

**FOCUS  
ON  
SCIENCE**

# Adaptation and Survival

On Level



Life Science  
Reproduction, Heredity, and Evolution

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## Adaptation and Survival

### Scientific Inquiry

**The central purpose of scientific inquiry is to develop explanations of natural phenomena in a continuing, creative process.**

### Life Science

**Individual organisms and species change over time.**

The processes of sexual reproduction and mutation have given rise to a variety of traits within a species.

Changes in environmental conditions can affect the survival of individual organisms with a particular trait. Small differences between parents and offspring can accumulate in successive generations so that descendants are very different from their ancestors. Individual organisms with certain traits are more likely to survive and have offspring than individuals without those traits.

In all environments, organisms with similar needs may compete with one another for resources.

Extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient to permit its survival. Extinction of species is common. Fossils are evidence that a great variety of species existed in the past.

Many thousands of layers of sedimentary rock provide evidence for the long history of Earth and for the long history of changing lifeforms whose remains are found in the rocks. Recently deposited rock layers are more likely to contain fossils resembling existing species.

Although the time needed for change in a species is usually great, some species of insects and bacteria have undergone significant change in just a few years.

Since the Industrial Revolution, human activities have resulted in major pollution of air, water, and soil. Pollution has cumulative ecological effects such as acid rain, global warming, or ozone depletion. The survival of living things on our planet depends on the conservation and protection of Earth's resources.

## English Language Arts

The following is a selective listing of the competencies and indicators addressed in this book.

### Word Recognition

- Use varied sources of information, including context, to monitor and self-correct for word-reading accuracy

### Background Knowledge and Vocabulary

- Determine the meaning of unfamiliar words, terms, and idioms by using prior knowledge and context clues

### Comprehension/Response

- Combine multiple strategies (e.g., predict/confirm, question, visualize, summarize, monitor, self-correct) to enhance comprehension and response

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## How to Help Your Students Make the Best Use of This Book

Encourage students to develop nonfiction literacy skills by completing the Active Reader activities. Also encourage them to . . .

- Underline main ideas in paragraphs.
- Circle details that support the main ideas.
- Write down questions as they read.
- Circle key words as well as unfamiliar words.

## Printing Instructions

**Student Book:** print pages 5–30

**Assessments:** print pages 33–34

**Answer Key:** print pages 35–38

**FOCUS  
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SCIENCE**

# Adaptation and Survival



**How does life on Earth  
continue to adapt in response  
to environmental change?**

All living creatures depend on their environment to survive. For millions of years, all the creatures on the planet have grown and changed along with their changing environment. This has created a world of plants and animals that live in harmony and balance with their environment.

Any change to these environments can have negative effects for creatures that live there. The challenge for scientists today is to understand how to keep these negative changes to a minimum.

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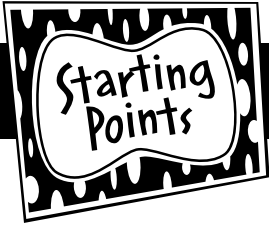
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# Build Background

## Predict

Food chains show how animals use other animals and plants as food sources. Describe some plants and animals that you think form a food chain.

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## Brainstorm

Earth is made up of countless habitats. A habitat is the natural environment of an animal or plant. Make a list of three things in your own habitat. Then list three things each in the habitat of a plant and animal of your choosing.

Your Habitat

Plant Habitat

Animal Habitat

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## Define

What does the word *extinct* mean? Write a definition and describe two different plants or animals that you know are extinct.

Define: \_\_\_\_\_

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Explain: \_\_\_\_\_

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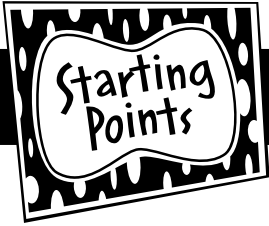


# Key Vocabulary

## Rate Your Knowledge

The words listed below have to do with environmental change. Each word is important, but some of them may be new to you. Rate your knowledge of each one by checking the appropriate column. Give the definition, if you know the word. After completing this book, come back to this page and write the definitions of words you did not know.

