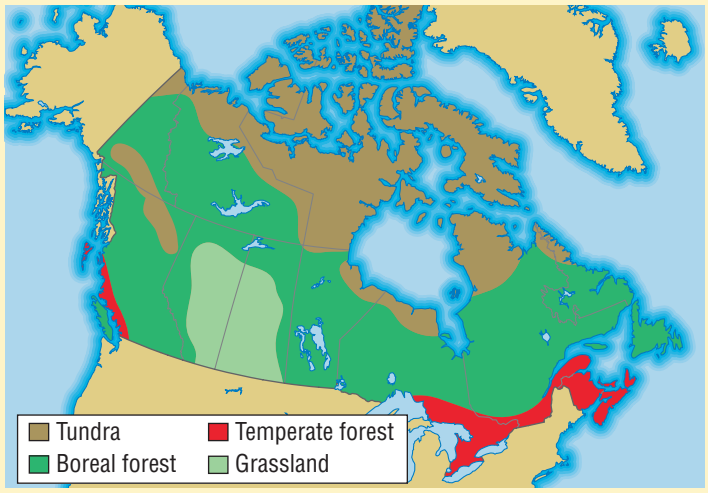
paper pencil

What to Do

1. Predict the types of habitats that the animals pictured here require for survival.
2. List the characteristics of habitats in which each animal would not live. Briefly explain your choices.
3. Predict in which of the four Canadian biomes each animal lives.
4. Use the Internet or the library to determine where each of these animals lives in Canada.

What Did You Find Out?

1. What clues would you look for in an animal's appearance when determining where it might live?
2. What environmental conditions determine where an animal might or might not live?
3. Which of these animals live in a broad range of habitats? Which live in a specific range? What characteristics might determine whether an organism can live in one kind of habitat or many? Explain your reasoning.
4. What organisms might live in Newfoundland and Labrador, but not in Nova Scotia? Explain.



Find Out ACTIVITY 8–F

Checking Out the Neighbourhood

Neighbouring habitats may be home to many different species, even if they are only a few metres apart. In this activity, you will sample the organisms living within two sites and compare the results.

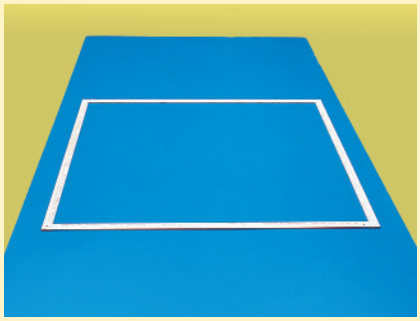
What You Need

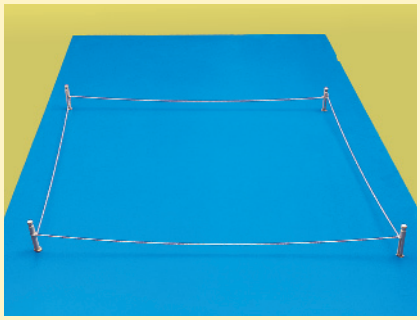
thermometer
4 metre sticks or 4 wooden pegs and string
ruler
plastic container with holes punched in the lid
hand lens
clipboard
plant, insect, and bird field guides (optional)

What to Do

1. Before you go to your study site, create two data tables similar to the one shown here. You should have one table for Site A and one for Site B. Take your tables with you to the site.
2. When you arrive at your first study site, sit quietly and observe it. Record everything that you can see, hear, and even smell to give an overall description of the site.
3. Choose a study area and make a square study area that measures 1 m on each side. You can use four metre sticks or four pegs and string.

Species	Approximate Number/Plot	Observations	Sketch





4. Measure and record the temperature on the soil surface and in the air. Record a general description of the site. For example, is the ground made up of soil, mud, or rock?

5. Choose at least three types of plants and three kinds of animals that are inside the square study area. Count and record the number of each of these organisms within the square. If an organism is very common, you may have to estimate how many live within the study area.

6. Make a sketch of each organism. Try to identify the organisms using the field guides. If you cannot find the correct name for the organism, create a descriptive name for it.

