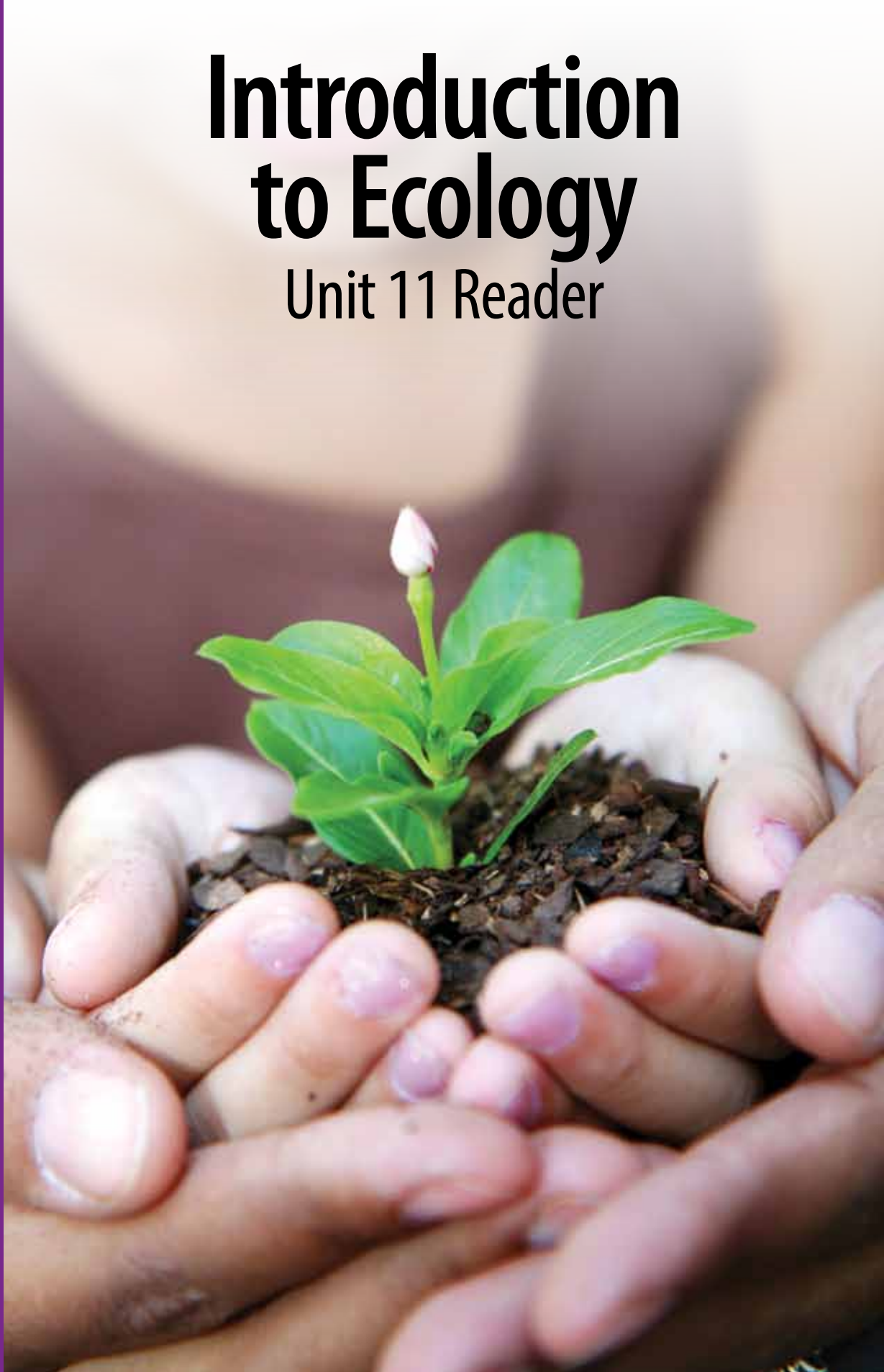
Introduction to Ecology

Unit 11 Reader



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Introduction to Ecology

Unit 11 Reader

Chapter 1

Living Things and Their Habitats

Ecology is about nature and life. It is about the relationships between living things and their **environment**. Someone who studies **ecology** is an ecologist. An ecologist studies living things and the way they relate to their surroundings.

This toad is part of an **ecosystem**. An **ecosystem** is like a habitat where an **organism** lives, but it includes many habitats plus the nonliving systems that support them. In an **ecosystem**, each living thing **depends on** other living and nonliving things for **survival**. Insects find shelter and food on trees and in moss. The toad finds those insects and eats them. The toad **depends on** rainfall to supply a place to lay eggs. One day, maybe a snake will eat the toad. These are the kinds of things ecologists like to think about!

This toad is part of an ***ecosystem****.*

The bee is attracted to the flower's bright color. The bee eats the flower's sweet nectar. The flower is also full of **pollen**. **Pollen** is a substance that looks like dust. When the bee buzzes off, it carries some of the flower's **pollen** away on its feet and wings.

To make seeds, flowers must share their **pollen** with other flowers. Flowers do not have hands or feet or any other way to get their **pollen** to other flowers. So, they **depend on** bees and other insects to spread it for them. The bee needs the flower in order to **survive**. The flower needs the bee and other insects in order to **survive**. These are perfect examples of the kind of relationships ecologists like to study.

*The bee needs the flower in order to **survive**.*

Here is another living thing you probably recognize: a squirrel. She is a little surprised to see you. This squirrel does not see people every day. She is not one of those squirrels you see **skittering** along branches in the park or your backyard. Instead, this squirrel lives deep in the forest.

She has a nest of leaves and sticks somewhere way high up in this tree. In the springtime, the mother squirrel shared her nest with her babies. But now, it is late summer. The babies have left the nest. The mother has the nest to herself. It is time for her to gather food for the winter.

This squirrel is surprised to see you.

This squirrel's favorite food is acorns, which are nuts from oak trees. In the summer, it is easy for the squirrel to go out and find plenty of acorns. But the squirrel must also gather and save food for winter. In the winter, acorns won't be so easy to find.

The squirrel uses her little paws to dig a hole in the ground. She buries an acorn. Over the summer and early fall, she may bury hundreds of them. Then, whenever she gets hungry during the winter, she can crawl out of her nest and go dig up an acorn.

It is easy to see how the squirrel **depends on** the tree. She uses the tree for both food and shelter. However, the squirrel also gives something to the tree.

How do you think the squirrel remembers where she buried all those acorns? Can she smell them? Does she put a little stick in the ground to mark each acorn? Does she draw a map on the back of a leaf? Actually, she does not remember where she planted all those acorns! She forgets a lot of them. Many of those acorns will remain in the ground right where she buried them.

Acorns are nuts from oak trees.

Acorns are nuts. Nuts are seeds with shells covering them. Like most seeds, acorns need to be planted in order to **sprout** and grow. Well, the squirrel did the oak tree a favor by planting all those acorns and then forgetting about them. If the acorns weren't buried, they probably would not **sprout** and might be eaten by another animal.

The squirrel and the oak tree are each doing what they do to **survive** and produce young. The tree grows leaves and acorns. The squirrel uses the leaves for shelter and the acorns for food. This makes it possible for the squirrel to **survive** and produce young. Also, because the squirrel buries acorns, the oak tree is able to produce young, too. This is how things work in an **ecosystem**. This is what **ecology** is all about!

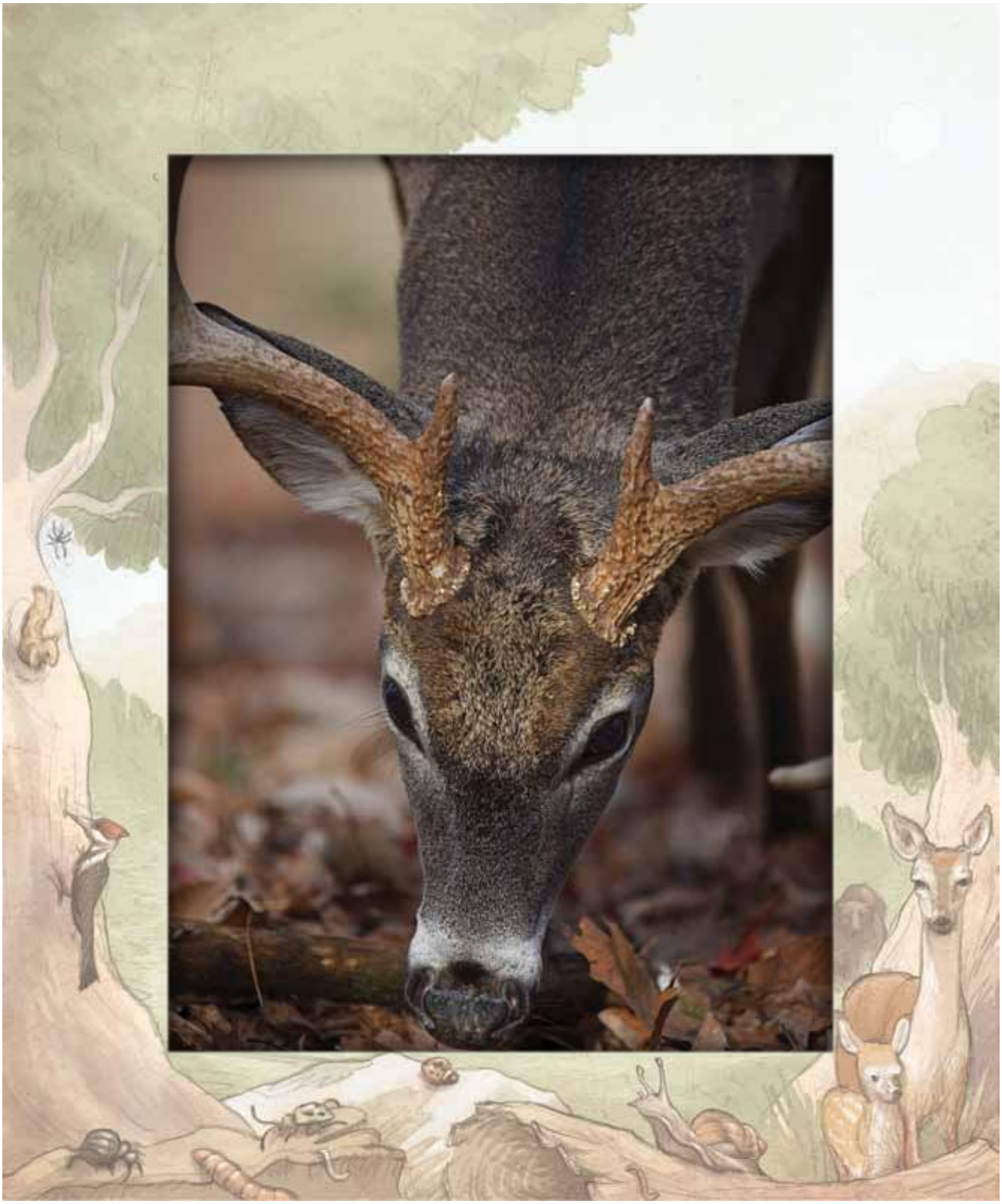
*Like most seeds, acorns need to be planted in order to **sprout** and grow.*

Chapter

2 Food Chains

Now you know something about squirrels and oak trees. Each has something to offer the other. The tree may produce thousands of acorns each year, but only a few will actually sprout and become **saplings**. Of those **saplings**, only a couple will survive and grow into **mighty** oaks, spreading their roots and changing with the seasons.

The rest of the acorns will be eaten by one creature or another. Deer eat them sometimes and so do various birds that **wander** through the forest, such as turkeys and woodpeckers. The acorns that aren't eaten will get covered by leaves, soaked by rain, and frozen by snow. If they aren't eaten by worms or other underground things, some of them will sprout into **saplings**.



Sometimes deer will eat acorns.

In the forest ecosystem, living things depend on one another. Many living things depend on trees for shelter and food. You can almost certainly find bugs on any tree. Woodpeckers can find them too!

If you dig down into the soil or scrape away some tree bark, you will discover all sorts of other critters in the forest ecosystem, such as worms, beetles, and ants.

You might not see all those insects and other little critters when you look around the forest, but they are there! You can find them under leaves, rocks, and fallen trees. Mostly, their world is underground and out of sight, unless you are willing to get dirty digging for them!

Beetles live in the forest ecosystem.

