SC.5.L.15.1 Describe how, when the environment changes, differences between individuals allow some plants and animals to survive and reproduce while others die or move to new locations.

LESSON 1

ESSENTIAL **QUESTION**

How Do Environmental Changes Affect Organisms?

Engage Your Brain

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

A forest fire can change a landscape in a matter of minutes! Trees are burned, and animals run for shelter. How could a forest fire be a good thing?

ACTIVE READING

Lesson Vocabulary

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

Compare and Contrast

Many ideas in this lesson are connected because they explain comparisons and contrasts—how things are alike and different. Active readers stay focused on comparisons and contrasts when they ask themselves, How are these things alike? How are they different?

It's All Around You

As far as we know, Earth is the only planet that we can live on. Water and air are two important reasons why life is possible on Earth.

ACTIVE READING As you read this page, circle things that make up environments on Earth.

What do oceans, clouds, fish, and birds all have in common? These things are all part of the environment. The **environment** is all of the living and nonliving things in nature. We depend on the environment for our food, air, and water and for a safe place to live. We share the environment with all other life on Earth. Every other living thing also depends on the environment to meet its needs for food, air, water, and a place to live. In this way, every living thing on Earth is connected.

You and the other living things around you interact with each other and with the nonliving parts of the environment. For example, think about the ways that honeybees interact with the living and nonliving things around them. Bees get nectar from a field of flowers, drink water from puddles, and sting animals if they get too close to the hive. Living things that interact with each other form a community. A community of living things and the nonliving things around them are called an **ecosystem**. Bees, birds, flowers, soil, water, and sunlight are all part of an ecosystem.

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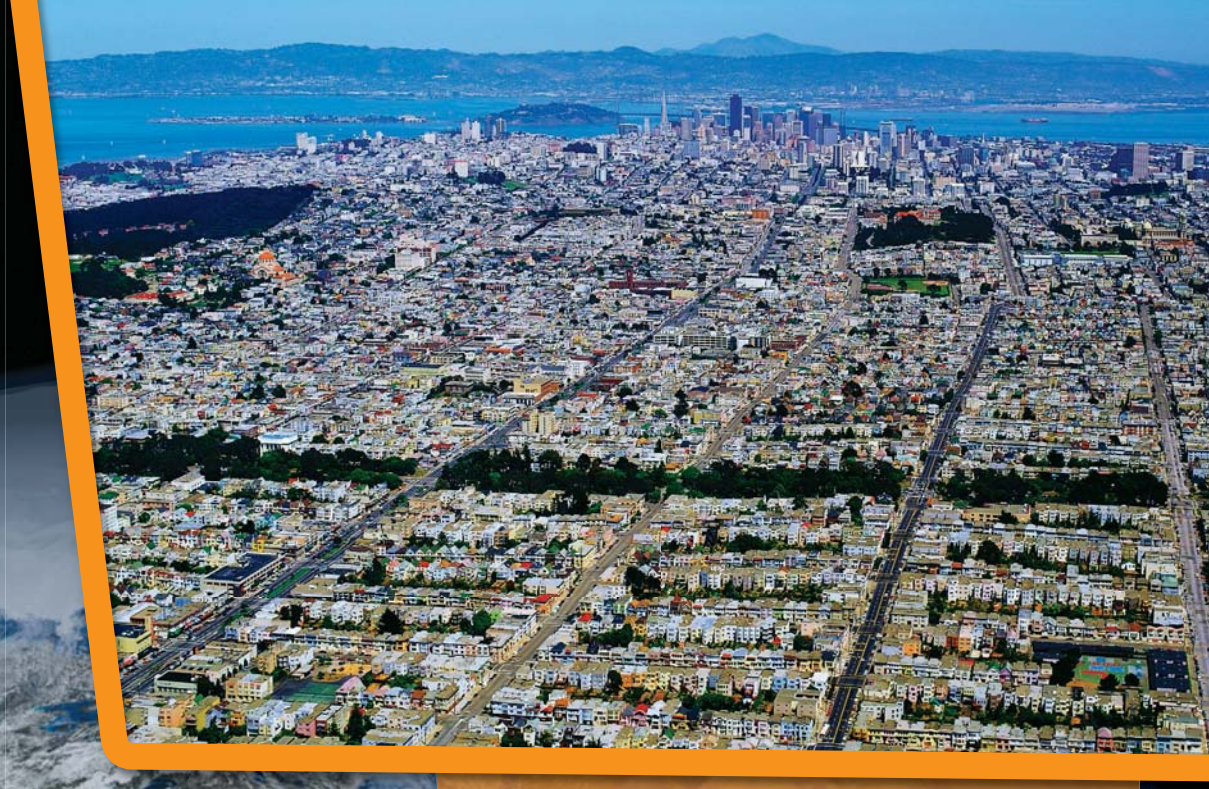