7. Repeat steps 2 to 6 at a different site (or, compare your results with a team that worked at a different site).

What Did You Find Out?

1. Write a paragraph that describes each study site. Include general information about the site (e.g., weather, overall description) as well as the kinds of living things you found there.

2. How did the characteristics of your first study site compare to those of the second site?

3. Explain why it is important for scientists to study more than one site within an area.

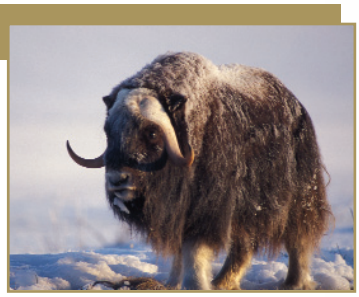
4. Predict how the site(s) you studied may be different in one year and in ten years. How might the species found there be affected?

Organisms around the World

Figure 8.8 shows the six major world biomes and a few of the plants and animals that are adapted to live there. The world is divided into major biomes, each with a particular set of environmental conditions. These conditions determine where organisms can survive and thrive.

Figure 8.8 World biomes and some of their characteristic organisms.

Tundra



Plants: Grasses, wildflowers, mosses, small shrubs

Animals: Musk ox, caribou, polar bears, Arctic foxes, weasels, owls, grouse, rodents, black flies, other insects

Location: Far north, such as the high Arctic region of Canada; also in high mountains

Climate: Very cold, long winters; short and cool summers; 10–25 cm of precipitation a year

Boreal Forest (Taiga)

Plants: Mostly spruce, fir, and other cone-bearing, evergreen trees

Animals: Rodents, snowshoe hares, moose, lynx, least weasels, caribou, black bears, grizzly bears, wolves, many birds

Location: Most of Canada, Russia, and Scandinavia (Sweden, Denmark, Norway)

Climate: Very cold winters, cool summers; about 50 cm of precipitation a year

Temperate Forest

Plants: Broad-leaved trees such as oak, beech, maple

Animals: Wolves, deer, bears, and a variety of small mammals, birds, amphibians, reptiles, and insects

Location: Most of the United States, United Kingdom, western Europe, Brazil, eastern China

Climate: Relatively mild summers and cold winters; usually have four distinct seasons; 75–150 cm of precipitation a year