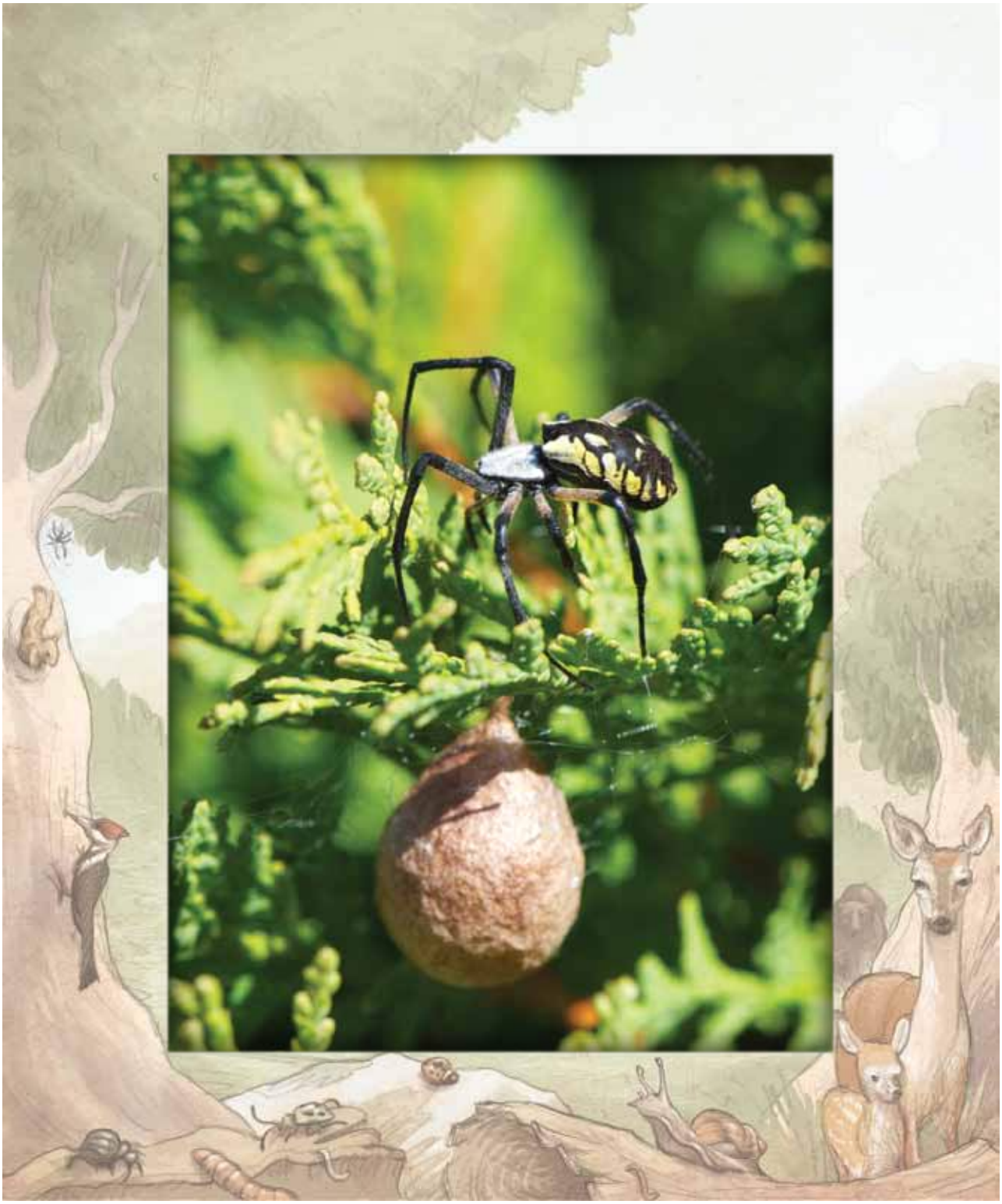
What are all those bugs doing there? They are doing what all living things do: surviving. To survive, living things need food. The **nutrients** in food provide energy for the body. Without energy, the body stops. It's that simple!

What else are bugs and other living things doing besides eating? They are doing whatever it is they need to do in order to produce young. Plants make seeds. Mammals, such as squirrels and deer, give birth to live babies. Bugs and birds lay eggs.

Spiders make egg sacs like the one in this image. When the sac opens, hundreds of tiny baby spiders will run out. Most of them will be eaten by other bugs. Those that survive will grow to be hunters like their parents.

Living things also must develop ways to **protect** themselves from other things in the ecosystem. Squirrels build their nests high in trees, away from **predators**. Worms dig down into the soil. Snails and turtles have shells to **protect** them.

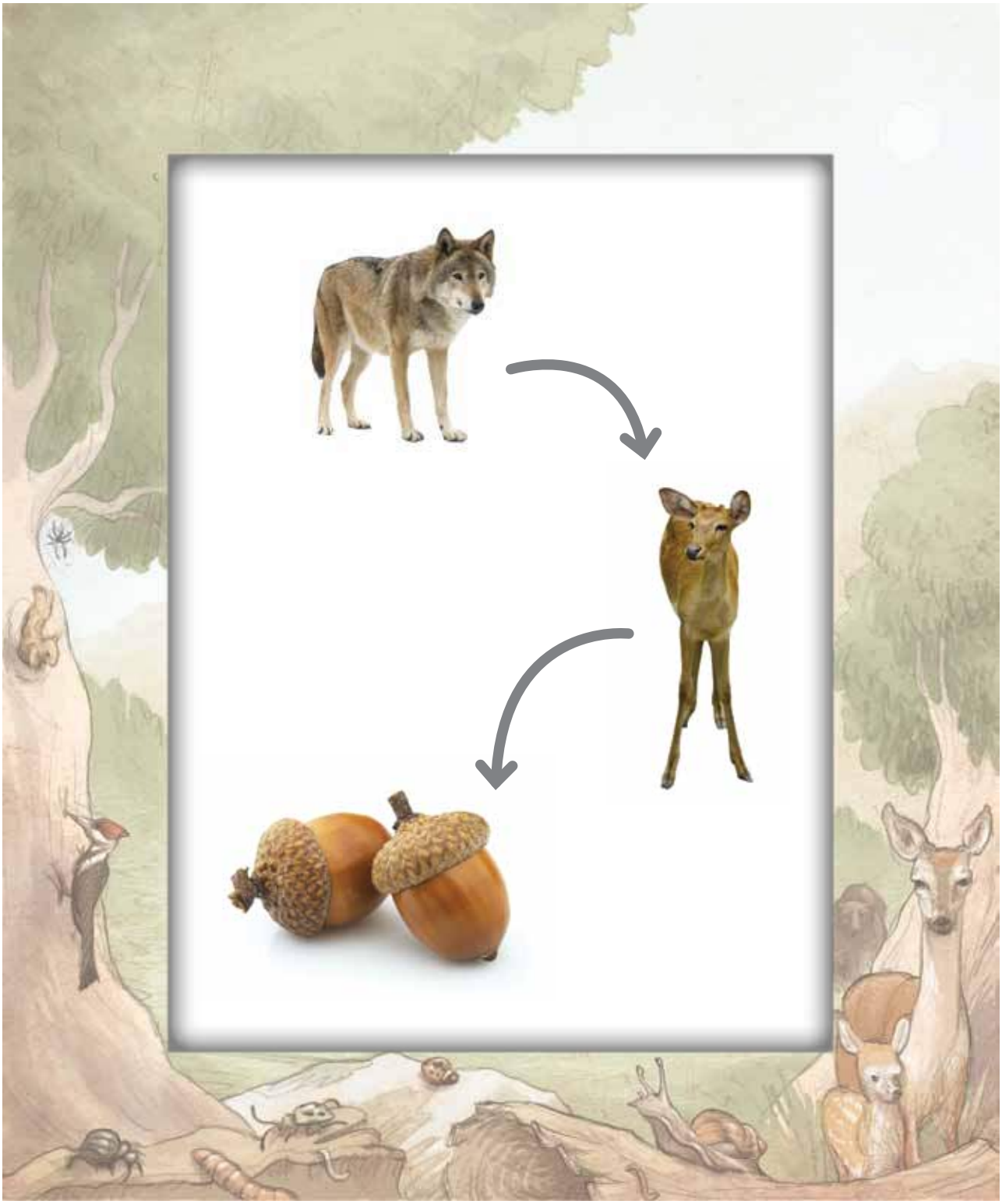
Unfortunately for squirrels, worms, snails, and turtles, these **defenses** do not always work. The **predators** that hunt and eat other animals for a living have sharp teeth and claws for catching their **prey**.



Spiders make egg sacs like this one.

There are ecosystems in many places. Each ecosystem has its own **food chain**. Look at the image of the wolf, the deer, and the acorn. This is a very simple way to think of the **food chain**. Smaller animals are eaten by slightly larger animals. But this image only represents a small part of a real **food chain**. Most **food chains** also include plants. They also include bacteria and other tiny, **microscopic** organisms.

Plants and smaller animals are usually near the bottom of the **food chain**. At the top of the **food chain**, you will find beasts like grizzly bears, lions, blue whales, or great white sharks. These animals are too big to be hunted by anything else. A lion or shark is called an **apex predator** because it is at the top of the **food chain**.



*A **food chain***

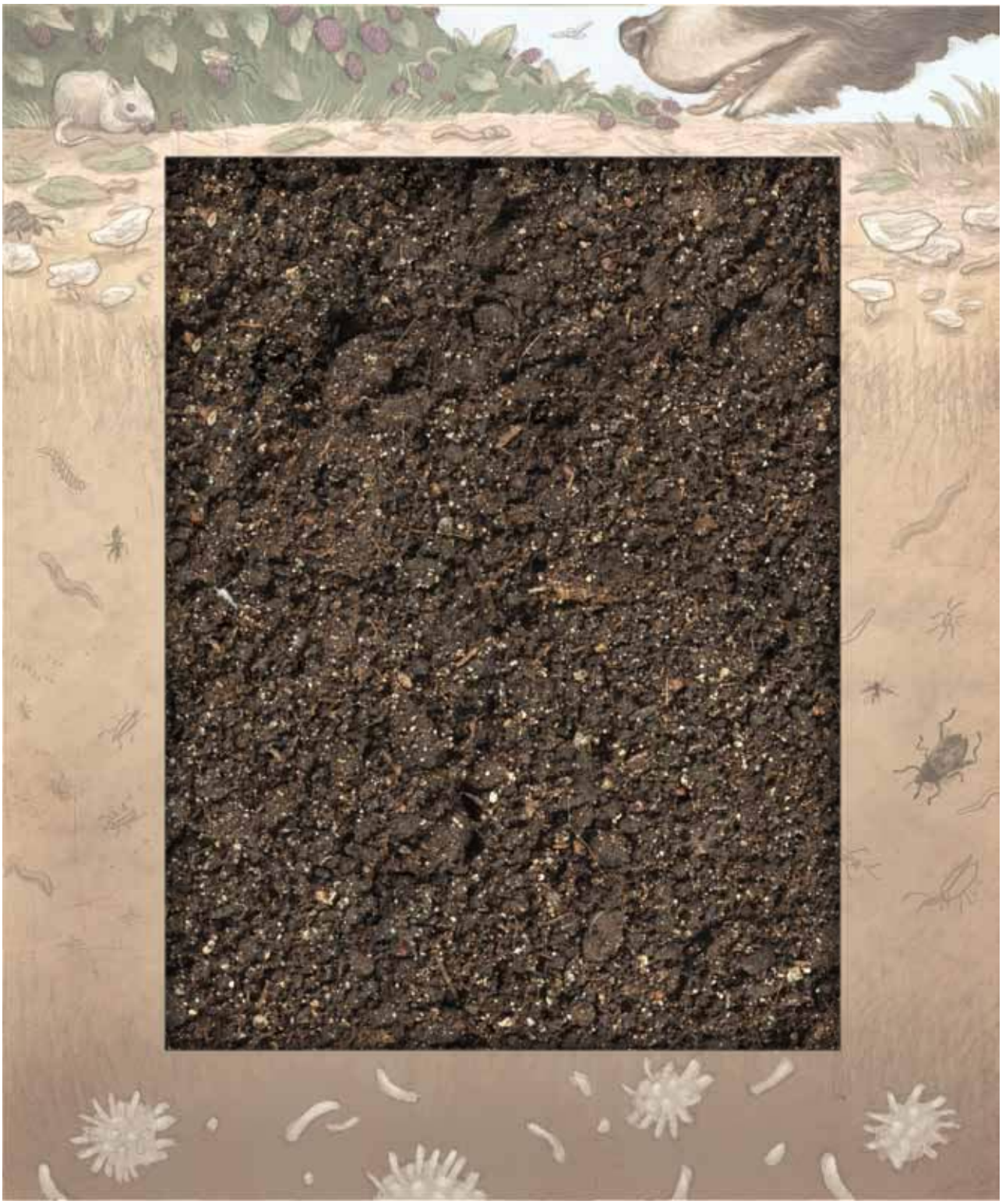
Chapter 3

Producers, Consumers, and Decomposers

Do you recognize the brown material in this picture? Some people call it dirt.

