

Living Things Respond to Change

Chapter

6

Environments can change. Natural hazards cause disruptions. Humans cause changes, too. Living things must respond to changes to survive.

Remember that organisms have adaptations. Adaptations are traits that help living things survive in a certain habitat. Adaptations can be body parts. They can be behaviors, too.

When a habitat changes, an organism's adaptations may no longer be helpful.

Organisms that stay in a changed habitat may struggle. They may no longer have shelter. They may have to go without food or water for a long time. Leaving may be the only way to survive.

Big Question

How do living things survive changes in their habitats?

Word to Know

Respond means to react to a change by doing something.



Can this red fox survive if more and more people move into its habitat?

Polar Bears Respond to Habitat Change

In Chapter 5, you learned about changes to a polar bear's habitat. Earth is getting warmer because of changes in climate. The amount of sea ice is decreasing in some areas. Polar bears need to stand on sea ice to catch seals. Now, some polar bears cannot find enough food.

Polar bears are large animals. They need a lot of food. Some of it is stored in their bodies as fat. The stored fat keeps the bears alive when food is harder to find. But the stored fat can only last so long. Polar bears rely mainly on seals for food. Polar bears eat very few other animals.



Some polar bears may have to walk a long way to find sea ice where they can hunt seals.

Polar bears are responding to less sea ice in different ways. Some polar bears swim or walk a long way to find sea ice. This uses up more energy than they can replace. Other polar bears don't eat during the warmest months. A few even try jumping into the ocean to catch a seal.

Polar bears must change their natural behavior. Some are able to survive. Others struggle. Some adult polar bears die because food is hard to get. Parents that cannot eat enough cannot feed their cubs either. The adults may lack the energy to find mates and reproduce.



Salmon Respond to Habitat Change

You also learned about salmon. These fish migrate between rivers and the ocean. When people dam rivers, salmon cannot easily migrate. Changes to Earth's climate also affect salmon.

Earth's warmer climate causes river temperatures to rise. Salmon need to live in cold water. Their bodies are not as healthy when the water is warm. This can harm their reproduction and growth. Some salmon have responded by changing when they migrate. They migrate earlier in the year to avoid warmer water temperatures.



Salmon lay their eggs in fresh water. Warmer river water can affect the survival of the eggs and young salmon.

Ecosystem Problems and Solutions

Chapter

7

You just read about changes in polar bear and salmon habitats. Human activities may have caused these problems. Many people want to find ways to fix these disruptions.

Conservationists are people who find solutions for problems in habitats and ecosystems. Conservationists work to save and protect plants and animals. They also work to protect air, water, and soil.

Conservationists want living things to have what they need to survive. On the next few pages, you will read about problems in certain habitats. Then you will read about solutions conservationists are using to try to fix them.



Big Question

What are some solutions to problems in habitats and ecosystems?

Vocabulary

conservationist, n.

a person who works to protect plants, animals, habitats, and ecosystems

To conserve something means to protect it from harm. The act of protecting living things and their habitats is called conservation.

Hunters have killed so many white rhinos that there are very few left. The northern white rhino is just one species that conservationists are working to protect.

Using Beaver Dams to Repair Habitats

You know that human-built dams can cause problems in river habitats. They block salmon from migrating. They also cause changes in the water. These changes affect salmon populations. The salmon do not reproduce as often. Young salmon struggle to survive.

Conservationists found a natural way to help restore some salmon populations. They remove beavers from one habitat and put the beavers back into river habitats. This encourages the beavers to build natural dams of their own! The dams create ponds. The ponds change the habitat, and the salmon have more places to lay eggs. The natural beaver dams also result in water that is rich in nutrients. Young salmon grow faster in this water and are healthier.



Beavers have many positive effects on river habitats. Allowing beavers to build dams can help salmon lay eggs and survive.

Word to Know

Restore means to bring back something. When people restore a habitat or population, they repair damage that was done by nature or people.

Beavers help habitats and ecosystems in other ways, too. Their dams cause wetlands to form. A wetland is a place where the land is covered with water. Wetlands provide a habitat for a large number of living things. They can slow down forest fires and floods. They also filter water from rivers and streams to help keep it clean.



Beavers build dams with tree branches. This creates new habitats for some animals.

Conservationists are also putting beavers in river habitats high up in mountains. Their dams keep rivers and streams filled. The water flows down the mountains. It provides moisture for dry land at the bottom.