This photograph shows part of a city. The nonliving environment includes the streets, buildings, bridges, and cars. The living part of this environment includes people, trees, ants, birds, cats, dogs, and other living things that call the city home.

air

land

What's in Your Environment?

In the space below, draw your local environment. Label each part.

Change Comes Naturally

The environment can change in response to natural events. Some of these events occur quickly. Others take place more slowly.

ACTIVE READING As you read this page, draw a box around events that change the environment rapidly. Draw a circle around events that change the environment slowly.

Storms can bring heavy rains and flood the land, which changes the environment. Natural events, such as floods, earthquakes, volcanic eruptions, and droughts, can change the environment very quickly.

In contrast, events such as an ice age happen more slowly. An ice age happens when Earth has colder-than-normal temperatures for a very long time. Large areas of land might be covered with ice for thousands of years.

Volcanic eruptions can also change the environment over a long period of time. How? A violent eruption sends gases and dust high into the air. The materials block sunlight from reaching Earth's surface. This can cause temperatures to drop for months or years.

The last ice age reached its peak about 18,000 years ago. Ice nearly 4 kilometers thick covered large parts of North America.

Is It Cold Enough For You?

Think about the environment during an ice age. How do you think the ice age affected living things?

Volcanoes can cause rapid change as hot flowing lava scorches the surrounding ecosystem. Volcanoes can also cause long-term change as dust and gases block out the sun's rays.

A forest fire is a natural cause of environmental change. Forest fires destroy vegetation. But many ecosystems need fire to stay healthy. Some trees even make seeds that cannot grow unless they have been burned!

Animal Architects

Living things are affected by their environment. Living things, in turn, can cause changes to their environment. These changes can be both helpful and harmful, depending on the point of view.

ACTIVE READING As you read this page, draw boxes around clue words that signal examples.

Beavers are only about 1 meter long, but they have a very large effect on their environment. For example, beavers use their teeth to cut trees. They use the trees to build dams across streams. Beaver dams cause ponds and wetlands to form.

The trees that beavers cut down to build their dam are harmed. In addition, organisms that lived in the flowing water of the stream and on the dry land around the stream must move.

But beaver dams provide a home for organisms that rely on ponds and wetlands. Ponds made by beaver dams increase the number of different kinds of organisms that can live in the area.

Fire ants are tiny red ants with very painful bites! They tend to attack in swarms and can even kill small animals. They live in dirt mounds that can be home to more than 100,000 ants! Fire ants were accidentally brought to the United States on a cargo ship. Since then, they have spread over all of the southeastern United States.

Harvester ants are large ants that eat seeds. As fire ants spread, they wipe out colonies of native harvester ants. Fire ants are an invasive animal. This means that they are invading an ecosystem that was not their original home. In their new home, they affect the native plants and animals.

Harvester ants are a favorite food of the horned lizard. Because there are fewer harvester ants, horned lizards have less food to eat. Now very few horned lizards remain. If they are not protected, in time there may be no horned lizards left!

Cause and Effect

Fill in the graphic organizer below to show a cause-and-effect relationship between fire ants and their ecosystem.