Dirt is what you are supposed to wipe off your shoes and wash off your hands, right? Dirt is what you are never supposed to get on your good shirt, right? To some people, dirt is just yucky and needs to be cleaned up.

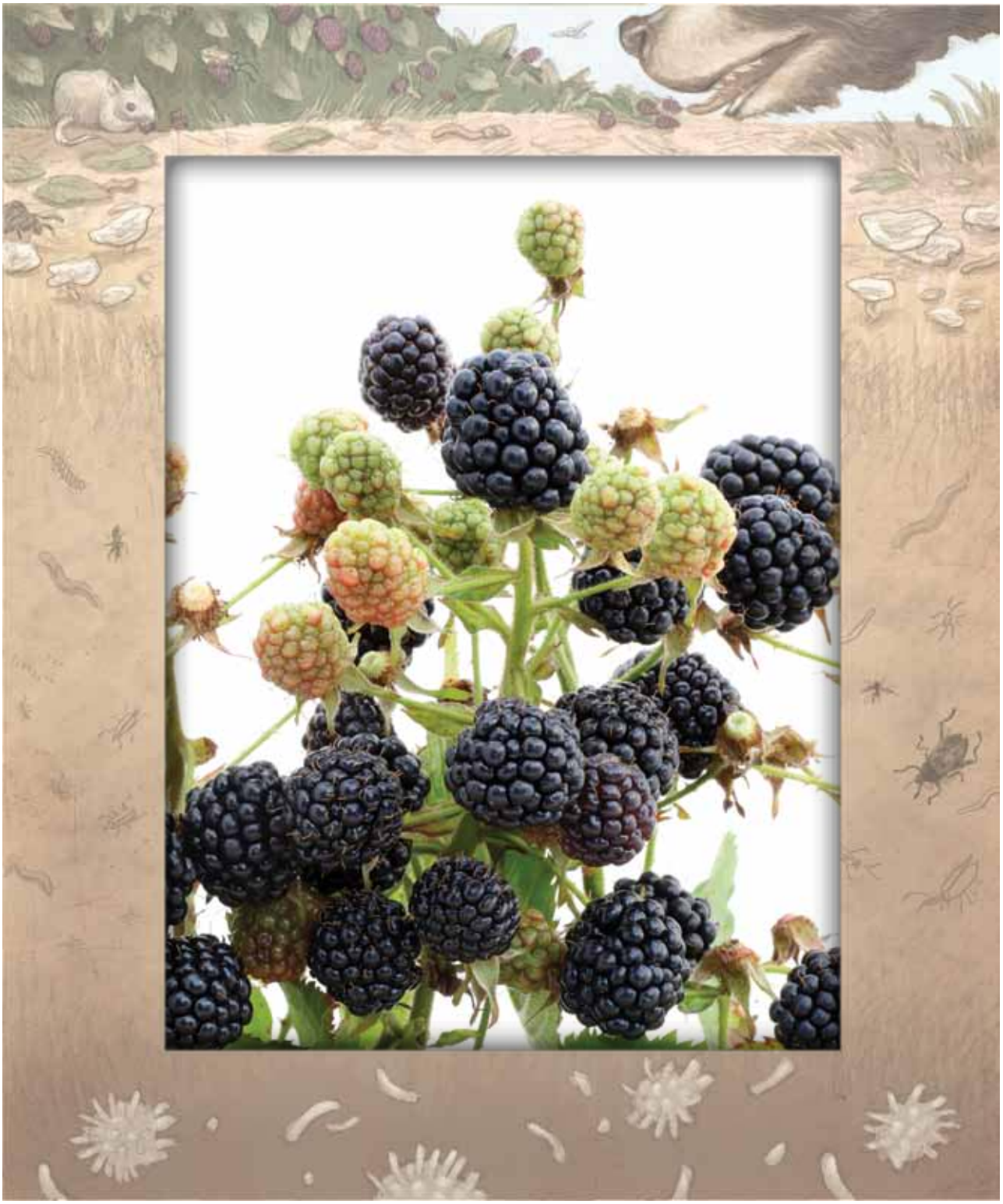
Well, ecologists don't mind getting dirty. Ecologists know dirt is very important. In fact, ecologists don't call it dirt at all. They call it **soil**. Without **soil**, life on land as we know it could not exist. **Soil** is at the heart of most ecosystems on land.



*Dirt is called **soil** by ecologists.*

In the forest ecosystem, every living thing can be sorted into one of three basic categories: **producers**, **consumers**, and **decomposers**.

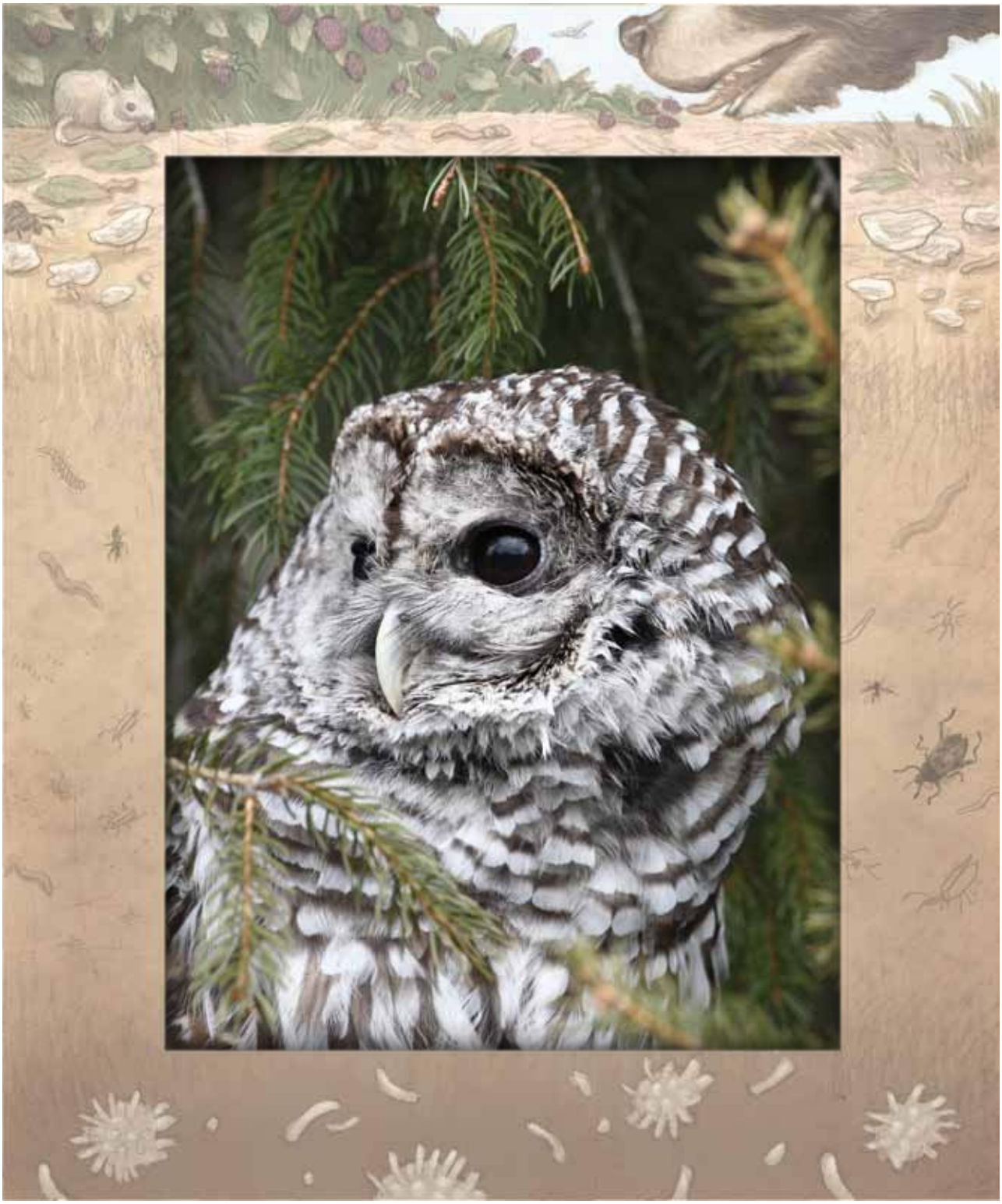
Producers make their own food. Plants do this through the process of **photosynthesis**. Many **producers** also happen to produce, or make, things that animals eat. The blackberry plant is a tasty example. It makes its own food through **photosynthesis**. The berries contain the plant's seeds. Wild animals such as birds, bears, and bugs eat the berries. The animals eat the juicy berries, but they do not digest the tiny seeds.



*A blackberry plant is a **producer**.*

Consumers eat other plants and animals. As you can probably guess, squirrels are acorn **consumers**. Unfortunately for squirrels, they are not at the top of the food chain.

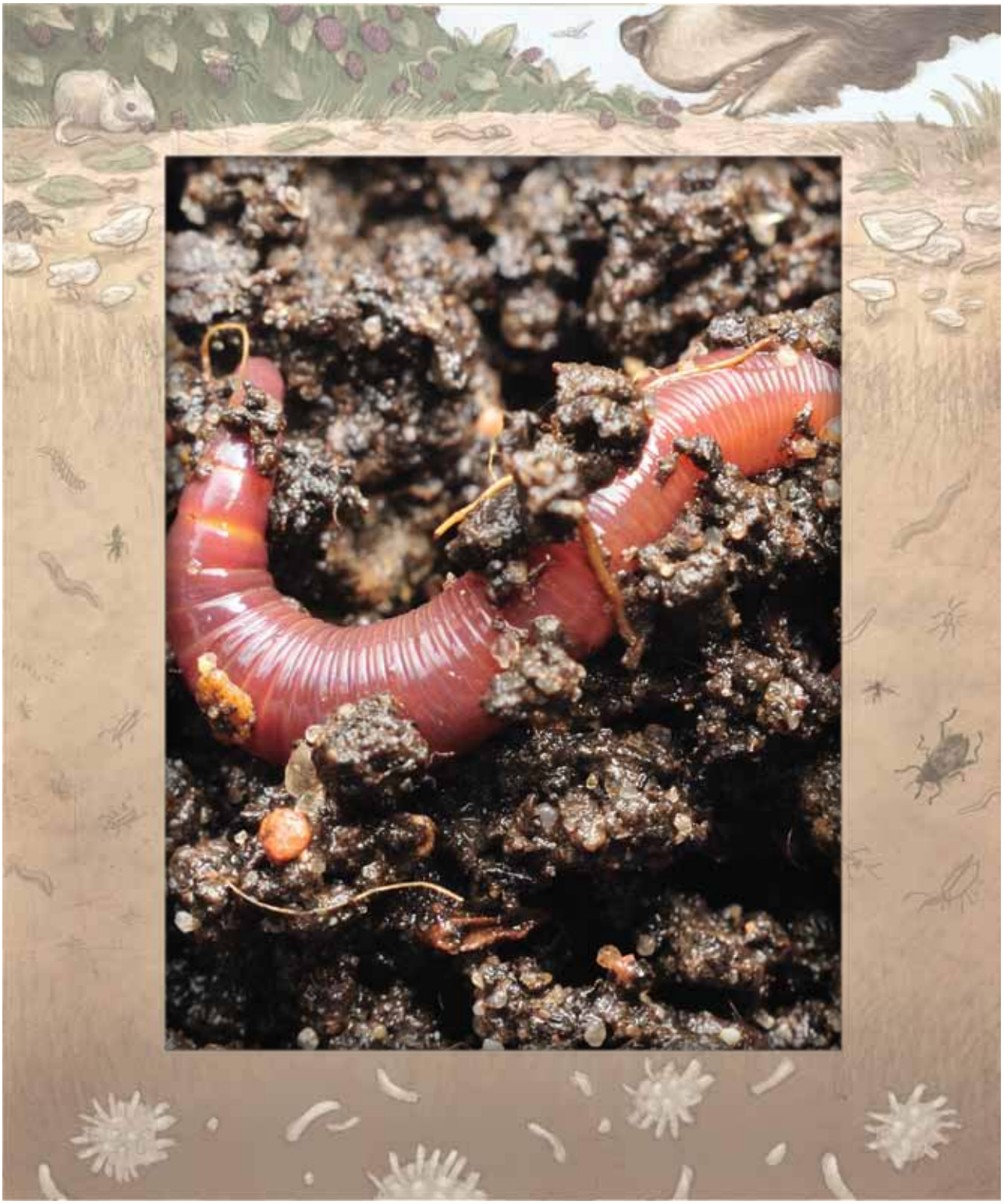
This owl is a skilled predator. It is nocturnal, meaning it hunts at night. It consumes small rodents, including squirrels. With excellent hearing and eyesight, the owl will catch any squirrel or other rodent who leaves the **safety** of its nest at night.