Building Safer Roads to Repair Habitats

Think about a large forest habitat. There is plenty of space for animals to live and hunt. Migrating animals can come and go. Now think of the same habitat with a road down the middle. The large habitat becomes two smaller habitats. There is not as much space for living things. Migrating animals must find a new path. Animals that try to cross the road may not survive.

People need roads. Living things must be able to roam and hunt safely. How can we conserve habitats and build roads? Conservationists came up with a solution. They designed wildlife crossings.



Animals walk over the bridge built by people. Fewer animals were killed after the bridge was built.

There are many kinds of wildlife crossings. Some go over roads. These can be used by larger animals, such as elk, deer, bears, and moose. Others are tunnels that go under roads. They can be used by smaller animals, such as tortoises, frogs, and badgers.

Some dams even have wildlife crossings called fish ladders. Fish ladders let migrating fish pass. People who design wildlife crossings make them as much like an animal's habitat as possible.

Wildlife crossings help animals migrate safely. They make roads safer for people, too. In many places with wildlife crossings, there are fewer accidents between cars and animals.



This is one example of a fish ladder. Fish swim up the ladder to get to the other side of the dam.

Solving Problems in Sea Turtle Habitats

Sea turtles spend most of their life in the ocean. They only come on land to lay their eggs in the sand.

Humans put sea turtle nesting sites in danger. People leave trash on the beach. Nesting turtles can get tangled in it. Building homes for people destroys the nesting habitat. Driving on beaches can crush the eggs. Wildlife steal the eggs for food.

Conservationists try many solutions to protect sea turtle eggs. Sometimes the nests are moved to quiet beaches. Special cages are built around the nests to warn drivers and keep out wildlife. Signs are put up so conservationists can find the nests and check on them. When the babies hatch, people make sure they have a clear path to the ocean.



Structures such as this one can protect a sea turtle's nest.



After they hatch, baby sea turtles make their way to the ocean.

Fossils and How They Form

Chapter

8

All living things in the past lived in some kind of habitat. They all lived in an ecosystem with other living and nonliving things.

Even in the Age of Dinosaurs, living things depended on their habitats to live.

You probably know a few things about dinosaurs. You may know that they were reptiles. You may know that they were different shapes and sizes. How can people know about the habitats dinosaurs lived in?

Fossils provide evidence about dinosaurs and other living things from the past. A fossil is the remains of a living thing from long ago. Many fossils form in layers of rock. Fossils provide clues about what an organism ate. They can show where an organism lived and something about its habitat. They suggest an organism's size and shape. They can tell how it moved.

Big Question

What can fossils tell us about ancient habitats?

Vocabulary

fossil, n. the remains of a living thing from long ago, usually formed in layers of rock



Does this fossil look like any animals that are alive today?

Word to Know

Evidence is information that supports an argument. For example, sharp teeth in a dinosaur fossil support the claim that that dinosaur probably ate meat. Your own observations can be used as evidence. Facts presented by others can be used as evidence, too.

Bones Become Fossils

You may have seen pictures of entire dinosaur skeletons. When an animal dies, it becomes buried in mud. Its soft parts decompose, or break down. Hard parts, such as bones and teeth, are left behind as fossils. Scientists find these fossil parts. Then they put them together like a puzzle.

Word to Know

When part of an organism *decomposes*, it breaks down and becomes part of the environment.

How do bones form fossils? An animal's bones decompose very slowly. Water can seep into them. The water contains materials that fill spaces in the bones. Over time, the bones become more like rock. Like other fossils, they are buried in layers of mud. The mud hardens around the bones.



By studying these fossil bones, how might a scientist describe the habitat this dinosaur lived in?

Shells Become Fossils

Some of the most common kinds of fossils come from shells. Animals from long ago that had shells lived in or near water habitats. Many of them were clams or snails. The animals that lived inside the shells had soft bodies. When the animals died, the soft bodies decomposed. The hard shells remained.

Shell fossils can be whole shells. They form like fossil bones do. But most shell fossils are just an impression. An impression is like a picture of an organism. It is formed when an organism lies in mud for a long time. The organism breaks down, but its shape is left behind.