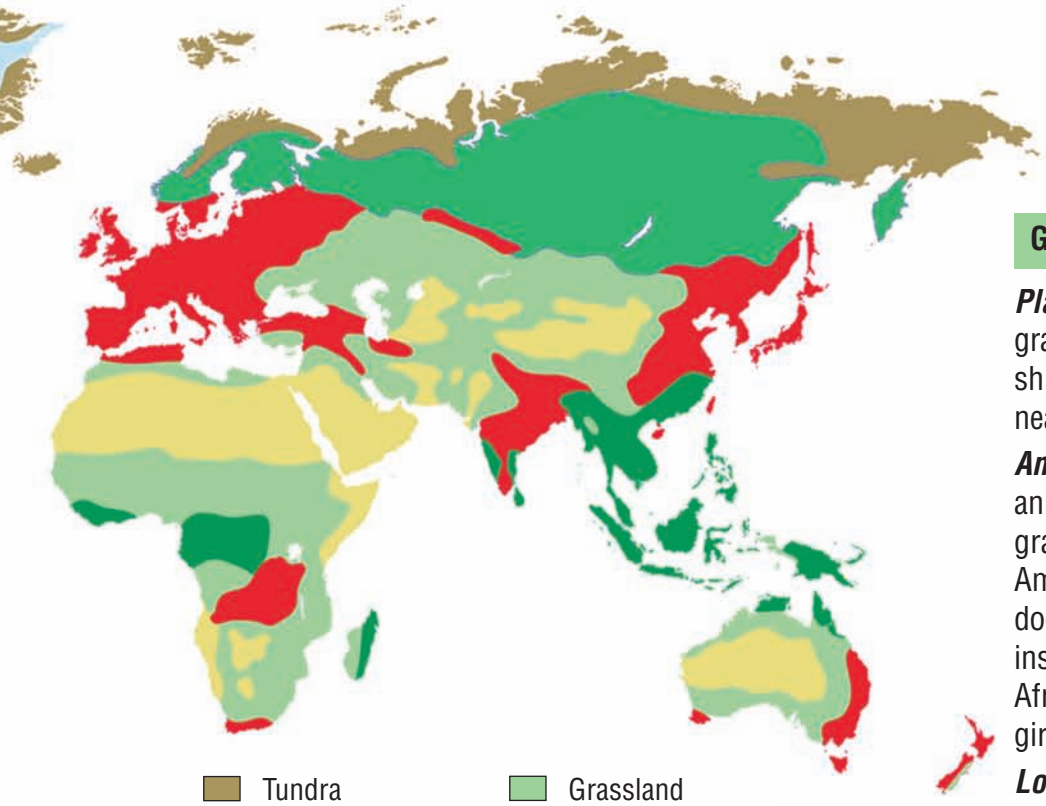
Tropical Rainforest

Plants: Very wide diversity of vines, orchids, ferns, trees

Animals: More species of insects, reptiles, and amphibians than in any other biome; monkeys, elephants, birds

Location: Near the equator

Climate: Hot all year round; 200–600 cm of rain a year



Tundra
Boreal forest
Temperate forest
Tropical rain forest
Grassland
Desert
Ice (not a biome)

Grassland

Plants: Mostly grasses and small shrubs; some trees near water

Animals: Grazing animals that eat grasses; in North America: prairie dogs, foxes, snakes, insects, birds; in Africa: elephants, lions, zebras, giraffes; in Australia: kangaroos

Location: Mid-latitudes; interiors of continents such as central Canada and the United States, parts of China, and eastern Europe

Climate: Cool in winter, hot in summer; 25–75 cm of precipitation a year

Desert

Plants: Very few plants; cacti, grasses, shrubs, some trees

Animals: Rodents, snakes, lizards, tortoises, insects, some birds; in Africa, the desert is home to camels, gazelles, antelopes, snakes, lizards, gerbils

Location: Mid-latitudes, such as northern Africa, central Australia, and parts of China

Climate: Very hot days, cool nights; less than 25 cm of precipitation a year

Figure 8.8 Up until about 10 000 years ago, a sheet of ice and snow up to 3 km thick covered half of Canada. Before it started to melt, this frozen sheet covered all of Canada and even part of the United States!

Change is Natural in all Biomes

Imagine travelling back in time to see your province 10 000 years ago. At that time, about half of Canada was covered in a huge sheet of ice like the one shown in Figure 8.8. A few thousand years earlier, ice had covered Nova Scotia and the other Atlantic provinces, too. Once the ice melted, the climate was still colder and drier than it is today. In fact, 10 000 years ago, Nova Scotia would have been part of the tundra biome.

Pause & Reflect

What do you think the landscape of Nova Scotia looked like 10 000 years ago? What kinds of plants and animals would you see? How would the plants and animals be adapted for their colder, drier environment?

Now imagine travelling farther back in time to see your province 100 000 000 years ago. At that time, North America was located farther south than it is today, so Nova Scotia was closer to the equator. The climate was much hotter and more humid than it is today. Nova Scotia might have been part of a tropical biome 100 000 000 years ago.

Pause & Reflect

What do you think the landscape of Nova Scotia looked like 100 000 000 years ago? What kinds of plants and animals would you see? How would the plants and animals be adapted for their warmer, more humid environment?

Throughout history, there has been a great diversity of life on Earth. Ten thousand years ago, one hundred million years ago, and even half a billion years ago, there were animals, plants, fungi, protists, bacteria, and archeans on Earth. However, many of the species that lived long ago do not exist today. They became **extinct**, which means that all the members of each species everywhere in the world died out completely. What can cause some species to become extinct but not others? You will think about answers to this question in the activity.