The owl is a skilled predator.

Decomposers are the third type of living thing in the forest ecosystem. Earthworms are **decomposers**. They feed on dead **organic** matter, such as leaves. The worms pull the leaves down into the ground. They shred the leaves into little pieces and then eat them.

Worms are pretty low on the food chain. Fish, birds, frogs, and turtles will all eat any worm unlucky enough to cross their paths.



*Earthworms are **decomposers**.*

Some insects are pretty big. Some are so small you need a magnifying glass to see them. Some fly. Some crawl.

Some insects are **decomposers**. Others are **consumers** and some are even predators. Most insects are pretty far down on the food chain.

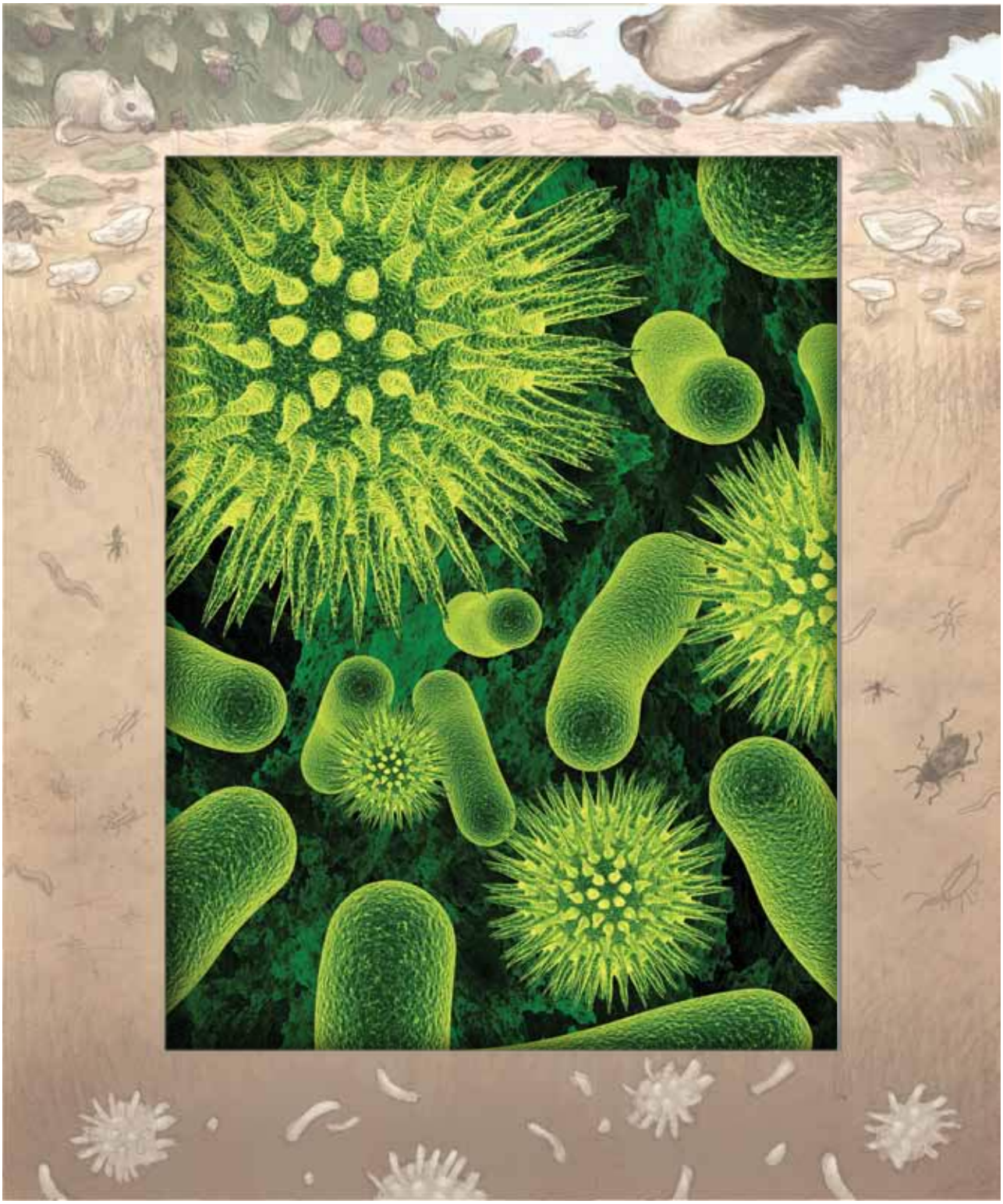
*Some insects are **consumers** and some are **decomposers**.*

In fact, there are billions and billions of other living things in the **soil** surrounding the worm. These **bacteria**, **fungi**, and other organisms are working to survive in the same **soil**. These organisms are so small you cannot see them without a microscope.

Bacteria are the most important **decomposers**. They are also the most **abundant** form of life in an ecosystem. **Bacteria** and other simple organisms have a very, very important job.

Bacteria and other teeny, tiny organisms cause dead plant and animal matter to **decompose**. When something **decomposes**, its body is broken down into simpler and simpler types of matter.

As leaves **decompose**, their nutrients will become part of the **soil**. Basically, the **decomposed** matter provides **vitamins** and **minerals** for new plants or other living things.



***Bacteria*, *fungi*,** *and other organisms are microscopic.*

Chapter 4

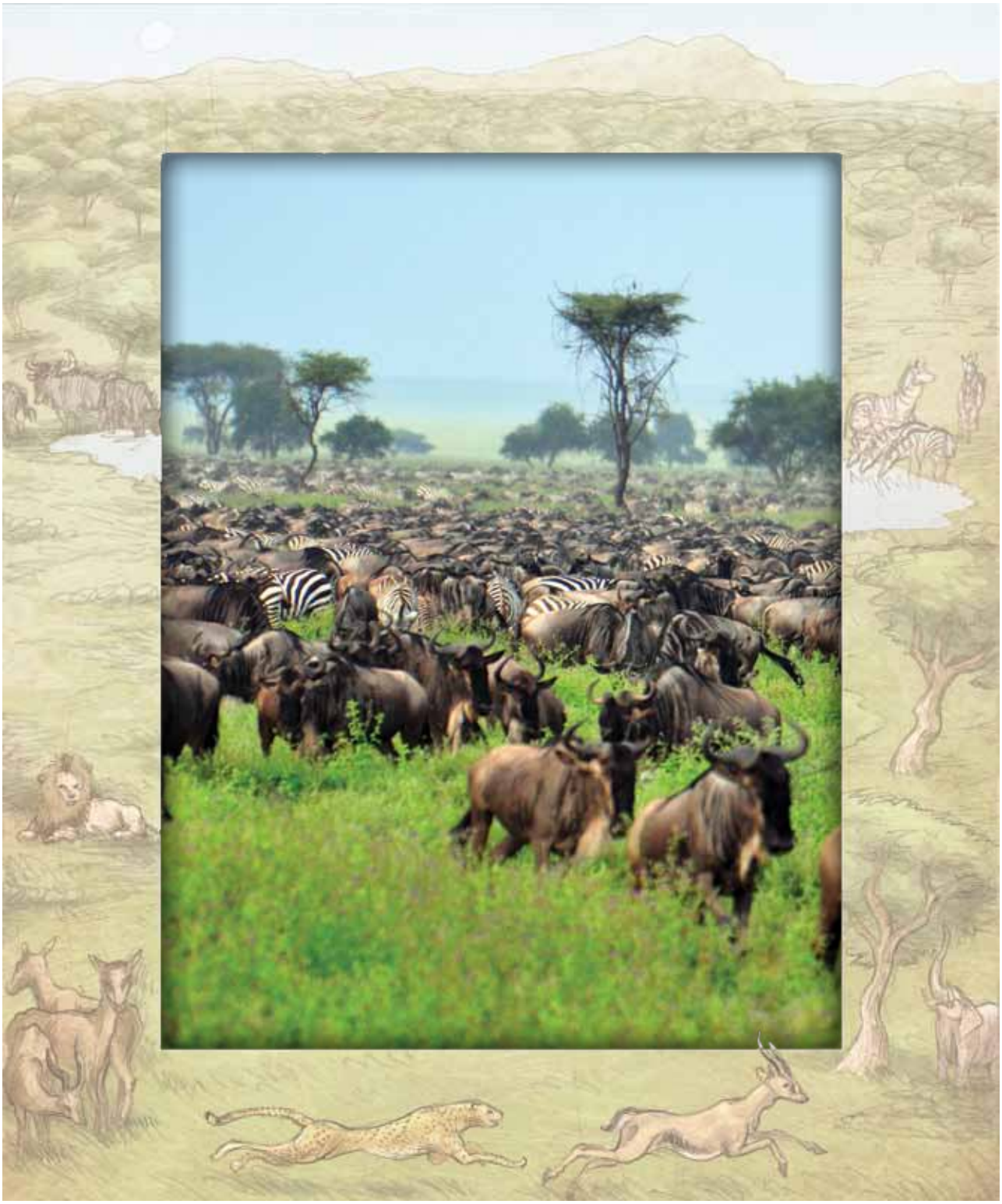
The Balance of Nature

This photo was taken in Kenya, a country in east Africa. Kenya is famous for the **wildlife** on its grasslands. When people visit Kenya, they often go on **safari** to see the animals.

A large portion of Kenya is part of the Mara National **Reserve**. A **reserve** is a protected area of land. People are not allowed to build towns or major roads there. The land is set aside for nature, especially the animals.

Most of the Mara is open grassland, known as a savanna. The land is basically flat, with gently rolling hills. There are some trees and bushes growing in the savanna, but it is mostly grass.

In many ways, the savanna ecosystem is like any other ecosystem. There are food chains with producers, consumers, and decomposers.