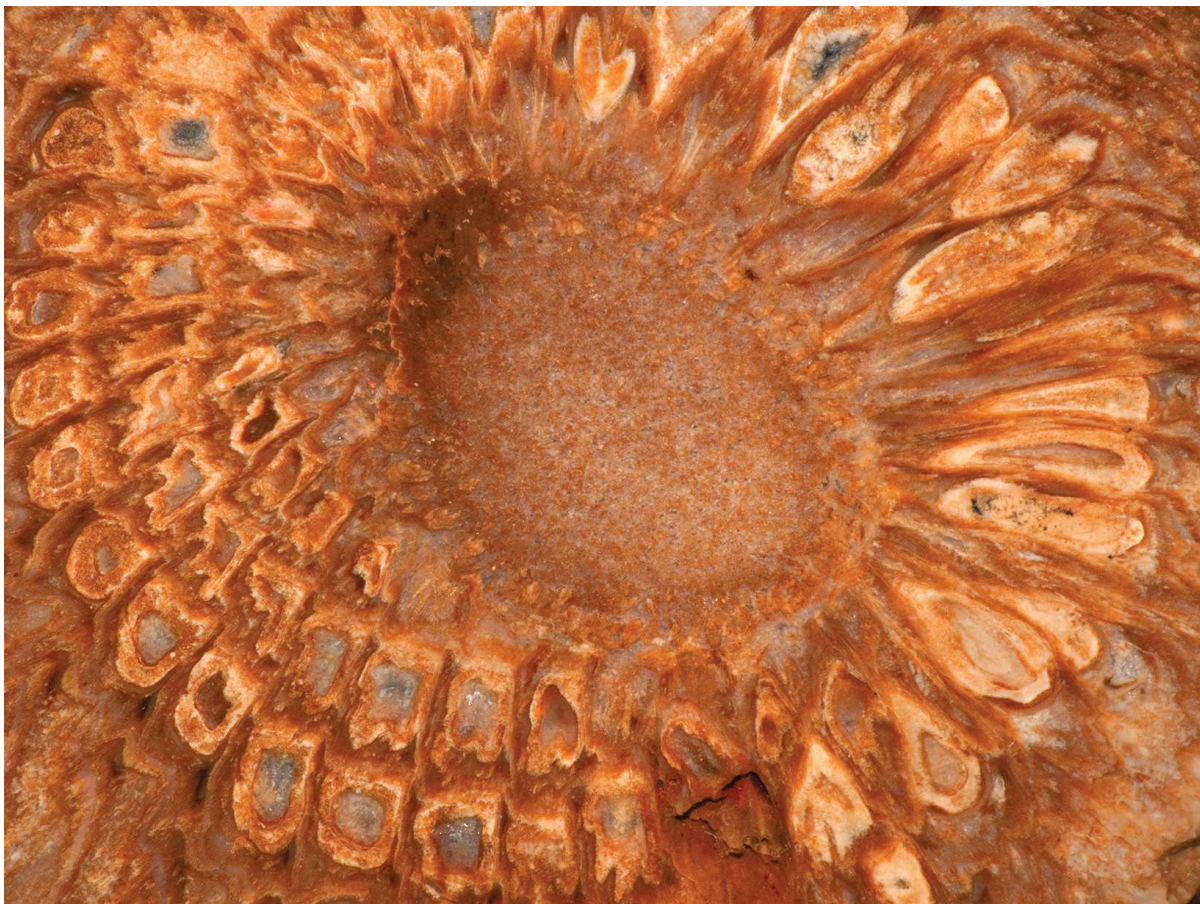


What if these fossil shells were found high on a mountain? What might this tell us about how ancient habitats have changed?

Plants Become Fossils

Animals are not the only organisms that form fossils. Plants form fossils, too. A plant can become buried in mud. More and more layers of mud form over it. The plant parts decompose. But the shape of the plant is left behind. The mud hardens into rock over time. A fossil is formed.

Scientists can learn a lot from plant fossils. These fossils are evidence of what habitats were there a long time ago. They can give clues about the habitat and climate. Scientists can also compare plant fossils with plants alive today to see how they have changed.



This is a fossil of a pine cone from a tree that lived long ago. Can such a fossil provide evidence of ancient habitats? What kinds of habitats do pine trees live in today?