	I don't know it.	I've seen it, but I'm not sure what it means.	I know it well, it means...
species			
extinct			
ecosystem			
habitat			
herbivore			
carnivore			
photosynthesis			
fossil			
adapt			
population			
organic			
equilibrium			



# Key Vocabulary

## Use Roots to Unlock Meaning

Many science words come from Greek or Latin. Knowing Greek and Latin roots can help you unlock the meaning of many science terms. Circle the word in each sentence that contains the root.

### photo-

1. Because film is photosensitive, it can only be developed in a dark room.
2. A photosphere is a layer of light that surrounds a star.
3. Plants turn light and water into a food source through photosynthesis.

### eco-

4. My teacher loved plants and animals, so she studied ecology in college.
5. The oil spill was an ecohazard because of the damage it caused to marine life.

## Multiple Meanings

Sometimes a word can have multiple meanings. These can be very different meanings depending how the word is used and what context it is referring to. Look up the following words in a dictionary. Note the number of different definitions there are listed for each word. Write down the definition you think best applies to the context of environmental change. Explain your choice.

1. *record*  
Define: \_\_\_\_\_

Explain: \_\_\_\_\_

2. *harmony*  
Define: \_\_\_\_\_

Explain: \_\_\_\_\_



# Chapter 1 Extinction

## FOCUS

This section describes what life was like during the time of the dinosaurs before they became extinct. Try to understand what extinction is and what happens to creatures that survive.

## A Trip Into the Past

Imagine you could travel back in time 65 to 144 million years to Earth's **Cretaceous Period**. You'd see a humid tropical landscape. You'd notice moisture rising from exotic plants as the sun touches them. You'd see ferns and moss covering the ground in the lush tropical forests. And you'd notice tall palm-like trees growing high and straight into the sky.

In the air, all kinds of insects buzz. On the ground, worms, bugs, and reptiles move in the soil. Fish and amphibians **inhabit** the swampy waters. And in the distance you hear the bellowing roars of Earth's most amazing creatures—the dinosaurs.

## ACTIVE READER

**1 Illustrate** Draw a picture of what you think Earth looked during the Cretaceous Period.



*During the Cretaceous Period massive herbivores like the Rapetosaurus roamed Earth. They were longer than a school bus.*



*Triceratops warned off attackers with their armored heads and horns.*



*One of the deadliest of all the carnivores, the Tyrannosaurus Rex, had an upright body and razor sharp teeth.*

## What is Extinction?

Now imagine you jump forward to a time about 65 million years ago. You see a totally different scene. All the dinosaurs are gone. They are extinct.

Extinction occurs when all the members of a **species**, or group of organisms, die off. In Earth's history, there have been several **mass extinctions**. Each time, as much as 95% of the life on the planet has disappeared. The organisms that survive become the building blocks for all new life on Earth.

At the end of the Cretaceous Period, dinosaurs suddenly became extinct. Birds, which are closely related to the **reptilian** dinosaurs, and mammals did not die off completely. They barely survived the mass extinction. So did certain insects, fish, and amphibians.

Scientists have worked to find what happened at the end of the Cretaceous. What caused the dinosaurs to go extinct? Why did some species survive while others died off? The remaining chapters of this book will explore these mysteries.

### ACTIVE READER

*1 Describe* What happens during a mass extinction?

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### FOCUS QUESTIONS

1. What is extinction?

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2. What happens to the organisms that survive a mass extinction?

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## FOCUS

This section explains how scientists piece together what happened on Earth millions of years ago. As you read, think about how extinction and environmental change might be related.

## Written in Stone

We know about mass extinctions in Earth's prehistory from the **fossil record**. A **fossil** is the **petrified** remains of a plant or animal. They are usually found as a hardened skeleton or an imprint in a rock.

Fossils take millions of years to form. Most of the fossils we find today formed when plants or animals died. These organisms were immediately covered in **sediment** or **organic material** such as **tar**. Over time, these sediments piled up and hardened. Layer on top of layer **compressed** and turned into rock or stone. The result can be a perfectly preserved record of what plants and animals looked like millions of years ago.

## What Do Fossils Tell Us?

Fossil **evidence** can tell scientists things like the size and shape of certain animals. They also suggest the kinds of plants that were on the planet. The fossil record is the combined information from all the fossils found around the world. Scientists are constantly adding new information to the fossil record. But based on the fossil evidence found so far, scientists have formed **theories** about what happened that killed off the dinosaurs and about half of all other plant and animal species.