Find Out ACTIVITY 8–G

Changes in Organisms over Time

About 40 000 000 years ago, North America was home to animals that might surprise you—such as camels! By about 10 000 years ago, all of North America's camels went extinct. We know about them from their fossils. Fossils are the traces and remains of ancient organisms that have been preserved in rock for thousands or millions of years.

What to Do

1. Examine the photos and captions. Then answer the questions that follow.

What Did You Find Out?

1. What phylum did the trilobites belong to? (Refer to Figure 7.14 in Chapter 7).
2. To which phylum do you think horseshoe crabs belong?
3. Nautiluses are related to the extinct ammonites. To which phylum do nautiluses belong?
4. An extreme event happened 65 000 000 years ago that caused many species from all six kingdoms to become extinct.
   - **(a)** Use what you know about adaptations to give a reason why ammonites, dinosaurs, and other organisms went extinct.
   - **(b)** Use what you know about adaptations to give a reason why some species, such as horseshoe crabs and nautiluses, did not become extinct.

A About 500 000 000 years ago, Earth's oceans were teeming with organisms called trilobites. Trilobites were arthropods. By about 265 000 000 years ago, trilobites had become extinct.

B Horseshoe crabs appeared on Earth around when trilobites did. Although they are called crabs, horseshoe crabs are more closely related to spiders and the extinct trilobite.

C Ammonites were ocean-dwellers that appeared about 250 000 000 years ago. They were members of the mollusc phylum. Ammonites went extinct 65 000 000 years ago.

D Nautiluses first appeared on Earth around when ammonites did. There are still several species of nautilus alive today, but most are extinct.

Considering Consequences

Environments all over the Earth are always changing. Sometimes these changes are natural. For instance, the event that caused so many extinctions 65 000 000 years ago was natural. Events today such as erupting volcanoes and rumbling earthquakes are also natural. Sometimes changes to the environment are caused by our need for resources such as trees and for land to grow food or build homes. What are some possible consequences for living things when the environment changes? Think about this in the next activity.

Find Out ACTIVITY 8–H

What Happens Next?

What To Do

1. Choose one of the two photos on this page.
2. Turn a sheet of paper sideways, and make a comic strip with three panels to fill the page.
3. In the middle panel, sketch the scene shown in the photo you chose. Write a caption under the panel that says, "Then it changed."
4. In the first panel, draw a picture showing what you think the scene looked like before it changed. Include any organisms and any other things that you think were there. Write a caption under the panel that says, "It looked like this."
5. In the third panel, draw a picture showing what you think the scene will look like a few years from now. Include any organisms and any other things that you think will be there. Write your own caption under the panel.

What Did You Find Out?

1. Write a short paragraph that explains how you decided on the details you showed in the third panel of your comic strip.
2. Share your comic strips with your classmates, and talk about the stories that you have created. Find students who chose the same scene that you did. Compare and contrast the features in your third panels.