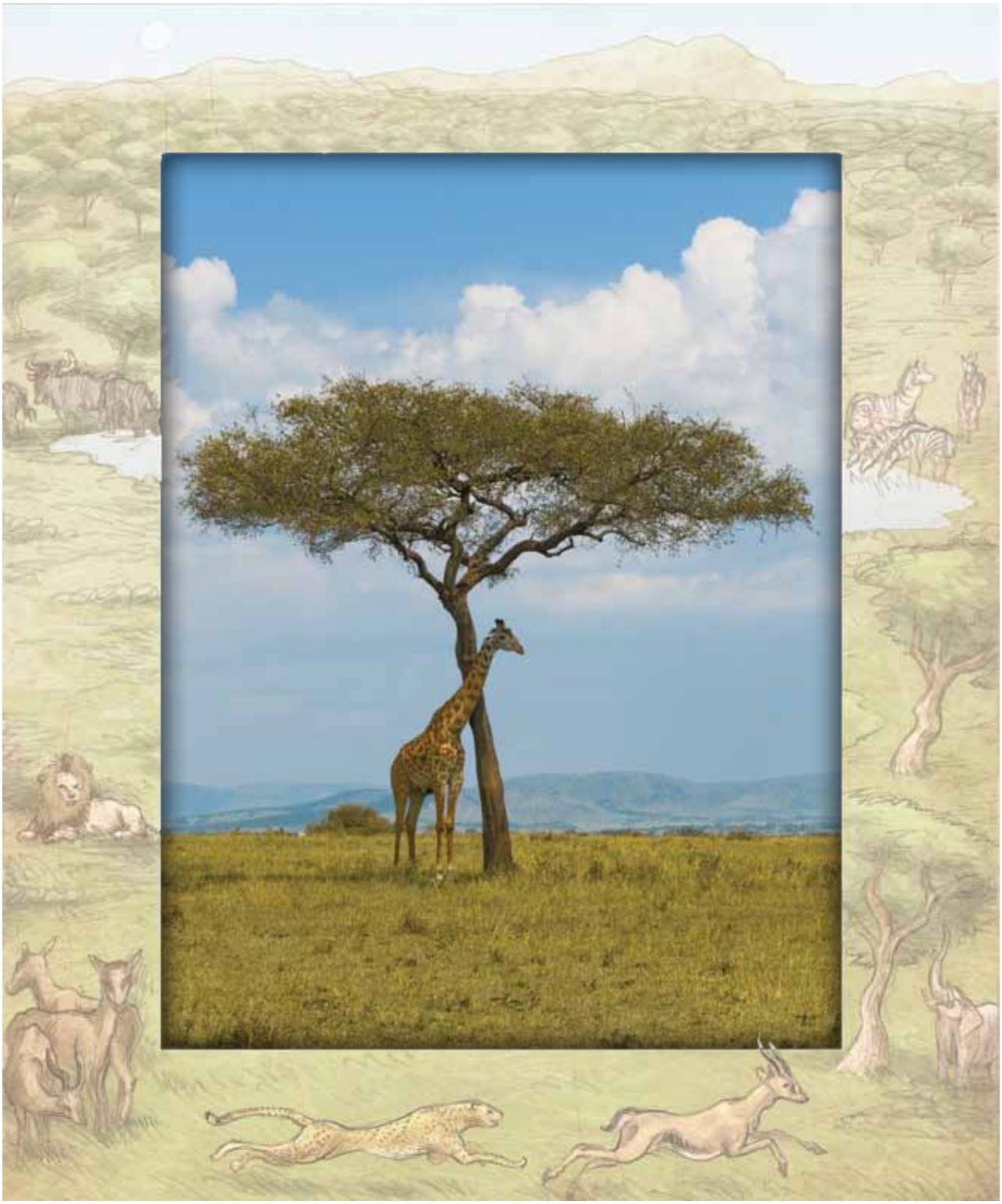


A savanna is basically flat, with gently rolling hills.

Huge **herds** of **wildebeests**, zebras, and other consumers eat the savanna grass. There is plenty of grass for everyone. This also means there is plenty of meat for the lions!

The Mara is known for its many types of **acacia** trees. Giraffes like to eat **acacia** leaves.

Some ants in the Mara like to eat certain **acacia** seeds. The ants carry the seeds underground. They eat the fruit that surrounds the seed, but they do not hurt the seed itself. Instead, they leave it there in the ground where they ate it. That's how some **acacias** spread their seeds! This is another example of a way in which organisms **rely on** each other in an ecosystem.



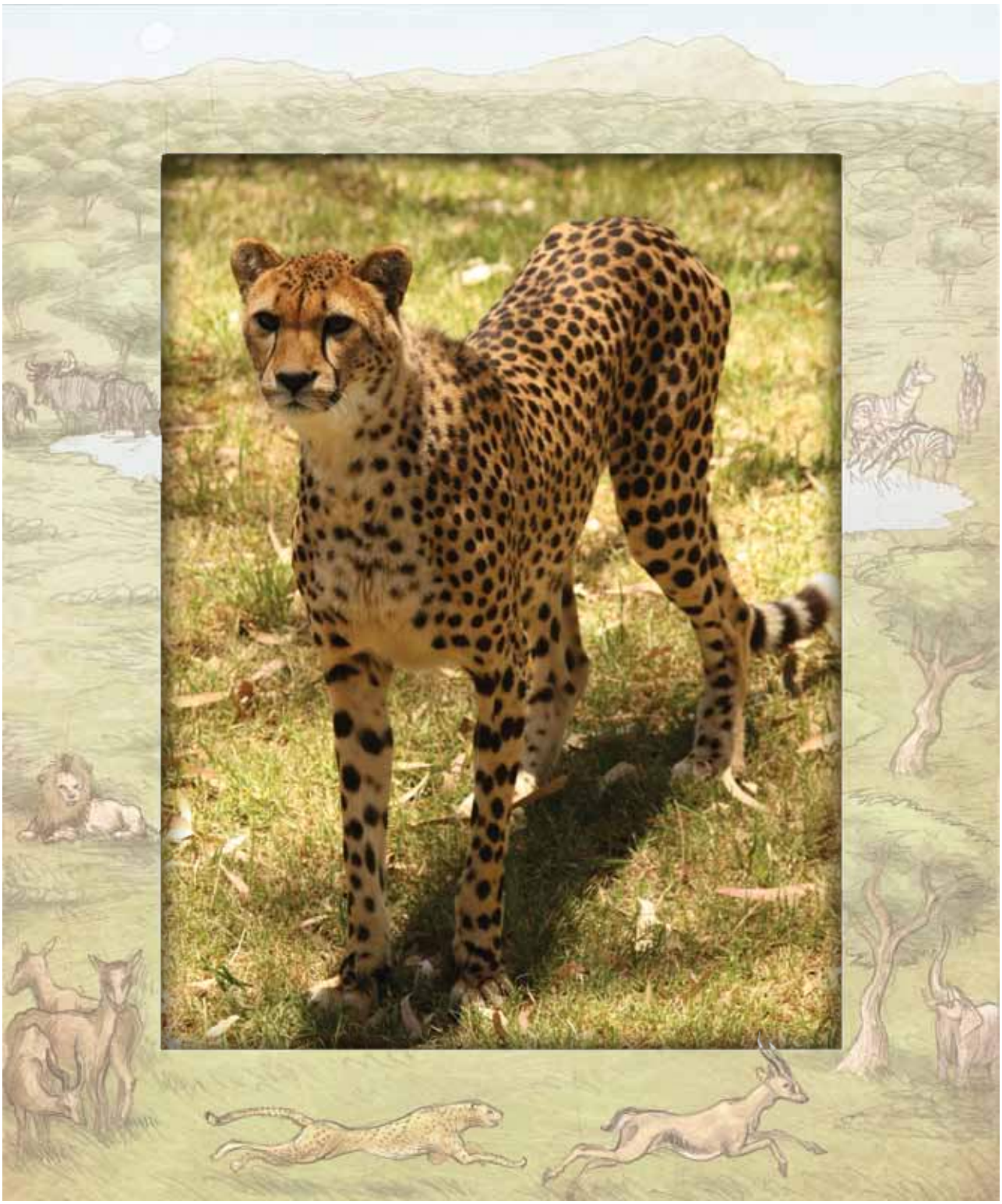
*Giraffes like to eat **acacia** leaves.*

Each living thing in a healthy ecosystem can survive with help from other living things. The living things depend on each other. Of course, not all living things survive for very long. Many critters are eaten by bigger animals. Most seeds do not sprout. But enough will survive to make sure life continues in the ecosystem.

The savanna's grass eaters would probably be happy if all the big cats disappeared. However, if all the big cats disappeared from the Mara, this would **upset** the natural **balance** in the food chain.

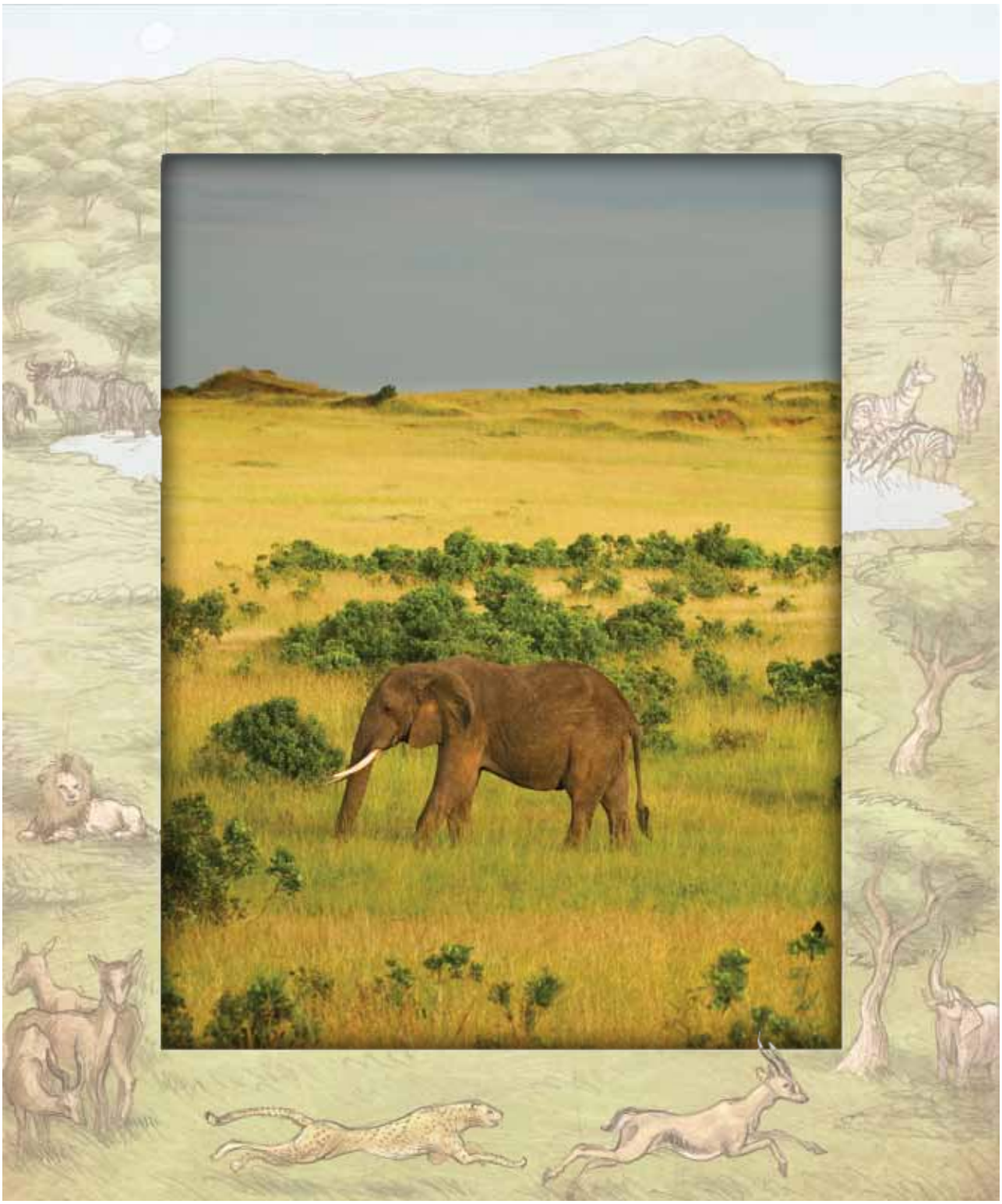
Cheetahs and other predators hunt the weak, sick, and young members of the **herd**. As a result, the strong animals in the **herd** tend to survive and have healthy young.

No **gazelle** wants to be eaten by a lion or cheetah. But in an ecosystem, the predators help keep the population from getting out of control. If there were too many **gazelles**, then all **gazelles** might have trouble finding enough food. Cheetahs help make sure there aren't too many **gazelles**!



A cheetah is a predator.

The grasslands of the Mara National **Reserve** seem to stretch on forever. It is hard to imagine anything bad ever happening to **upset** the ecosystem of this vast, beautiful land. But if nothing bad ever happened, then the government of Kenya would not have bothered making this a **reserve**. Many animals were illegally hunted to near **extinction**. The people of Kenya had to set the land apart in order to protect the ecosystem and all the animals in it.