*Fossil evidence can tell scientists about the plants and animals that inhabited Earth millions of years ago.*

## ACTIVE READER

**1 Recall** What does organic material come from?

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**2 Explain** What does fossil evidence tell us?

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## Good to Know

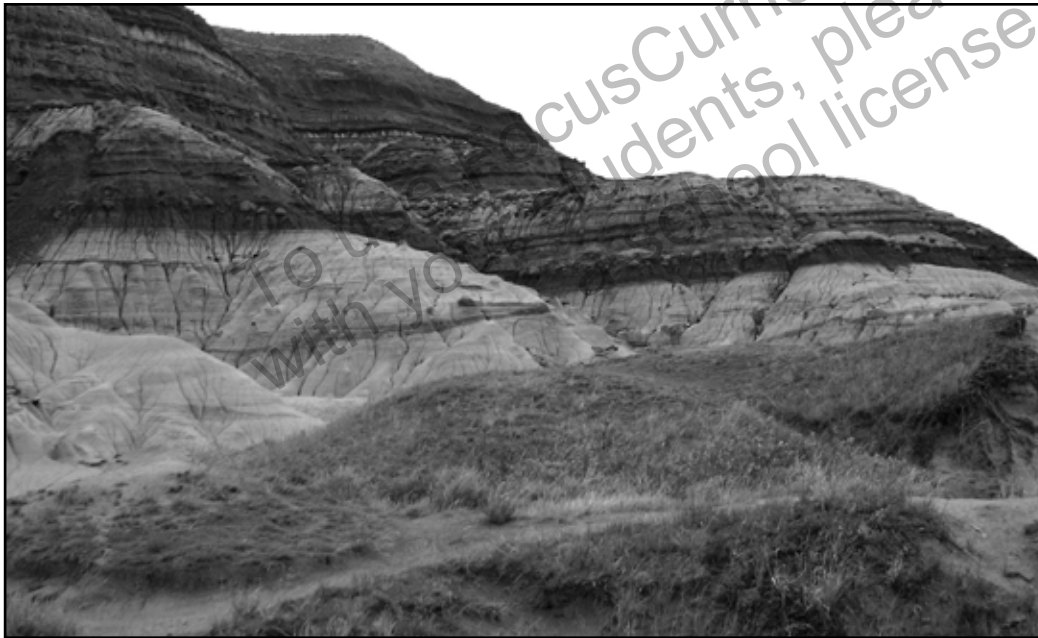
Fossils aren't always found in rock. Many perfectly preserved insects and plants are found in amber. Amber is hardened fossilized tree resin. Millions of years ago insects, seeds, and plants would get caught in the sticky resin, and when the resin fossilized over millions of years, the specimens would remain trapped inside.

## The Fossil Record

The sedimentary rocks under our feet have been laid down over millions of years. Digging down through the layers is like taking a trip back in time. Younger rock sits atop older rock. Fossils in the layers provide clues about how species changed over time. Scientists can analyze the rock layers for clues about the seas and atmosphere at different times.

For example, the picture below shows a break between the lighter colored rock below and the darker colored rock above. In between these two layers, scientists have found a thin layer that is mostly iridium. Iridium is an element found in asteroids. This iridium layer has been dated to about 65 million years ago, at the same time as the extinction of the dinosaurs.

Other scientists have found a gigantic crater near Mexico's Yucatan Peninsula. It suggests that something gigantic impacted Earth—also about 65 million years ago. Could this crater and iridium layer be evidence that a huge asteroid crashed into Earth? Could it have caused the extinction of the dinosaurs?



*Erosion wears down Earth's surface revealing layers of sedimentary rocks deposited over millions of years.*

### ACTIVE READER

**1 Research** *What are asteroids and where do they come from? Write an explanation below.* \_\_\_\_\_

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## A Prehistoric Mystery

Scientists don't really know what happened to cause the dinosaurs and many other living things to become extinct. There are several theories. Some believe that a giant asteroid crashed into Earth and kicked up enough dust and debris to block out the sun. This radically changed Earth's environment because plants could no longer photosynthesize. Dinosaurs were herbivores, and so lost their food source.