Find Out ACTIVITY 8–1

Make a Species Profile

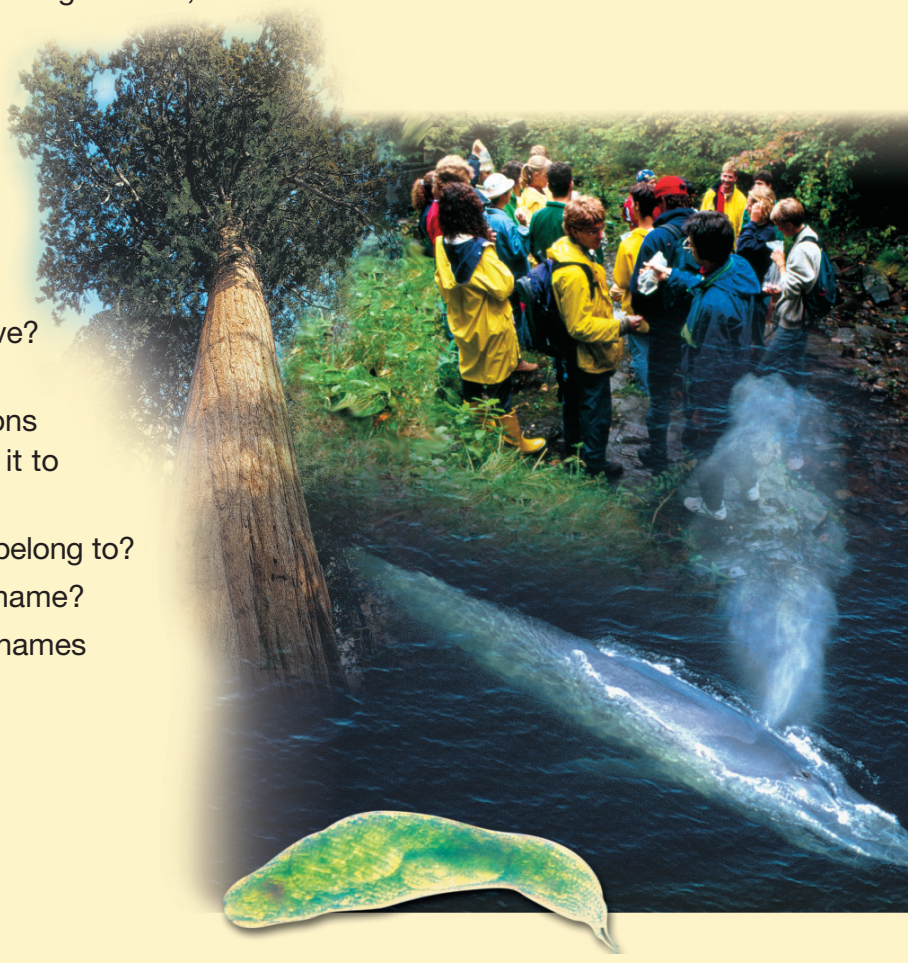
Scientists have learned about life on Earth by observing organisms, doing experiments, reading what other people have observed, and by asking lots of questions. Do you have a favourite plant or animal? What do you already know about it? What else could you learn about it?

What To Do

1. Choose a plant or animal that appeals to you. It can be any species, past or present. If you are not sure which species to select, flip through books, scroll through nature web sites, or watch a nature movie or documentary on video or DVD.
2. Find out:
   - In what part or parts of the world does it live?
   - What physical and behavioural adaptations does it have that suit it to where it lives?
   - What phylum does it belong to?
   - What is its scientific name?
   - How many common names does it have?
   - In what ways has it changed over time? (In other words, what are some of its ancestors? For instance, dinosaurs are ancestors to modern-day birds.)
3. Come up with at least two other questions to ask about your chosen species, and answer them.

What Did You Find Out

4. Organize all your information in the form of a poster, essay, or multimedia presentation, and share it with the class.



Section 8.2 Summary

Organisms are adapted to their specific habitats. The conditions within a large area, or biome, give clues to the animals and plants that can be found there. If the environmental conditions for which an organism is adapted change, and if all the members of a species are no longer able to survive in the changed conditions, the species may become extinct.

- Each of the four biomes in Canada support different types of animals and plants.
- The adaptations an organism has are related to the conditions of the environment in which it lives.
- For millions of years, there have been species of organisms from all six kingdoms living on Earth. Most of the species alive today are different from the species that lived in the past.

Key Terms

biomes

extinct

Check Your Understanding

1. In which biome is Nova Scotia? List two plants and two animals that are well-suited to live in Nova Scotia. Explain your answer.

2. The leaves of most plants contain a green-coloured substance that absorbs light energy so the plants can make food for themselves. The sharp spikes of cactus plants are its leaves. They are adaptations that serve a different function for cactus plants.
   (a) Infer a function for the leaves of cactus plants.
   (b) If cactus leaves have this function, does that mean cactus plants do not make food for themselves like other plants do? Explain why you do or do not think so.
   (c) If you find out that cactus stems are green, does that change your answer to (b)? Explain.

3. Giraffes are adapted to life in the grasslands biome. What features of a giraffe would make it unsuitable for life in the tundra biome?