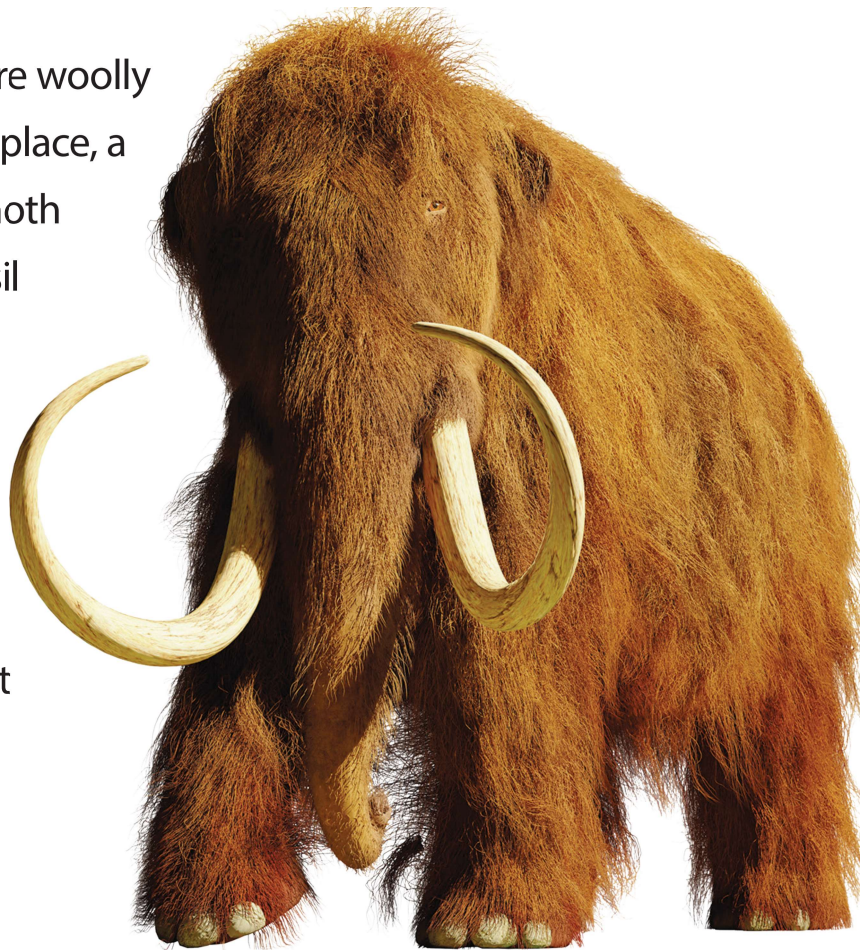
Permafrost Can Preserve Soft Body Parts

As you have read, the soft parts of an organism decompose first. Then the hard parts are fossilized. But sometimes, an entire living thing becomes a fossil. This happens when it dies and is covered in mud that quickly freezes. This layer is covered with more layers of mud. The frozen layer is called permafrost. Permafrost preserves an organism's soft parts as well as hard parts. The soft parts include skin and muscle.

Word to Know

When something is *preserved*, it is kept in its original form.

The most common permafrost fossils are woolly mammoths. In one place, a frozen baby mammoth was found. The fossil formed about 40,000 years ago. Some permafrost fossils have been found underwater! This is evidence that the area was once dry land.



Permafrost fossils help scientists know what a woolly mammoth looked like when it was alive. If it looked like this, what kind of habitat did it live in?

Amber Can Preserve Organisms

Some living things from the past are preserved in amber. Amber forms from a sticky material that comes from trees. Insects and other living things became stuck in the sticky material. It hardened to form amber. The organisms were preserved inside it.

Living things preserved in amber look whole. You can see insects' body coverings, wings, legs, and antennae, for example. But the soft parts inside them are gone. Scorpions, ants, mosquitos, dinosaur feathers, plants, and even lizards are some of the organisms and body parts that have been preserved in amber.



If amber comes from trees, what does this tell us about the habitat of these trapped living things?

Fossil Clues About Changing Habitats

Chapter

9

Fossils give scientists clues about living things from the past. They also give scientists clues about past habitats.

Fossil clues show that habitats in some places were different than they are today. Scientists can draw conclusions about past habitats by studying fossils of the organisms that lived there.