Other scientists believe huge volcanoes erupted with enough heat and gas to change Earth's atmosphere. Still others believe that Earth slowly became too cold for dinosaurs to live. Whatever the cause, each theory says that widespread environmental change made it impossible for the dinosaurs to survive.

### FOCUS QUESTIONS

1. What is one theory that explains how the dinosaurs became extinct?

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2. What do all the theories explaining how the dinosaurs became extinct have in common?

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### Good to Know

The fossil record isn't a complete picture of life in prehistoric earth. That's because not all living creatures leave fossils. Earthworms, jellyfish, and organisms that don't have any kind of skeleton or hard shell don't fossilize. Scientists have to take this into account when they formulate their theories.



## Stop and Think

This page will help sum up what you have read so far. Use the tip to help you answer the question.

Occasionally, mass extinctions wipe out significant numbers of plants, animals, and other species. As a result, Earth is repopulated by the species that manage to survive. Use your knowledge of science to answer questions 1 and 2.

1. What provides scientists with evidence that mass extinctions have occurred in the past?

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2. How do scientists use the information they gather to determine what happened to cause these extinctions?

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3. Which of the following statements about fossils best describes the way scientists can use them to gather information?

- (1) Scientists can determine which species are now extinct.
- (2) Scientists can identify plants and animals in the fossils.
- (3) Scientists can read patterns of climate change in the rock.
- (4) Scientists can understand how Earth has changed over time.

## Tip:

When you are asked to explain a process, think about causes and effects. Describe what happens first, second, and so on.

Dear Ms. Understanding,

I know fossils are really old, but when scientists find them it's not like they are buried with a calendar. How do scientists know the age of the fossils they find?



*Befuddled in the Bronx*

Dear Befuddled,

Scientists use several different tools and a lot of detective work to answer that question. One of the most important tools is called Radio



Carbon Dating. The remains of all plants and animals that eat those plants contain an isotope of carbon. This **isotope** breaks down, or decays, at a consistent rate. By measuring the levels of this isotope in an artifact and then calculating its level of decay, scientists can date it.

*Ms. Understanding*



Photosynthesis is very important because it starts the food chain. Other organisms eat plants and use their **carbohydrates** to fuel their own growth. These organisms are called **heterotrophs**. There are several different types of heterotroph, but they all have one thing in common: they survive by consuming other organisms as food.

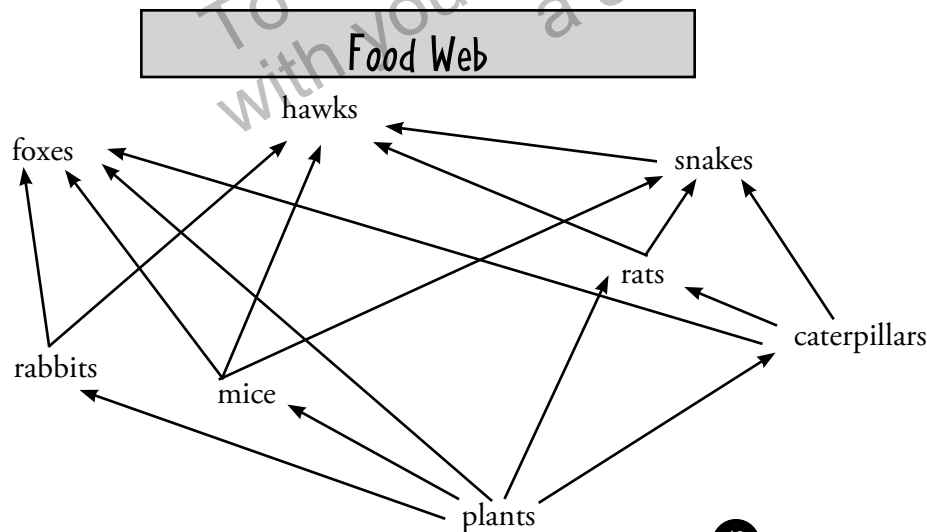
As soon as a heterotroph eats an autotroph, the food chain starts. It continues when the next heterotroph in the chain eats the first. This goes on and on until you reach the top of the food chain. When the top heterotroph, also called the top consumer, dies, the body **decays** and the energy stored in it returns to the earth.