4. There are two species of wild rose plants that live in Nova Scotia, but they live in different locations. One species, *Rosa virginiana*, commonly lives on salt-water shorelines. The other species, *Rosa carolina*, commonly lives at the edge of forests. Would you expect members of these two species to look different from each other? Explain.

5. What information could you learn about an organism from its fossilized remains?

Prepare Your Own Chapter Summary

Summarize this chapter by doing one of the following:

- Create a graphic organizer.
- Produce a poster.
- Write a summary to include the key chapter ideas.

Here are a few ideas to use as a guide:

- Describe how specific adaptations enable organisms to survive in their environments (for example, mimicry, camouflage, feeding, and other behaviours and physical characteristics).
- Choose an animal or plant that lives in your local environment. Describe how this organism's adaptations allow it to survive there.
- Make a graphic organizer to show different factors that could lead to a species becoming extinct.
- Make a Venn diagram to compare the environmental conditions and the plants and animals found in two different biomes.

Conversation with an Elder

Sheldon Googoo

Sheldon Googoo is a Mi'kmaq elder who lives near the Bras d'Or Lakes. Sheldon is now a Mi'kmaq advisor to his school board, but before that he was a teacher. When he was an elementary school teacher, he and his students participated in the Fish Friends project, a program for students in Grades 4, 5, and 6. In the classroom, his students raised Atlantic salmon from fertilized eggs to fry (young fish), and then went on a field trip to release them into the Bras d'Or.

An essential part of the Mi'kmaq culture is the belief that people must respect Earth and conserve the natural world for future generations. For many centuries the Mi'kmaq lived in harmony with nature. Around the Bras d'Or Lakes, they fished for Atlantic salmon that swam up from the ocean, through the lakes and into the rivers to lay their eggs.

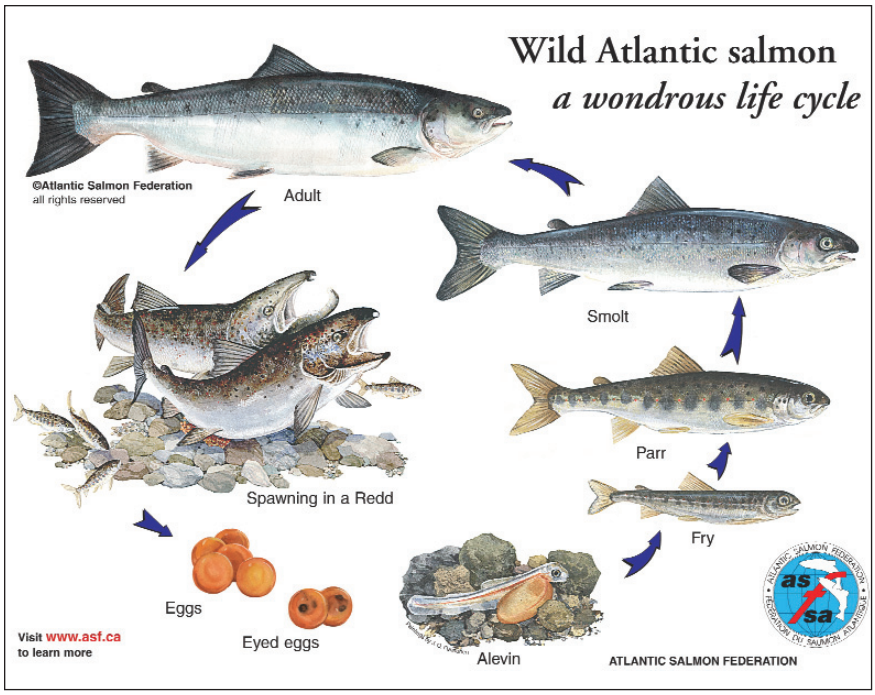
For the last four centuries, as the human population increased, the environment of the lakes became degraded. The population of salmon decreased. Now conservation groups like the one Sheldon and his class worked with are helping to clean up the rivers and streams and re-stock the waterways with salmon.