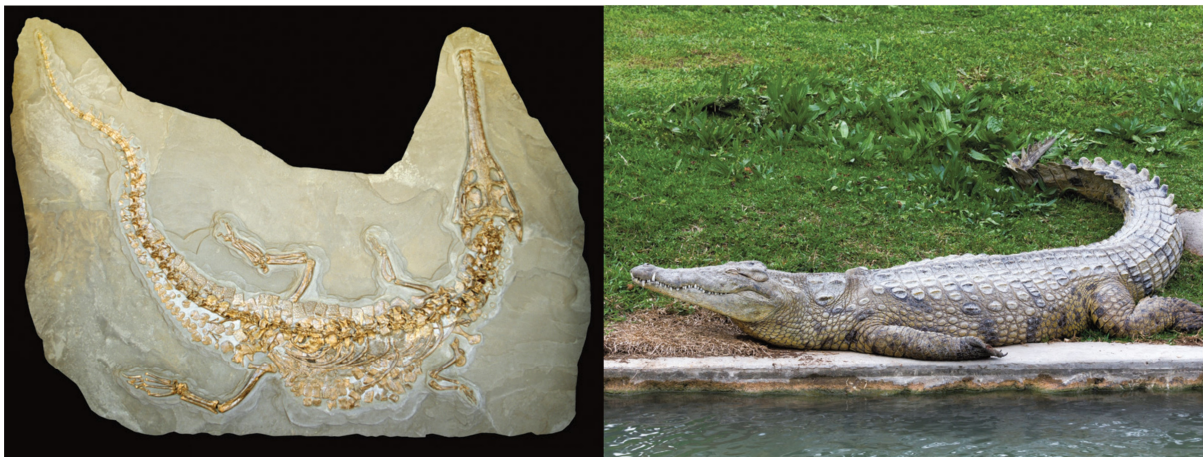
Scientists investigate fossils to understand how climate and landforms have changed over time. Fossils also show that there are many kinds of living things that are now **extinct**. This means that they no longer exist.

Big Question

What do fossils reveal about organisms, habitats, and change?

Vocabulary

extinct, adj.
having no surviving members



This fossil is of a species of crocodile that lived in the past. How is it like this species that is alive today? How is it different?

Some Fossils Are Very Old, and Others Are More Recent

Some kinds of rocks form layers. The layers at the bottom are usually the oldest. The layers at the top are usually the youngest. Fossils are found in different rock layers. When scientists know the age of a layer, they can draw conclusions about the age of the fossils in the layer. They can compare older fossils to younger fossils. They can see how living things and their habitats have changed over time.

Some very old fossils are billions of years old. They were simple organisms with only a single cell. Other species, such as ancient birds, have been found in newer rock layers. Those layers are much younger—about 150 million years old.



Where is the oldest rock in these layers? Where is the youngest rock layer?

Evidence That Landmasses May Have Moved

The Arctic is a very cold place. The land and sea there are covered with snow and ice. But scientists found fossils of extinct alligators there. They know that alligators alive today only live in warm climates.

Coral reefs form in warm ocean water. But scientists have also found fossil coral in the Arctic. This is evidence that the rock on which the fossil coral was found was once in a warm ocean. Scientists suggest that the land on which these things once lived may have moved north into a cold climate.



Fossil coral provides a clue that land may have moved to a colder part of Earth's surface.

Evidence That Ancient Tropical Forest Habitats Have Changed

Colombia is a country in South America. Scientists studied fossils from a coal mine there. The current land is very rocky, and there are few trees. But the fossils show evidence that it was once a tropical forest.

Scientists found fossil ferns and palms. Ferns and palms are plants that live in warm, wet habitats today. Scientists compared the fossils with living plants to draw conclusions about the past habitat.

Coal itself is evidence of ancient plant life. Coal is a rock that forms from the remains of plants that lived in swamps and bogs. Swamps and bogs are common in tropical forests.



This is a fossil of a fern leaf. It could be from an area that was once a tropical forest.

Fossils Are Evidence That Life Has Changed over Time

Do you live in the western United States? There might be dinosaur bones in the rock under your backyard! Scientists know that giant dinosaurs roamed this land. Thousands of bones have been discovered there.

Dinosaurs left other clues besides bones. They left tracks in the mud. These tracks formed impression fossils. Scientists use the tracks to tell whether a dinosaur walked on two legs or four legs. Footprints also provide evidence about a dinosaur's size.

Scientists have also found dinosaur eggs and nests. These fossils provide clues that some kinds of dinosaurs cared for their young. Similarities between dinosaur eggs and bird eggs are evidence that birds alive today are related to dinosaurs.



These tracks show that dinosaurs roamed near this place in Colorado.