*Heterotrophs, like the caterpillar consume other organisms to get energy.*

### Maintaining Equilibrium

Food chains are connected to each other in food webs. Any time one organism eats another there is less energy available. This means that for the habitat to support life, there has to be more organisms at the bottom of the food chain than at the top. In the example below, there are a lot more plants than rabbits, mice, rats, and caterpillars. There are more mice, rats, and caterpillars than snakes, and there are fewer hawks and foxes than all the other organisms in the web.



### ACTIVE READER

**1 Contrast** *What is the difference between an autotroph and a heterotroph?*

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**2 Infer** *If all the snakes are killed it doesn't just affect the hawk population. What happens to the rat population?*

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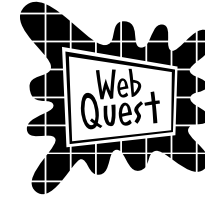


Gradual change is also caused by humans. When too much fertilizer is used on crops, some is washed into the water system. Algae then grows in lakes and ponds. Too much algae on the surface of a pond blocks sunlight to the plants below. This kills a vital food source for insects and fish and upsets the balance of the ecosystem.

**Catastrophic change** can also be natural or human made. Catastrophic change happens rapidly. It often causes the total destruction of a habitat and a high rate of death to the organisms living there. Examples of natural catastrophic changes are volcanic eruptions, tidal waves, floods, and hurricanes. Human-made catastrophic changes are oil spills, forest fires, flooding from river dams, draining of wetlands for agriculture, and deforestation for raising livestock.



*These birds died because of an oil spill. This was a human-caused catastrophic event.*



Oil spills are probably one of the worst human caused catastrophic changes that can impact an ecosystem. Go online and research oil spills. Identify a major oil spill that happened in the past and write a brief summary explain what happened, where, and what's been done to clean it up.

**FOCUS QUESTIONS**

1. What is the main difference between catastrophic change and gradual change?

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2. Explain how can too much fertilizer can cause change in a lake or pond.

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**FOCUS**

This section explains how species respond to change. Pay attention to the key idea of adaptation.

**Species' Response to Change**

Species respond to different types of environmental change in different ways. When the environmental change is gradual, species change, or **adapt**. To adapt is to change in order to survive in a new environment or condition. The tendency to adapt is what has produced all the organisms on Earth today.

**How Adaptation Works**

Plants and animals are born with physical or behavioral traits that help it survive. When this organism reproduces, it passes the beneficial traits on to its offspring. This insures that its offspring have a higher survival rate for that environment. Organisms that don't develop beneficial traits have less chance of survival and die off. When this happens, their non-beneficial traits die with them.



*Cacti adapted to the hot dry climate of the desert by storing water in their stems and by growing hair or spikes to avoid losing water through leaves.*



*The stick insect has adapted its appearance to look like a twig or stick. This camouflage allows it to hide from predators.*

**ACTIVE READER**

**1 Paraphrase** Explain how adaptation works.

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In 1859 Charles Darwin described a Theory of Evolution to explain how species of organisms are related and how

they change over time. He believed that through the processes of adaptation and natural selection, different species evolved from a common ancestor. The result is the wide variety of species of plants and animals we see on Earth today. Who was Charles Darwin? Look him up to find out more about who he was and how he developed the Theory of Evolution.

### Species' Response to Gradual Change

One example is the giraffe. Giraffes didn't start out with long necks. They evolved into animals with long necks because their long necks help them reach food high in the treetops. Long ago they may have had the same length necks as horses or zebras. But with heavy competition for food in the grasslands of Africa, the giraffes adapted. They began feeding on the leaves of taller trees. The giraffes with the longer necks could reach more food and flourished. These giraffes reproduced and passed their long necks onto their offspring.

The giraffes with shorter necks couldn't reach as much food. They were less successful and some died off before they could reproduce. This guaranteed that the genes for short necks were not passed on as frequently to the next generation of giraffe. Giraffes with long necks continued to reproduce, generation after generation, passing along their genes at a greater rate than other giraffes. This is how the long necked giraffe we know today came to be. This process is known as **natural selection**.