Q. Why did you decide to participate in the Fish Friends project?

A. As members of the Mi'kmaq community, my family was always interested in the state of environment. The Fish Friends project was a way of engaging my students in something I cared deeply about. The students could watch the fish grow, learn about how they live, and then see them swim away in the local ecosystem.

Q. Did the community support your efforts at the beginning?

A. Yes, the local paper wrote an article about Fish Friends. Many people—parents, students, and teachers from other schools—visited us to see the fish. We received them as pea-sized eggs, which developed into "eyed" eggs with a visible spot in the centre. The eggs hatched into alevin, which grew into fry or young fish. It's the fry that we released into the lake.



After they are released, the salmon fry grow into parr. Parr, which are well-camouflaged, live in the river or lake for two to eight years. When they are 12 to 24 cm long, parr transform into smolt. The smolt swim down the river and out into the ocean. This migration to and from ocean feeding grounds may be a trip of more than 4000 km. After one or more years, the adult salmon swim back up the rivers and lakes. Females use their tails to dig a nest or "redd" in a stream bottom. Then the males and females spawn, producing fertilized eggs.

Q. What did your students think about the project?

A. They loved it! They were just as excited at the end of the project as they were at the beginning.

Q. Why were the Bras d'Or Lakes chosen as the release site?

A. The idea came from the co-ordinator of Fish Friends. He had identified this as one of the endangered areas, with a low fish population. We went on a bus to the release site. Each student had a bag of fish and was responsible for the safe release of those fish.

Q. How did the students feel after the release?

A. They had become fond of their fish, and some students cried many nights after the release. Former students still come up to me today and remember the experience of the Fish Friends project.

Q. Was the community supportive through the whole project?

A. Reporters from the local paper were there on the day of the release, and they published a follow-up story. Since then, many other schools have participated in a Fish Friends project. I think everyone became more aware of the importance of nature and of how all living things are connected in the web of life.

EXPLORING Further

Find out more about the Fish Friends project at **www.mcgrawhill.ca/links/ns+science6**. Follow the links to download the *Volunteer Primer* that explains the program, and discuss it with a friend or family member who might be interested in becoming a volunteer at your school. Write a proposal to recruit a volunteer, and explain to your teacher or school principal how your school could participate in the program.

Conversation with Elders

Patrick and Eleanor Johnson

Patrick and Eleanor Johnson are Elders in the Membertou community in Sydney. They work at the Mi'kmaq College Institute at the University of Cape Breton, which they helped found. They also helped develop courses that support the achievements of Mi'kmaq communities. Eleanor continues to teach at the College. Patrick is the Director of Mi'kmaq Student Services.

For Patrick and Eleanor Johnson, Mi'kmaq is their first language. Their parents and grandparents spoke Mi'kmaq to them as they were growing up but also taught them English so they would be comfortable in school. Eleanor was able to use both English and Mi'kmaq in her studies. While studying for her second degree, a Master's degree at Saint Mary's University in Halifax, she was the first person in North America to submit a thesis written in an aboriginal language.

Q. What relationship do the Mi'kmaq people have with the environment that supports them?

A. We are part of the environment. In our communities we do not have direct ownership of the land we live on. We are given a space in our community where we can put our home, but the land it sits on is owned by the First Nation Community. In the past, a family would occupy enough land to sustain themselves. If the land was not able to provide enough for them to be comfortable, then the family would ask permission of the District Chief to move elsewhere.

Q. What knowledge did the Mi'kmaq have that helped them survive on their lands?

A. The Mi'kmaq had an intimate knowledge of the land and the weather. They knew what resources there were and how to use them to provide themselves with food and shelter.

Q. How do the Mi'kmaq show respect for their environment?

A. We feel reverence for the land and the creatures that are on the land. For example, hunters gave thanks to the animal that allowed itself to be killed for food. They would make an offering or say a prayer to thank the animal for providing the community with food, clothing, and tools.

There is a ceremony that some of our Elders do on February 1 to *Apukanajit*, the winter spirit that controls the elements. They make an offering to the spirit of *Apukanajit*, asking that they stay warm and not freeze during the winter, and have enough clothing and food. They also entreat the spirit of *Apukanajit* to protect them and all who travel during the remaining winter months.