Fossils Are Evidence That Some Kinds of Living Things Are Now Extinct

Dinosaurs were reptiles that are now extinct. Giant mammals once roamed Earth, too. Mastodons, woolly mammoths, and giant ground sloths were giant mammals. These mammals are also extinct.

Some of these mammals lived in very cold places. Scientists know this because they found evidence of glaciers near the fossils. Glaciers are huge fields of ice and rock. These cold places suddenly began to turn warm. The warming temperature changed the habitats there. Many large mammals could not survive these changes. They became extinct.

Those giant mammal species are extinct today. But some of their remains are found in glacier ice. The remains include skin, fur, and bones. Scientists compare the fossil body parts to those of mammals alive today. They find evidence that living and extinct mammals are related.

Word to Know

A *glacier* is a huge field of ice and rock that slides very slowly downhill. Glaciers are described as rivers of ice.



This woolly mammoth most likely lived in a cold habitat.

Habitat Changes and Extinction

Chapter

10

Habitats are always changing. Some changes are small. Some are big. Some changes take a very long time. Some, such as floods and fires, happen fast. Changes in habitats affect living things. Living things may not be able to meet their needs in a habitat that has changed a lot. Many will have to move, and many may die.

Big Question

How do changes in habitats lead to the extinction of species?

If the destruction or change in a habitat is widespread and lasts a long time, an entire species may be in danger. A species becomes extinct when all of its members die.

All the dinosaur, woolly mammoth, and mastodon species no longer roam

the land because they are extinct. The habitats of these animals changed over a long time. All the individuals of these species were not adapted to the new habitats. They could not respond in ways that kept them safe.



Dinosaur habitats changed over time. As a result, dinosaur species became extinct.

Habitat Change Caused Dinosaur Extinction

How did dinosaurs become extinct? Scientists have two main ideas. The evidence comes from rocks and fossils.

One idea is that a large asteroid from space crashed into Earth. The crash caused dust and smoke to rise into the air and block the sun. The world became cold and dark. Plants could not grow because they did not have sunlight to make food. Plant-eating dinosaurs died. Then meat-eating dinosaurs died, too.

The other idea is that a large volcano erupted. Smoke and ash blocked the sun. Acid rain fell from the sky. Dinosaurs died from lack of food.

These are only two ideas, and something else may have led to the extinction of dinosaurs. No matter what the cause, when a habitat or environment changes, some living things may not be able to survive and reproduce.