### Species' Response to Catastrophic Change

In the case of catastrophic change, organisms need to adapt more quickly. If a habitat is completely wiped out, the ecosystem needs to rebuild or a new system will take its place. In this instance, highly **opportunistic species** are usually the first to colonize an environment. Opportunistic species are organisms like certain plants and bacteria, insects like cockroaches, and small rodents like mice rats that can reproduce quickly. Because of this they can pass beneficial traits to their offspring faster and in greater numbers. This helps them survive in hostile environments. Bedbugs, for example, had not been much of a problem for humans for many years. But starting in about 2008, the bedbug problem was back. The species had been kept under control by the use of pesticides, chemicals that were poisonous to bedbugs. But bedbugs adapted so that the poison was no longer effective.



*Cockroaches are an opportunistic species that can adapt quickly to hostile environments.*

#### ACTIVE READER

**1 Recognize** List another animal that has a unique physical trait.

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**2 Infer** How does this adaptation help its survival?

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**Good to Know**  
 Darwin's theory of evolution through natural selection is commonly referred to as survival of the fittest.



### Mystery Solved?

We can tell from the fossil record that not all the organisms on Earth were wiped out at the same time as the dinosaurs. Scientists have found the remains of early ancestors of modern organisms like crocodiles, komodo dragons, turtles, some plants, insects, and even mammals. In order to survive to become the species found on Earth today, these early organisms must have adapted to their ever-changing environment.

### But What About the Dinosaurs?

Whatever the cause, at some point 65 million years ago, the dinosaurs failed to adapt to an environmental change. It may have been caused by an asteroid strike, an eruption, or simple a gradual change in climate. It is likely that something destroyed the dinosaur's food source. Most dinosaurs were plant-eaters and they were unable to get enough food or adapt their diet. Then, the meat-eating dinosaurs starved as well. Birds, mammals, and insects survived because their diet is more diverse. They were able to adapt to the new conditions. This failure to adapt is the reason why the only dinosaurs left on Earth today are fossils found in museums.

### FOCUS QUESTIONS

1. Explain why only beneficial traits get passed along in natural selection.

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2. What can happen when a species fails to adapt?

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### ACTIVE READER

**1 Differentiate** What is one key difference between how adaptive species reproduce and how opportunistic species reproduce?

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Stop and Think

This page will help you summarize what you have read so far.

**Tip:**  
Look back through the chapter to find key words in the questions and answer choices. Reread the sentences that contain those words.

1. Which of the following is a human-made catastrophic environmental change?

- (1) deforestation for agriculture
- (2) flooding from massive storms
- (3) destruction of coastal areas by a tsunami
- (4) devastation of towns and villages by an earthquake

Use the images below and your knowledge of science to answer questions 2 and 3.



2. The arctic fox's fur changes color depending on the season. Using what you know about adaptation, explain the benefit of this trait.

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3. Through what natural process did the ability to change fur color become standard for the species?

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Dear Ms. Understanding,

I've read that humans have evolved from ape-like creatures. Over time, we lost many of the traits that our ape-like ancestors must have had, like fur. We must have lost these traits through natural selection, but I thought natural selection only passed on traits that are helpful to a species? Does that mean being hairless is key to our survival?



*Wondering in Watertown*

Dear Wondering,

Natural selection doesn't just pass on traits that insure a species' survival, it can also eliminate traits that are no longer useful. At some point, fur was no longer necessary to human survival, and human ancestors with less hair survived as well as those with lots of hair. This allowed the hairless gene to be passed along until our ancestors started looking more like humans today.



*Ms. Understanding*



**Adaptations** Evidence of adaptation is all around us in the plants, animals, and people we see everyday. Pick one plant or animal. It can be a household pet like a cat or dog, an insect like a fly or spider, or a garden plant like a tree or flower. Study it closely. List four physical traits that are unique to your subject in the table below. Then list what you think each adaptive trait does and how it helps your subject survive. For example, you might list your cat's sharp claws. They help the cat hunt and kill its prey. This provides it with food for survival.