Open grasslands

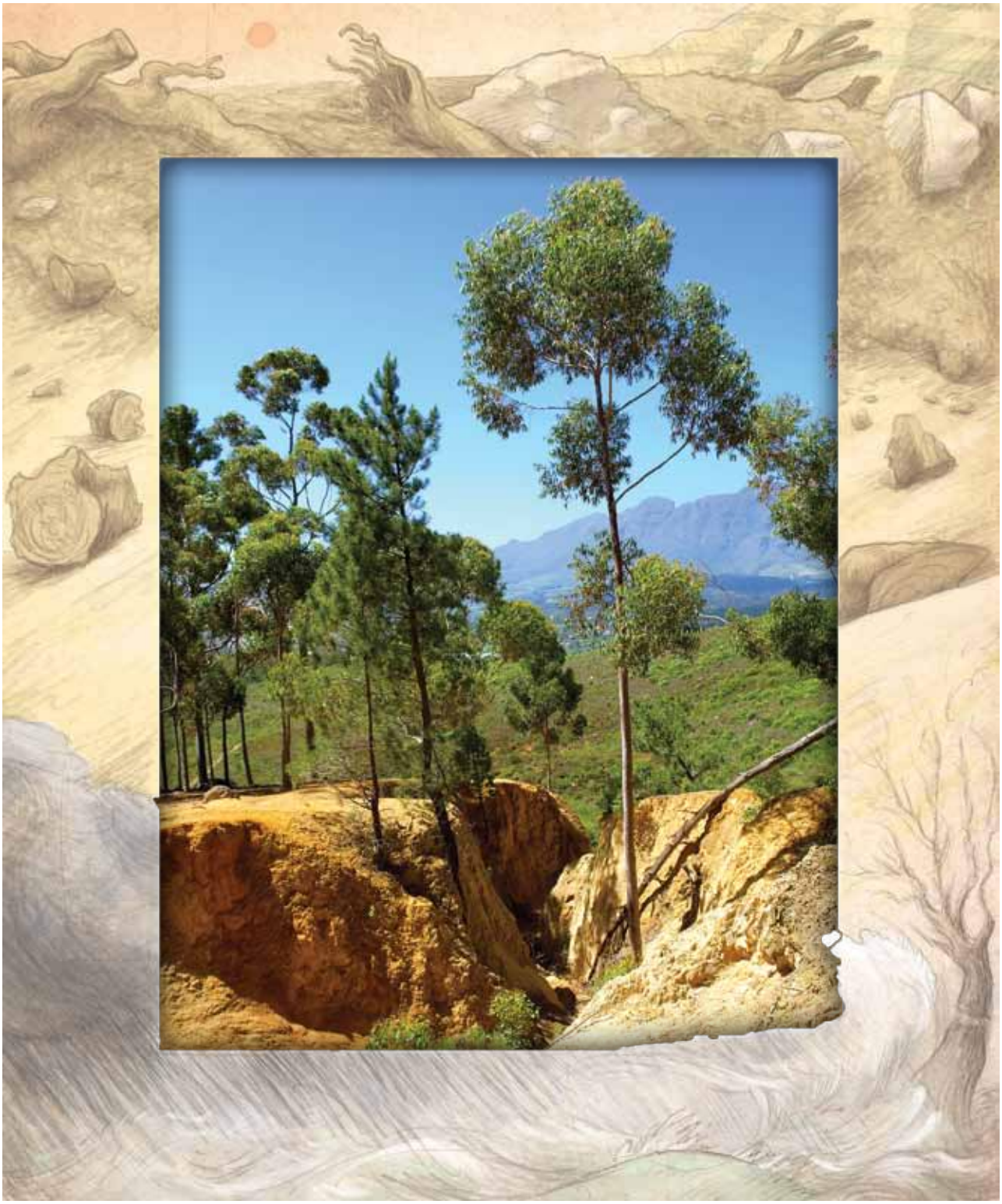
Chapter 5

Natural Changes to the Environment

Ecosystems can be **fragile**. It doesn't take much to cause big changes in the environment. Sometimes the ecosystem can recover from a change. Sometimes the change is forever.

Erosion is one **common force** of nature. Over time, the land on either side of a stream can **erode**. When it rains really hard a little stream can fill with water and flood. A **flood** may last for an hour. It may last for a few days.

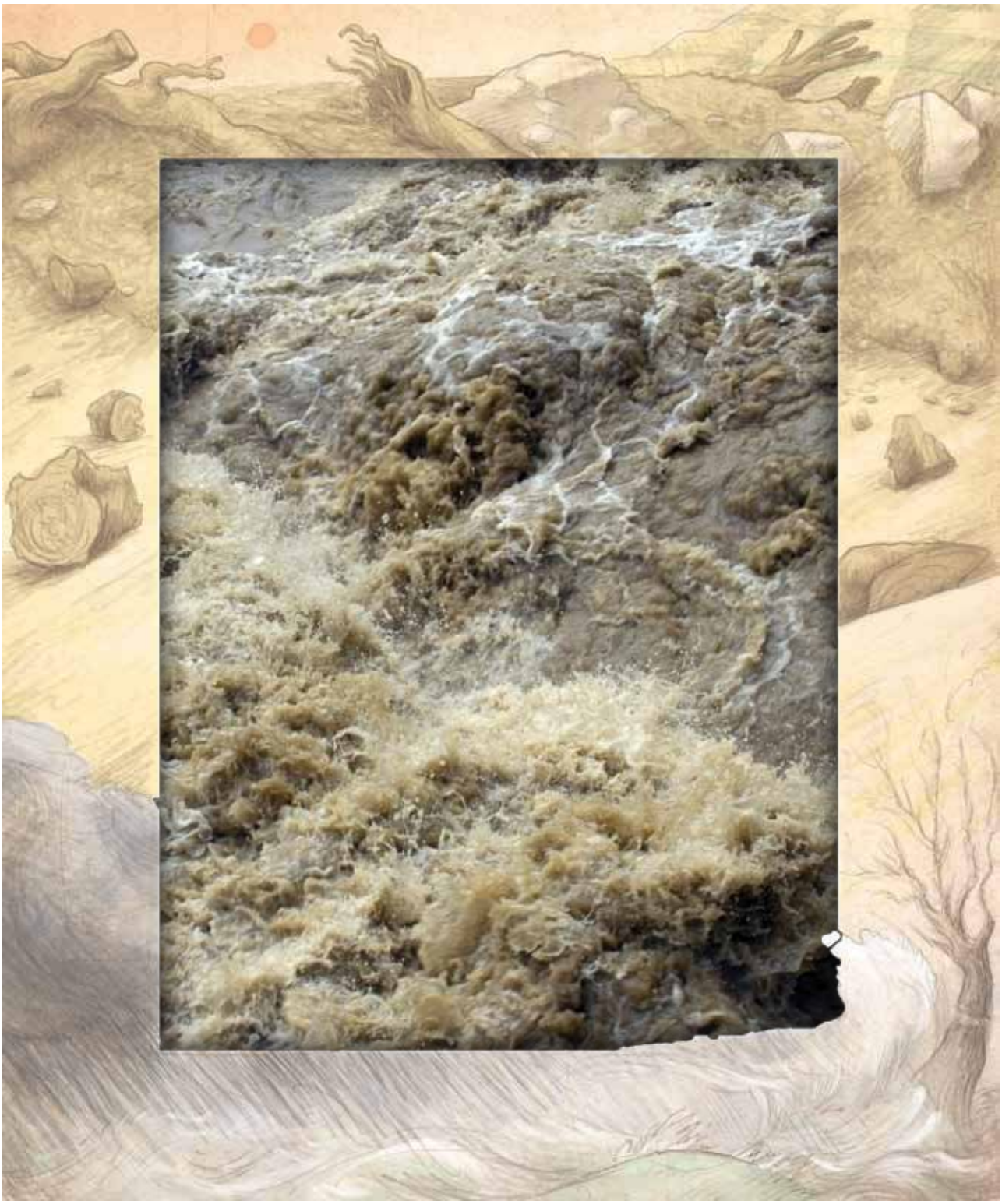
The plants on a hillside have roots that reach deep into the soil. The roots hold the soil together. When it rains, or when the wind blows really hard, the plant roots hold the soil in place. Without plants, the soil starts to **erode**.



*Without plants, the soil starts to **erode**.*

Water is one of nature's most powerful **forces**. During a big **flood**, the entire **landscape** can be changed. A flooded river can tear apart plants, trees, and soil.

First, the **topsoil** is removed. This is the richest soil, where you find most of the nutrients and **decaying** matter. Once the **topsoil** is washed away, the **forces** of nature slowly eat away at the clay and rock underneath.



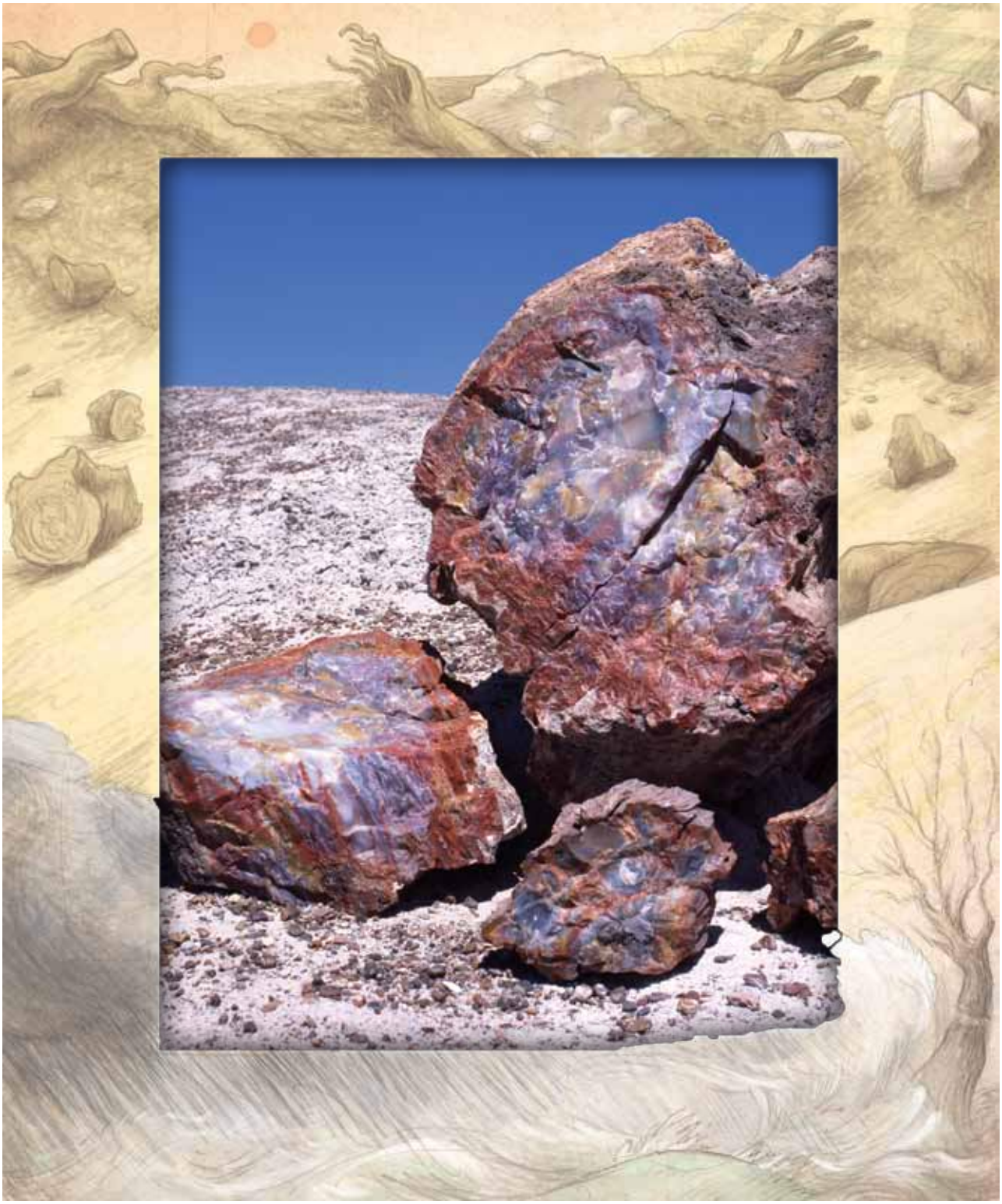
Water is one of nature's most powerful ***forces****.*

This is from **Petrified** Forest National Park in Arizona. Throughout the park, there are ancient trees that have turned to stone. The trees have been **petrified**!

These may look like normal rocks but they're not! There was a forest ecosystem here about 200 million years ago, when some of the first dinosaurs roamed the earth. These rocks are actually pieces of **prehistoric** trees!

Back then, there were producers, consumers, and decomposers, too! Fossils found in the **Petrified** Forest show that there were swamp plants, like ferns. There were also dinosaurs that looked sort of like crocodiles.