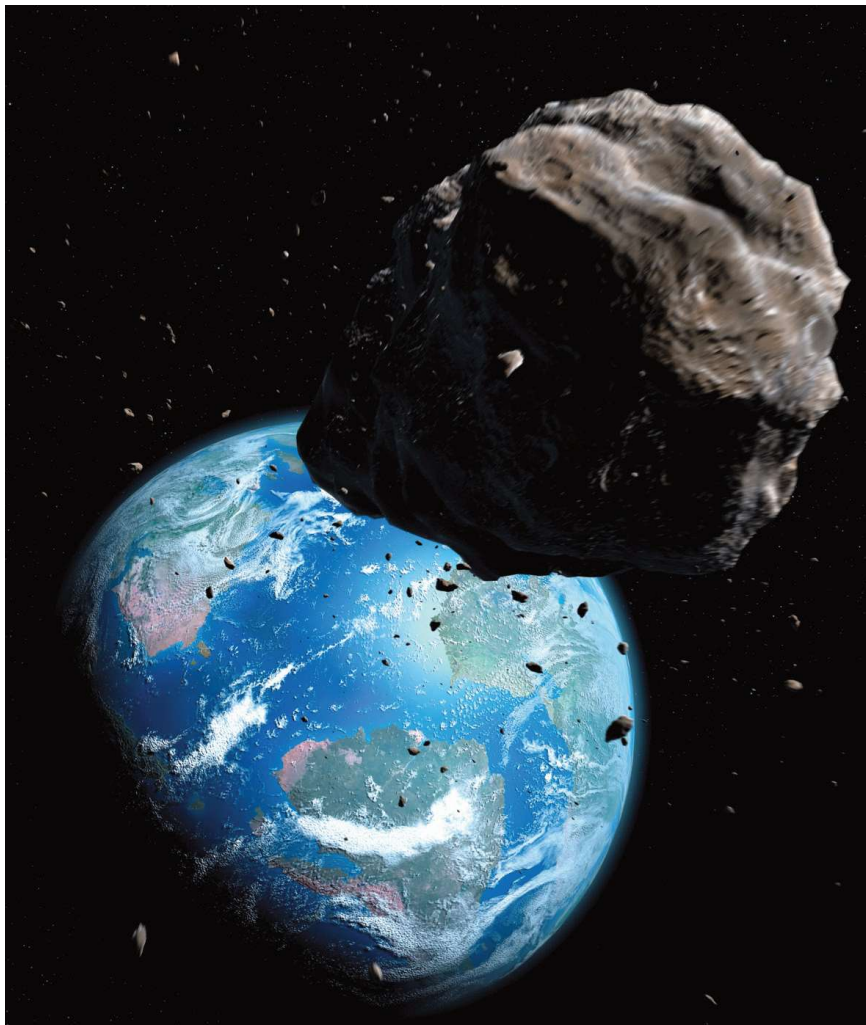


When a volcano erupts, smoke and ash fill the air and could result in habitat change.

Habitat Change Can Cause Widespread Extinction

When the dinosaurs got wiped out, so did many other species. This type of event is called a mass extinction because it causes the deaths of many organisms at once. Other mass extinctions have happened on Earth. Fossils give scientists clues about these events.

Natural events and changes have caused mass extinctions in the past. Some scientists have suggested that we are now in a time of a new mass extinction. This one, they suggest, is caused by human activity.



An asteroid like this one may have crashed into Earth and caused a mass extinction.

Changes in Habitat Have Caused Extinction Recently

In 1900, there were one million western black rhinos on Earth. In 2001, there were only about 2,300. A few years later, black rhinos were extinct. Hunters killed western black rhinos for their horns. Their habitats were destroyed for building and farming. The western black rhino could not survive these changes.

The Steller's sea cow became extinct about 250 years ago. It ate a plant-like organism called kelp. Sea otters lived in these kelp forests. They ate sea animals called urchins that eat kelp, too. The otters in that area were hunted for their fur, and they disappeared. The urchin population grew because the urchins had no predators. The urchins quickly ate all the kelp. Sea cows died because they could not find food. Again, habitat change can lead to the death of all the individuals of an entire species.



This black rhino is a relative of the western black rhino. It might become extinct, too.

The passenger pigeon was a North American bird. People thought its meat was tasty. They also thought these birds were pests. Hunters shot the birds and poisoned them. They destroyed the birds' nests. Passenger pigeons became extinct in the early 1900s.

Plants also can become extinct because of habitat change. The Saint Helena olive tree is one. It lived on an island in the Atlantic Ocean. People cut down these trees for wood. The few trees that were left had trouble reproducing. Scientists tried to save the trees. They grew young trees in a lab. But these trees could not survive in the wild. The last Saint Helena olive tree died in 2003.



Human activity caused the extinction of the passenger pigeon.



Human activity caused the extinction of the Saint Helena olive tree.

Habitat Change Threatens Many Living Things

Some species are close to becoming extinct. They are endangered. An **endangered species** is one that has almost disappeared. Conservationists try to help endangered species survive. But some of them are likely to die anyway.

Vocabulary

endangered species, n. a species that is at risk of becoming extinct within a few years

The Sumatran elephant is an endangered species. It lives in a forest habitat. Its habitat is being cleared to make room for farms and buildings. The elephants are also killed for their tusks. There are only about 2,500 Sumatran elephants left in the wild.

The Amur leopard lives in forests in Asia. There are fewer than one hundred Amur leopards left in the wild. People kill these leopards for their fur. People also hunt their prey for food. Construction and forest fires have changed the leopards' habitat, too.



The Amur leopard is in danger of becoming extinct.

Glossary

A

adaptation, n. a body part or behavior that helps a living thing survive (7)

B

behavioral trait, n. a way an organism behaves, or acts (13)

C

climate, n. the pattern of weather over a long period of time (30)

conservationist, n. a person who works to protect plants, animals, habitats, and ecosystems (35)

E

ecosystem, n. all the living and nonliving things in a place and their interactions (19)

endangered species, n. a species that is at risk of becoming extinct within a few years (58)

extinct, adj. having no surviving members (47)

F

fossil, n. the remains of a living thing from long ago, usually formed in layers of rock (41)

H

habitat, n. the natural place where an organism lives (1)

I

invasive species, n. an organism that causes harm in a place where it does not normally live (22)

M

migrate, v. to move from one place to another in different seasons (27)

S

survive, v. to stay alive (1)



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