Observation Subject	Function	How it Helps Survival
Trait 1		
Trait 2		
Trait 3		
Trait 4		

# Glossary

**adapt** – To change in order to survive in a new environment or condition.

**autotroph** - Any organism able to feed itself by transforming energy and inorganic materials into food.

**carnivore** – An animal that eats meat.

**carbohydrate** – A group of organic compounds that provide energy in the form of food for most animals.

**catastrophic change** – A sudden or widespread disaster characterized by death and destruction.

**Cretaceous Period** – A geological period on Earth 144 million to 65 million years ago.

**compress** – To press together under pressure.

**decay** – To breakdown or deteriorate.

**deforestation** – The process of removing trees and forests to claim land for other uses.

**ecosystem** – A system formed from the reaction between organisms and their environment.

**equilibrium** – A state of balance.

**erosion** – The wearing away of the surface of the earth by natural elements like water, wind, and ice.

**evidence** – An artifact or piece of information that is helpful in forming a conclusion.

**evolve** – To develop or undergo a gradual change.

**extinct** – To no longer be living or existing.

**food chain** – The order in which organisms feed off one and other.

**fossil** – The preserved remains of a plant or animal.

**fossil record** – The combined results of all information from fossils found around the world.

**habitat** – The natural environment in which an organism lives.

**herbivore** - An animal that eats vegetation.

**heterotroph** – An organism that consumes other organisms as food to create energy.

**inhabit** – To live in.

**isotope** – One of a group of atoms with the same number of protons but a different number of neutrons. For example, Carbon 12 has 6 neutrons and Carbon 14 has 8 neutrons. Both are isotopes of Carbon.

**mass extinction** – The large scale death of one or several species in a relatively short time frame.

**natural selection** – A process where organisms with traits that increase their chances of survival in an environment pass those traits on to their offspring, while organisms without beneficial traits die off before they can pass those traits on. This insures that beneficial traits are preserved and unhelpful ones die out.

# Glossary

**opportunistic species** – A species with the ability to reproduce quickly and in large numbers, which allow them to quickly repopulate and adapt in situations of extreme environmental change.

**organic material** – Matter that results from the decay of once-living matter. petrified – turned into stone in the process of petrification.

**photosynthesis** – A process where green plants or algae use energy from the sun to make energy-rich sugar molecules that can be used as food.

**pond succession** – The geological process that turns a pond into solid ground over time.

**predator** – An organism that survives by hunting and eating other organisms.

**reproduce** – To mate and give birth to offspring.

**reptilian** – like that of a reptile

**sediment** – Debris or matter that settles at the bottom of a liquid.

**species** – A group of organisms that are from the same family of plants or animals.

**tar** – A thick, sticky black substance created from the breakdown of organic materials like wood and peat.

**theory** – An idea formed by analyzing evidence to explain an occurrence.

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# Adaptation and Survival

Assessments

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# Check Understanding



In the Answer Document on this page, mark your answer in the row of circles for each question by filling in the circle that has the same number as the answer you have chosen.

1. How do scientists use the fossil record?

- (1) to prove how the dinosaurs became extinct
- (2) to find examples of all living things that ever lived on the planet
- (3) to gather evidence to help them form theories about the history of life on Earth
- (4) to gather information about soft, jelly-like animals such as worms, jelly fish, and slugs

2. What is a habitat?

- (1) a behavior unique to a certain animal
- (2) the environment in which a plant or animal lives
- (3) the temperature found in a certain environment
- (4) an area that includes a variety of ecosystems

3. Which statement explains why oil spills in coastal area are more destructive to habitats than oil spills far out at sea?

- (1) Oil spills far out at sea are easier to contain and clean up.
- (2) Fish tend to avoid oil spills when they occur far out at sea.
- (3) Coastal areas have more populations of plant, bird, and animal life than far out at sea.
- (4) Oil floats on the surface of the water and blocks photosynthesizing water plant's access to the sun's rays.

4. Which pair of words are synonyms?

- (1) producer, consumer
- (2) autotroph, producer
- (3) autotroph, consumer
- (4) heterotroph, producer

## Answer Document

- |    |   |   |   |   |    |   |   |   |   |
|----|---|---|---|---|----|---|---|---|---|
| 1. | ① | ② | ③ | ④ | 3. | ① | ② | ③ | ④ |
| 2. | ① | ② | ③ | ④ | 4. | ① | ② | ③ | ④ |

# Check Understanding



The photographs below show changes to the natural environment. Use them and your knowledge of science to answer questions 5 and 6.



an erupting volcano



oil spill



pond succession



the use of fertilizer on crops

5. Which photographs are examples of gradual change and which ones are examples of catastrophic change?

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6. Which photographs show changes caused by natural processes and which show changes that are human-made?