At some point, the area was flooded by huge amounts of water and mud. The trees were covered. The entire forest was destroyed, along with the food chain. All that mud covering the trees dried. Over millions of years, the mud turned to rock. Instead of rotting, the trees turned to rock, too!



*These rocks are actually pieces of **prehistoric** trees.*

Millions of years and **countless floods** later, the land in **Petrified** Forest National Park has **eroded**. We are left with this strange **landscape**. It is still called a forest, but many of the trees are really rocks.

The land is almost like a desert. However, the **Petrified** Forest does get some rain. There is actually a lot happening in this ecosystem, even though it looks like a dry, sandy place. There are 500 different **species** of plants in **Petrified** Forest National Park. There are no dinosaurs, but there are little lizards. There are also toads, snakes, birds, and **jackrabbits**. Coyotes are near the top of the food chain. They eat just about anything, meat and plant alike.

The **Petrified** Forest is interesting because it shows how nature's **forces** can change the **landscape**. When the land changes, the ecology changes. There were once forests and swamps here. Now, it is a rocky desert. The hills have **eroded**. Much of the rich soil has been washed away, leaving mostly sand and rocks. But it is still an ecosystem! Through all the changes, there has always been life here. Living things find a way to adapt and survive.

*Coyotes are near the top of the food chain in the **Petrified** Forest.*

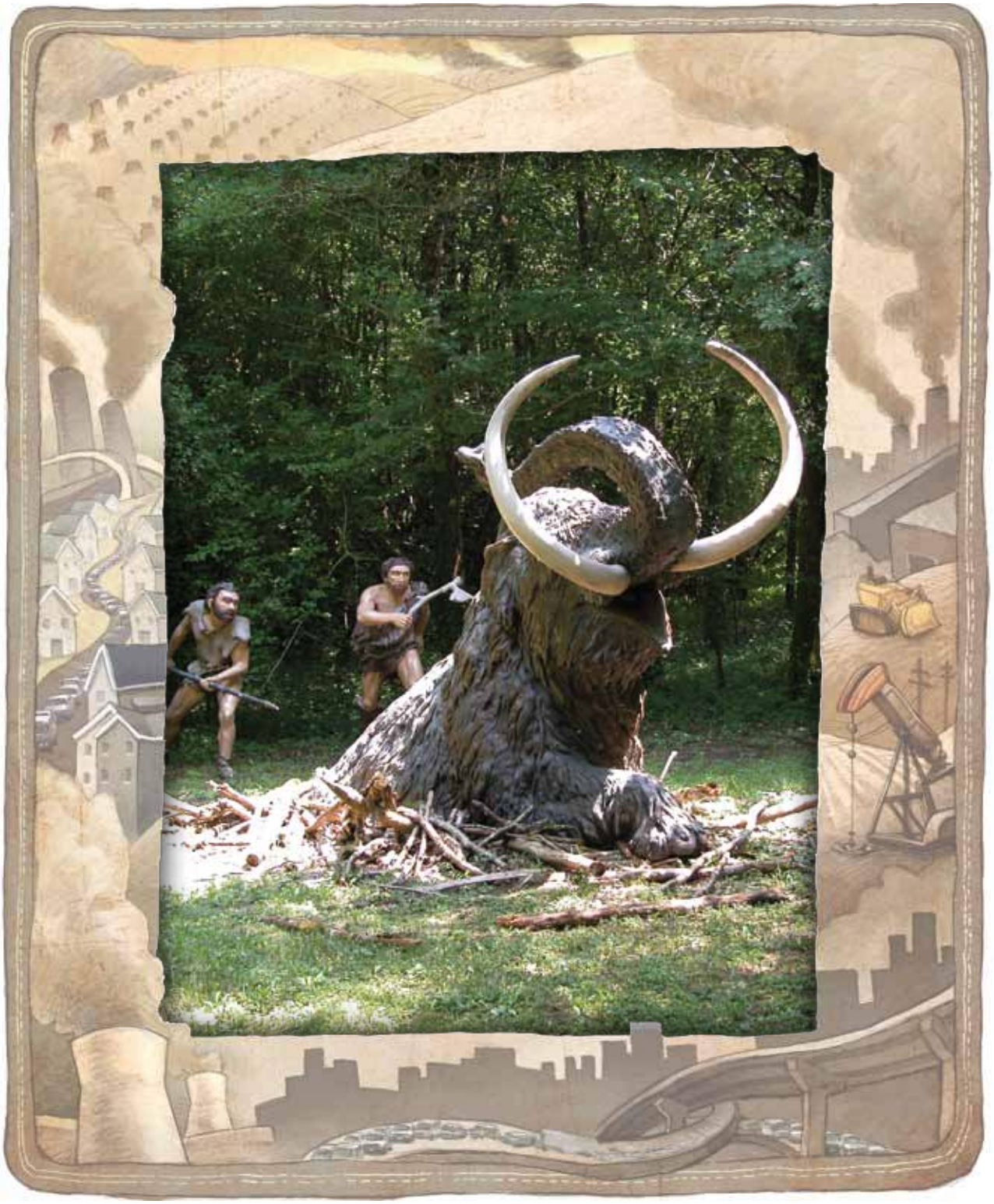
Chapter 6

Human Changes to the Environment

As you have learned, every plant and animal in a natural ecosystem depends on other plants or animals for its survival. For example, a butterfly depends on a flower's nectar for food. At the same time, a flower depends on butterflies and other insects to spread its pollen.

Thousands of years ago, early humans were like all other living things in nature. They were just another part of the natural food chain. They hunted animals and gathered plants for food. They made shelters and clothing using the materials in their environment. Most importantly, they used only what they needed for basic survival.

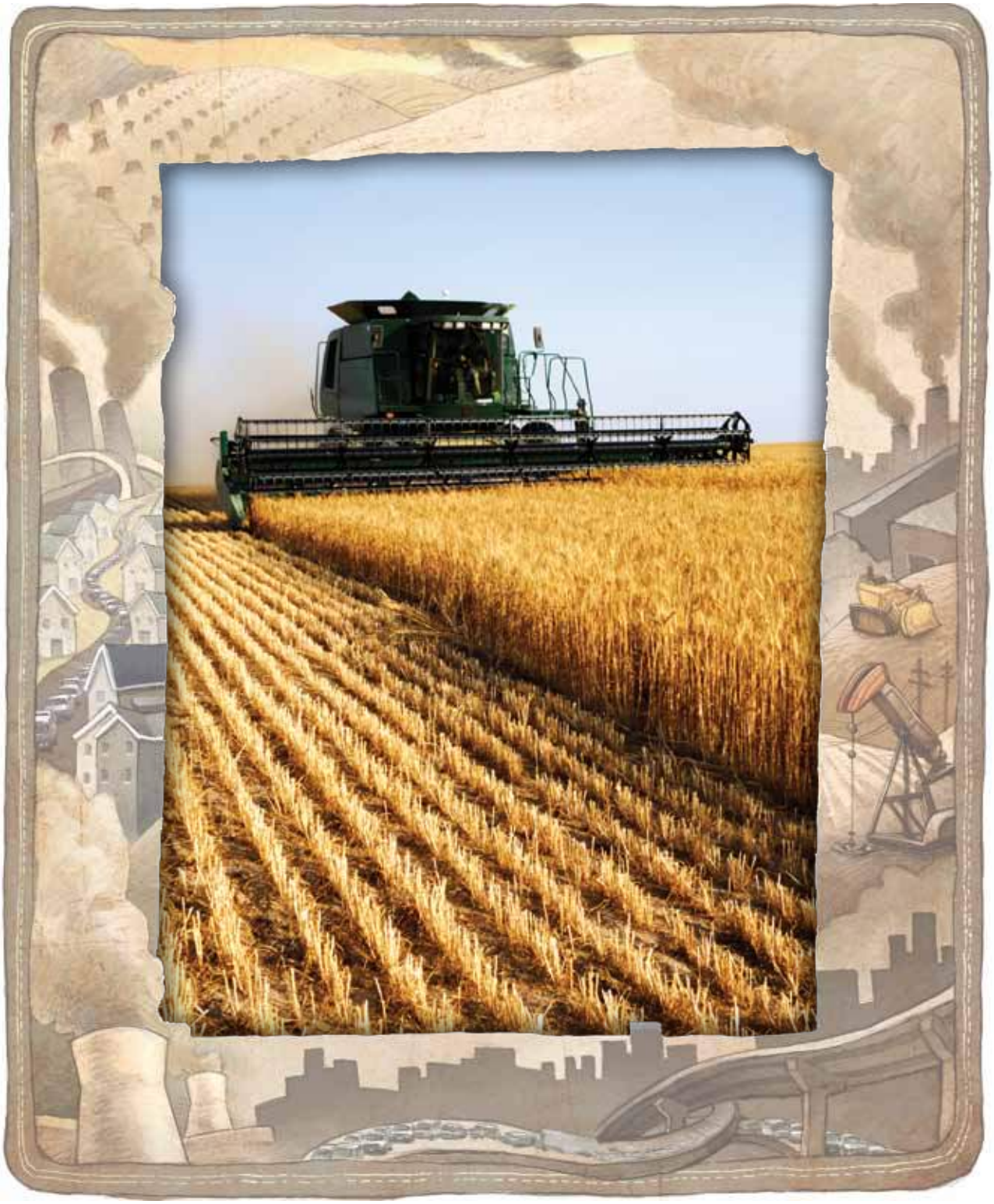
However, humans also had the ability to create and use **technology**. At first, they used simple **technology**, like tools made of stone and wood. These tools made it easier to hunt, build, and do other things for survival.



Humans used tools made of stone and wood.

Over time, **technology** improved. Humans learned to create and use machines. Instead of hunting animals, they learned to raise animals like cows and chickens for food. Instead of gathering nuts, berries, and roots, they learned to grow their own crops. In other words, humans learned to change and control some parts of nature in order to meet their needs.

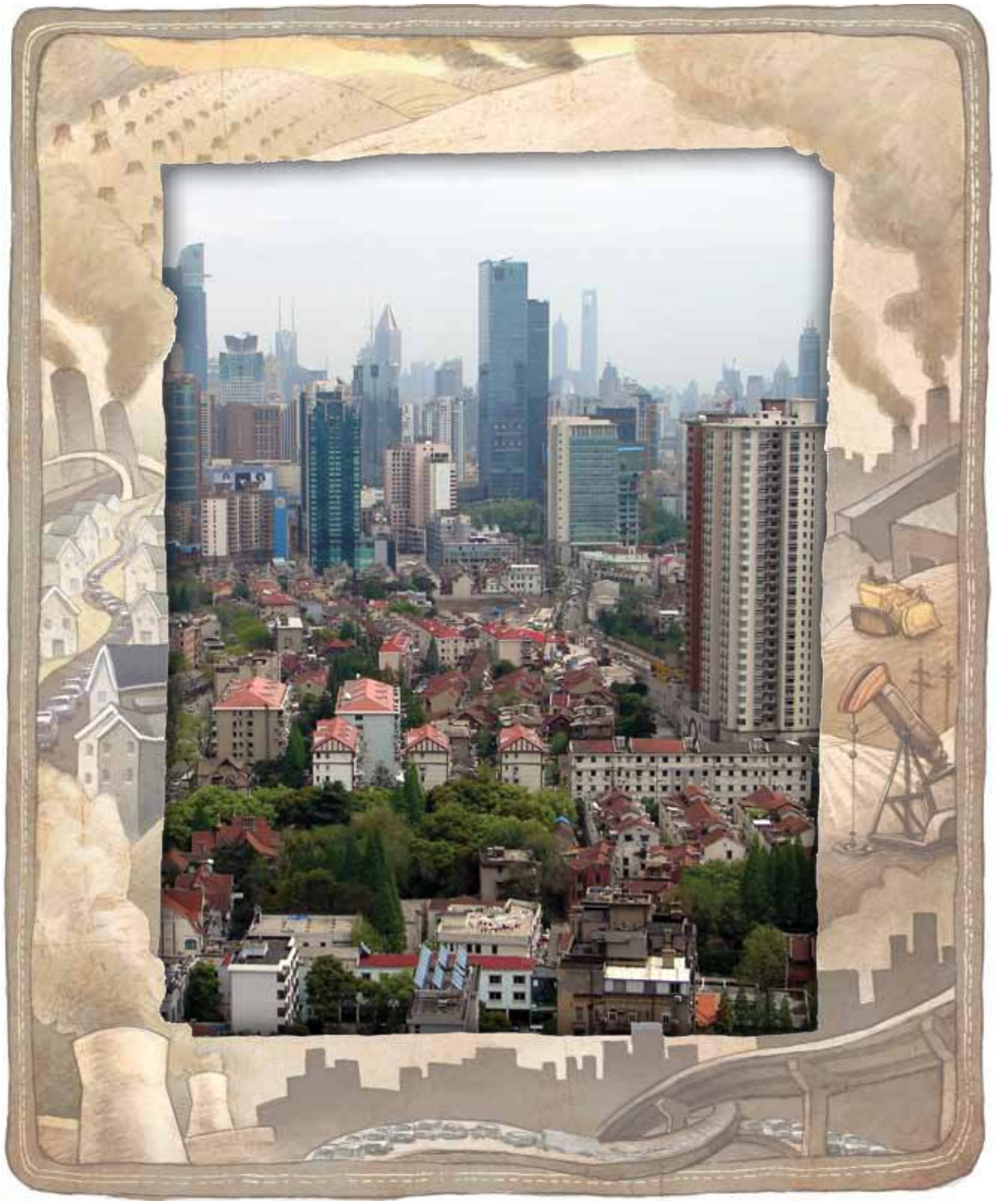
With **technology**, humans were able to change the environment. The land in this picture may have been a forest or natural grassland. Now, instead, it is a wheat field. Insects and other organisms still live in the soil and feed on the wheat plants. However, this is not what you might call a natural field. Humans planted the seeds in this field and humans decide when to harvest the crops to make food.