Cause	→	Effect

Humans Change the Environment

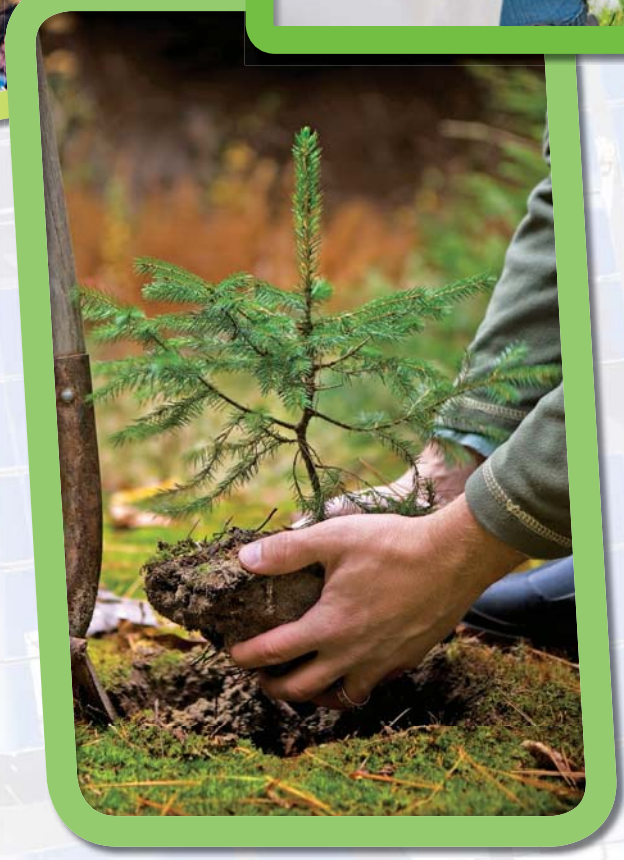
Humans are part of the environment and we have a large impact on our ecosystems. The effects of humans on the environment are both harmful and beneficial.

ACTIVE READING As you read these two pages, draw brackets around phrases that describe ways people harm the environment. Underline phrases that describe ways people help the environment.

Many human activities are harmful to an ecosystem. For example, people mine coal to get energy to power homes and businesses. Open-pit mining, like the mine shown here, kills all the plants living in that area. Other organisms must move to find food.

People cut down forests to use the wood or to clear space for homes. When the trees in an area are cut down, as they were in the bottom photograph, organisms that usually live in the forest must move or die. This effect is called habitat destruction. A *habitat* is a place where an organism usually lives.

Humans produce a large amount of waste that is disposed of as trash. Most trash ends up in landfills. If landfills are not built properly, wastes can pollute soil and water. **Pollution** is any harmful substance that gets into the environment. Pollution can kill organisms or cause diseases.



Not all changes caused by humans are harmful. People work to protect their environment and to protect organisms from harm as a result of ecosystem change. Protecting ecosystems and the organisms living in them is called **conservation.**

People try to restore habitats and repair damaged ecosystems by replanting trees and cleaning up pollution. People also remove invasive plants and animals so native organisms can survive.

In addition, people try to help organisms affected by natural disasters. People care for animals injured or orphaned by these disasters.

What Can You Do To Help?

In the space below, list things that you can do to help the environment. Include things you already do and things you would like to do in the future.

Living Things Change

Look at the snakes slithering down this page. Each snake looks different, but they are all the same kind of snake. Why don't they look the same?

ACTIVE READING As you read these two pages, circle the clue word or phrase that signals a detail such as an example or an added fact.

You don't look exactly like your parents. You have many similarities, but there are also small differences that make you unique. Every organism is slightly different from every other organism. Sometimes these differences can be very important.

Corn snakes, like the ones shown here, come in many colors and patterns. Some are very light colored, some are golden brown, and some are bright orange. Suppose a hawk is flying over a wheat field, looking for a snack. Which of these snakes is least likely to become lunch? If you guessed the golden brown snake, you are correct. Why? Its color would blend in with the wheat. The hawk would not see it, and the snake would survive. The snake would reproduce and pass on its coloring to its offspring. Its golden brown offspring would have a better chance of surviving in the wheat field and would also produce more offspring. Eventually, most of the snakes living in the wheat field would be golden brown.