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**FOCUS  
ON  
SCIENCE**

# Adaptation and Survival

**Answer Key**

# Answer Key

## Page 8: Build Background

**Predict:** Student answers will vary.

**Brainstorm:** Student answers will vary.

**Define:** Student answers will vary.

## Page 9: Key Vocabulary

**Rate Your Knowledge:** Student answers will vary.

## Page 10: Key Vocabulary

**Use Roots to Unlock Meaning:** 1. photosensitive; 2. photosphere; 3. photosynthesis; 4. ecology; 5. ecohazard

**Multiple Meanings:** Student answers will vary but should include some version of the idea that a record is a collection of data or evidence that can help prove factual information.

## Page 11: Key Concepts

**Active Reader:** Answers will vary, but should include the idea that volcanic rocks or fossils containing volcanic ash can help prove that volcanoes existed on Earth millions of years ago.

## Page 12: Chapter 1

**Active Reader:** Student's illustrations will vary.

## Page 13: Chapter 1

**Active Reader:** One or more species die out in a relatively short period of time.

**Focus Questions:** 1. Extinction occurs when a group of organisms or an entire species dies off and no longer exists on the planet. 2. They become the building blocks of all new life on Earth.

## Page 14: Chapter 1

**Active Reader:** 1. Organic material comes from decaying organisms that were once alive.; 2. Fossil evidence tells us about what Earth was like in the past.

## Page 15: Chapter 1

**Active Reader:** 1. Asteroids are small planets and other space debris that orbit the sun, mostly between the orbits of Mars and Jupiter.

## Page 16: Chapter 1

**Focus Questions:** 1. Responses may refer to volcanic eruptions, climate change, and asteroid strikes.; 2. All involve the idea that environmental change is responsible for extinction.

## Page 17: Chapter 1

### Stop and Think:

1. Scientists use the fossil record to determine these events.; 2. They use fossils to form theories about what life was like millions of years ago.; 2. (4)

## Page 18: Chapter 2

**Active Reader:** Responses will depend on the student's surroundings.

## Page 19: Chapter 2

**Active Reader:** 1. Autotrophs make their own food; heterotrophs rely on eating other organisms for food.; 2. The rat population will grow.

## Page 20: Chapter 2

**Active Reader:** Organisms benefit because there is enough food, not too many predators, and reproduction is encouraged.

### Focus Questions:

1. That heterotroph population will run out of food and the system will become imbalanced.; 2. A drawback is that changes in the food chain or habit can affect organisms negatively.

## Page 21: Chapter 3

### Active Reader:

1. Seeds sprout in pond. Plants grow attracting insects. Insect and plant waste build up on pond floor raising its level. More plants begin filling the pond into a swamp or marsh. Their roots connect and fill in until you have solid ground.

## Page 22: Chapter 3

### Focus Questions:

1. Catastrophic change happens quickly and gradual change happens slowly.; 2. It can cause algal bloom, which can block sunlight to organisms at the bottom of a pond or lake killing them off.

## Page 23: Chapter 3

**Active Reader:** Descriptions will vary, but should match the explanation in text.

## Page 24: Chapter 3

**Active Reader:** Answers will vary.

# Answer Key

## Page 25: Chapter 3

**Active Reader:** Opportunistic species reproduce quickly.

### Focus Questions:

1. Traits that do not benefit the survival of a species make it harder for them to survive; this insures the unhelpful trait dies with that organism before it gets passed on to its offspring.; 2. The species can become extinct.

## Page 26: Stop and Think

1. (1); 2. The arctic fox is a predator, so camouflage is necessary for it to sneak up on its prey.; 3. Like any adaptation, this trait would've developed through natural selection.

## Page 27: Chapter 3

**Hands on Science:** Answers may vary.

## Page 33: Check Understanding

1. (3); 2. (2); 3. (3); 4. (2)

## Page 34: Check Understanding

5. An erupting volcano and oil spill are catastrophic. Pond succession and fertilizer use are gradual.; 6. Pond succession and volcanoes are natural. Oil spills and fertilizer use are human-made.

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