Q. How are young people taught to become good caretakers of their environment?

A. The role of young people is to learn their language. As they do that, they will learn to have respect for the land and the environment that they are part of. We are part of a collective, not just of Mi'kmaki, but also of the whole world.

Q. Do you talk with your grandchildren in Mi'kmaq?

A. Yes. We were both brought up speaking Mi'kmaq. That was the language we used at home and how we communicated with our parents and relatives. Our children have continued this tradition, and now our grandchildren have their first two years of instruction in Mi'kmaq at the Eskasoni Immersion school. The language is integral to our culture, traditions, and history. Our grandchildren are our future, and the language is so integral to our culture, traditions, and history that we make sure we speak it all the time. Sometimes, if one of our grandchildren persists in speaking English, we pretend to be deaf. We only answer if they speak in Mi'kmaq.

Q. What is the most important part of your culture to pass along to your children and grandchildren?

A. Everyone should have respect for all creatures, from the tiniest ant to the most gigantic whale. We should recognize how the environment affects everything we do. We are not the rulers of the environment. We are only a presence in it.

EXPLORING Further

In communities across Canada, people are waking up to the importance of the environment. In cities, volunteers plant trees. In towns and rural areas, people are cleaning up the sides of highways, or helping to restock rivers and lakes with fish. Aboriginal cultures have a strong sense of community, but anyone anywhere can feel connected to the environment and to others. Volunteer organizations can help you be part of the community.

Go to **www.mcgrawhill.ca/links/ns+science6**. Follow the links to find information about dozens of volunteer organizations in Nova Scotia. Select either one from the information you find or another one that you know about in your community. Find out what their volunteers do, and what opportunities there are for you to become involved. Report back to your class about opportunities that interest you in a form suggested by your teacher.

Project

SKILLCHECK
- Initiating and Planning
- Problem Solving
- Modelling
- Communication and Teamwork

Design a Plant for its Habitat

You have been studying the diversity of animals and plants and how they are adapted to where they live. Use your problem-solving skills to design a plant that could survive in an extremely harsh environment.

Challenge

In small groups, you and your classmates will use your knowledge of plant structure and adaptation to design a plant. Your plant must be able to survive in and contribute to one of the following environments: a cold, wet coastal region; a desert; a dry alpine area; or a tropical rain forest.

Materials

art supplies

other supplies depending on project

Design Criteria

A. Your project must include a written description of your plant and its habitat, plus a model of the plant that includes all parts.

B. Your description must include the following:
- a common name and a scientific name
- the classification of the plant
- an illustration showing the parts of the plant
- a description of the plant's habitat
- a description of the growing conditions the plant will experience through one year
- details about how the plant's roots, stems, and leaves will be able to perform their jobs.
- other information about how the plant is adapted to its habitat
- information on what resources the plant needs to survive
- a description of how the plant will reproduce
- a description of how the plant will protect itself
- a description of how the plant will contribute to its habitat and support other organisms
- a description of how the other organisms will interact with the plant

C. You may use a variety of materials to construct and display the model of your plant. It is not necessary to build its habitat.

Plan and Construct Group Work

1. With your group and your teacher, choose which habitat your plant will grow in. Brainstorm with your group about the challenges this habitat will pose to your plant and what it will need to survive.
2. Each member of the group should sketch an initial design for the plant.
3. Evaluate the designs, and, as a group, choose the best design or come up with a new design for a plant that will be best adapted to the chosen environment.
4. Create a list of jobs that must be done to complete the project. Decide which group member will be responsible for each job.
5. Create a plan that includes resources, jobs assigned, an outline of what your project will look like, and a timeline for getting the work done. Have your teacher approve your plan. Adjust your plan if necessary.
6. Carry out your group's plan and complete your project.
7. Present your plant to the class.

Evaluate

1. What would happen to your plant if you put it in a different environment? Explain.
2. **(a)** How did your presentation help people learn about plants in an interesting way?
   (b) How would you improve your group's presentation?