DO THE MATH

Find Median and Mean

Length of Corn Snakes	
Snake 1	3.5 m
Snake 2	5.5 m
Snake 3	4.6 m
Snake 4	5.1 m
Snake 5	4.8 m
Snake 6	3.9 m
Snake 7	5.3 m

Adult corn snakes vary not only in color, but also in length. The table shows the lengths of several adult corn snakes. Study the data, and then answer the questions.

1. The median is the middle number of a data set when the numbers are placed in numerical order. Find the median of the data set. _____
2. The mean is the average of a data set. Find the mean of the data set. _____

Sometimes living things change because their environment changes. For example, bacteria have changed as a result of their changing environment. Since the discovery of antibiotics, people have learned how to kill bacteria. The first antibiotic, penicillin, saved many lives by killing bacteria that cause disease.

But in a very large population of bacteria, a few are not affected by penicillin. These bacteria survive and multiply. Over time, they produce large populations of bacteria that are not affected by penicillin.

Researchers have had to find new antibiotics to kill these bacteria. But, again, some bacteria are not killed. These bacteria continue to multiply.

Many types of antibiotics have been developed. And bacteria have become resistant to many of them. Now there are bacteria that are resistant to almost all known types of antibiotics. These bacteria are extremely difficult to kill.

Antibiotics in soaps and cleaners kill many bacteria. However, when not all of the bacteria are killed, the ones that survive multiply. Little by little, bacteria are becoming resistant to antibacterial soap and cleaners.

Gone!

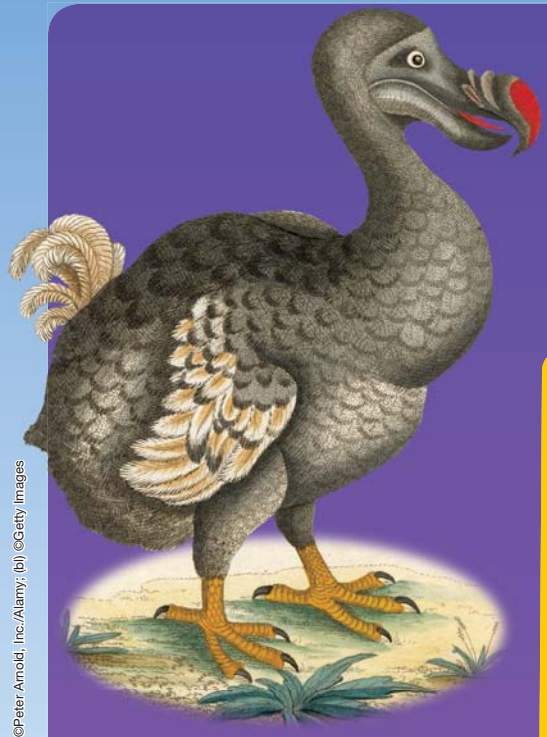
Some living things change when their environment changes. Some living things move to new places. Others simply do not survive.

ACTIVE READING As you read these two pages, underline the definition of *extinction*. Circle pictures of organisms that became extinct because of natural environmental change.

Millions of years ago, Earth was covered with giant reptiles! Now, most of those reptiles are extinct. **Extinction** happens when all the members of a certain kind of living thing die. Giant reptiles, such as the *Tyrannosaurus rex* shown here, lived in a time in which Earth was warm. Over time, the environment cooled, and many of the reptiles could not survive.

These dinosaurs, *Diplodocus* and *Triceratops* (from left to right), were large plant-eaters. They became extinct about 65 million years ago.

The Tasmanian wolf lived in Australia and New Guinea. Ranchers believed the wolves killed sheep and cattle, but this was never proven. The Tasmanian wolf was hunted to extinction by the 1930s.



The dodo bird lived on an island in the Indian Ocean. Around 1600, people came to the island. People hunted the birds for food. They cut down the island's forests to make room for houses. Nonnative animals, such as cats and pigs brought by people, destroyed the dodo birds' nests. Within 80 years after they were discovered, the dodo birds were extinct.

Time Traveler

If you could go back to the island of the dodo birds in 1600, what advice would you give to people to help conserve the dodo birds?

Today, people work to conserve habitats and protect organisms from extinction. Even so, many organisms are in danger of becoming extinct. As these organisms' environments continue to change, some will adapt, some will move, and some will not survive.