Technology *for harvesting food improved over time.*

The land beneath any town or city was once a natural ecosystem. Then, humans came along and used **technology** to change the natural environment. There are some trees, grass, and flowers in a city. But they are only there because people want them there. Some animals, like squirrels and birds, also live in cities alongside humans. But these creatures had to learn to survive in an environment created by humans.

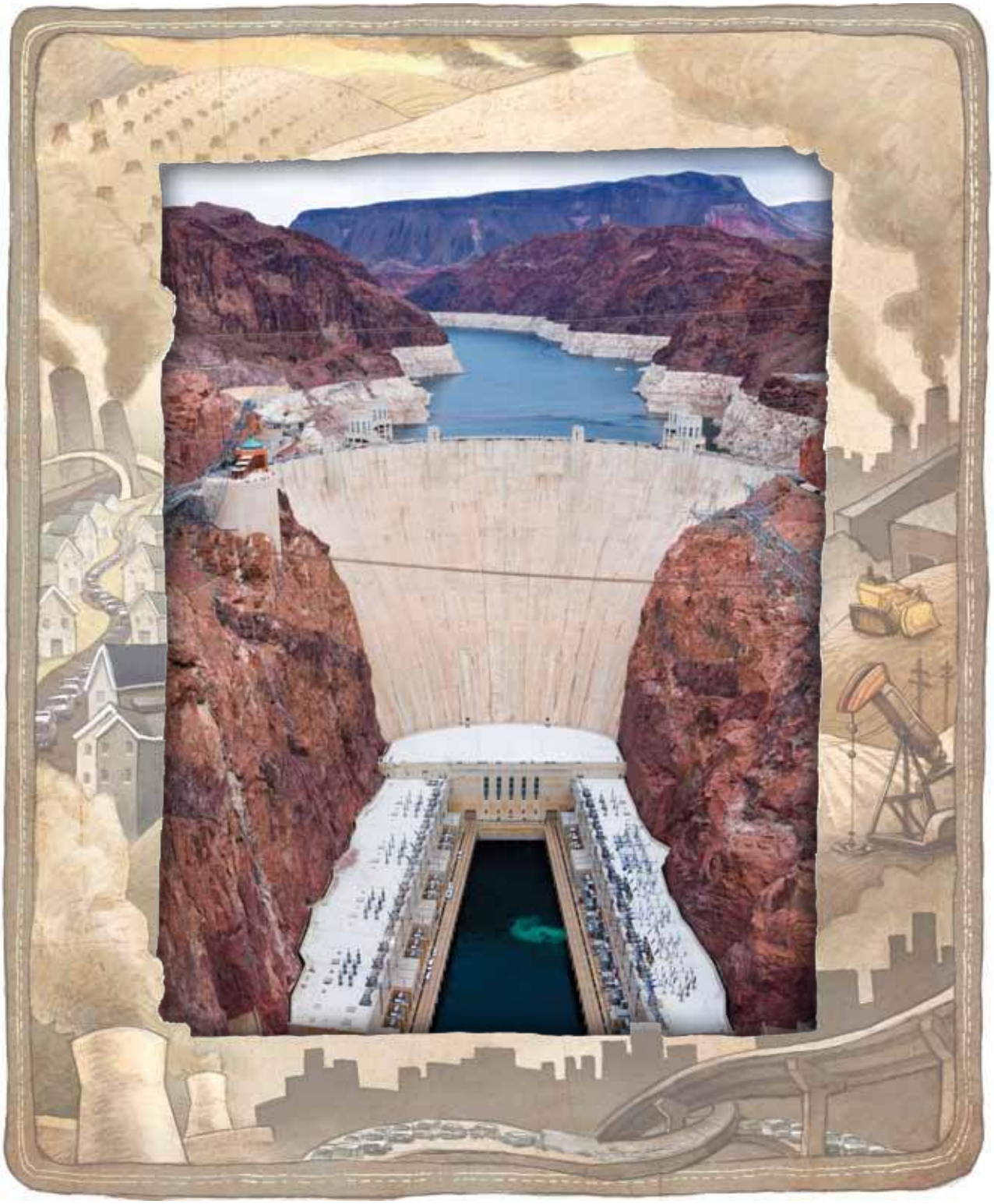
Now, with all our cities and **technology**, it is sometimes easy for us to forget about nature and ecosystems. It is easy for us to think of nature as something we can visit, but not something we are really part of.



*People used **technology** to create cities.*

It is also easy for us to think of nature as a **resource primarily** for humans—something we can use and change to suit our needs. This image shows one of the most amazing things ever built in America: the Hoover Dam. There are thousands of dams in America but the Hoover Dam is the biggest. It was built across the mighty Colorado River. It **generates hydroelectric** power, or electricity, for over a million people in Arizona, Nevada, and California. The **reservoir** created by the dam also provides water for thousands of homes and farms.

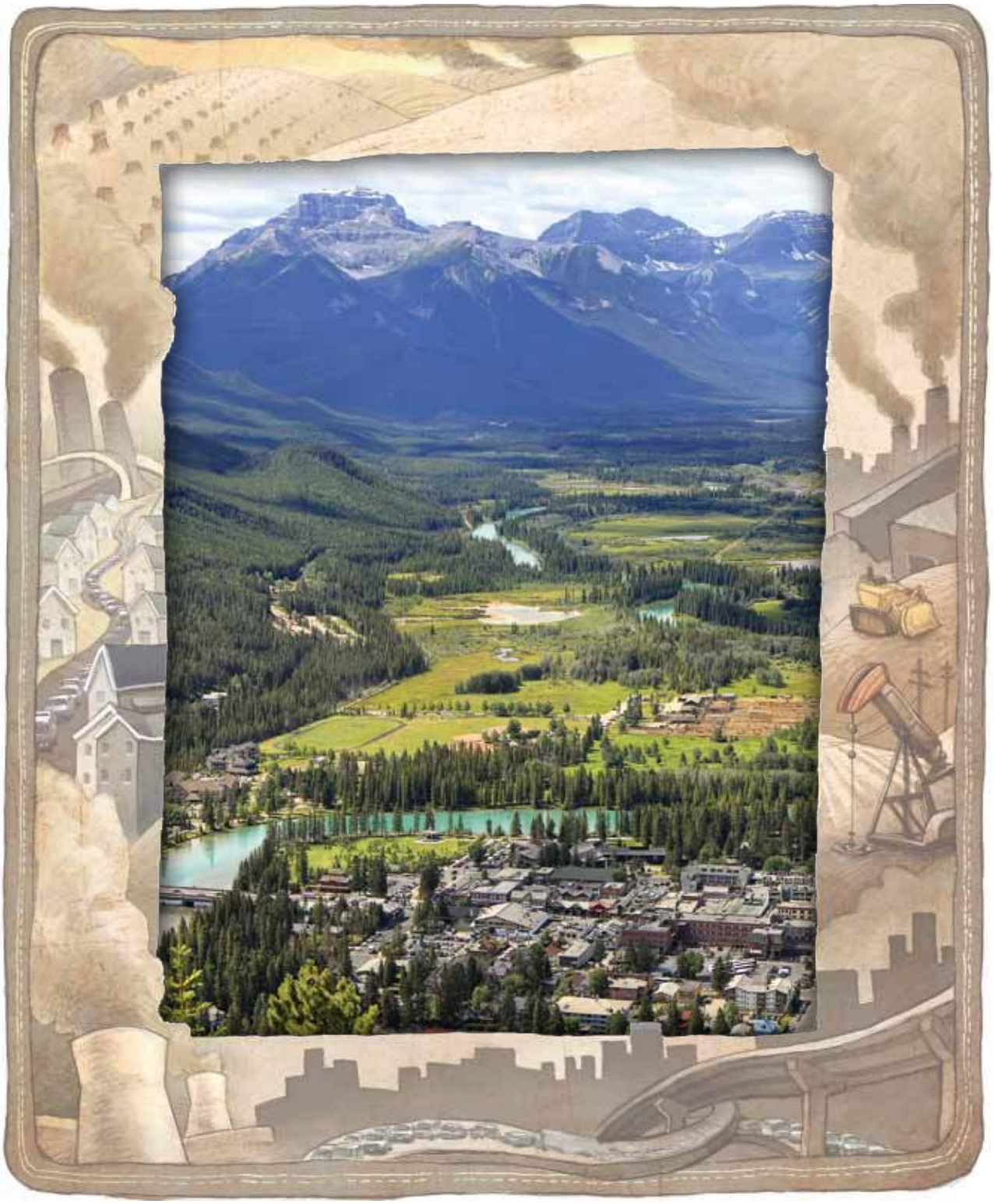
The Hoover Dam is very important for people who depend on it for water and electricity. But the dam also changed the landscape and ecology along the Colorado River forever. It changed the natural flow of the river and **endangered** several species of fish and plants. You can say the dam was good for people but not so good for the environment. Either way, it is here to stay and it is a good example of a way in which people can change the natural environment.



The Hoover Dam is the biggest dam in the United States.

The people in this little town live in a very beautiful place surrounded by a natural ecosystem. They have their houses and roads and they have cleared away some of the forest to make **pastures** for animals or farming. But most of the surrounding land still belongs to nature.

Not all environmental changes caused by humans are bad for the environment. It is certainly possible for people to survive and enjoy life while helping to protect the balance of nature. In the next three chapters, you will learn more about the damage people can do to ecosystems and, more importantly, the things we can do to protect them.



This town is surrounded by a natural ecosystem.

Chapter 7

Environmental Damage Caused by Humans

Most of the vehicles you see every day—from boats and trains to cars and planes—have one thing in common: they need gasoline in order to operate. A car's engine burns gasoline. The energy from burning gasoline makes the car move. Gasoline is made from oil, which is thick, black liquid that can be found deep underground in certain places on Earth.

Getting oil out of the ground is not easy. People get oil by drilling wells deep into the earth. The wells suck oil up from underground. Thousands of oil wells are used to **pump** oil out of the ground all over the world.

A lot of oil is located in the earth's crust deep beneath the ocean waters. This is a picture of an **oil rig**, or oil platform. It is **anchored** far out in the ocean. Dozens of workers live on the **oil rig** for months at a time. They use a special type of drill to get oil from hundreds or even thousands of feet beneath the ocean surface.

*An **oil rig***

Unfortunately, drilling for oil is not only difficult but also dangerous. This danger became reality on April 20, 2010, when a terrible accident happened on an **oil rig** called the *Deepwater Horizon*.

The *Deepwater Horizon* was owned by a company called BP. It was **anchored** in the Gulf of Mexico, about 40 miles off the coast of Louisiana. An important piece of equipment deep underwater broke, allowing oil and natural gases to escape from the earth. This caused a huge explosion on the **oil rig**. The *Deepwater Horizon* was destroyed by the explosion and fire that followed. Tragically, 11 men died in the explosion and 16 others were badly injured. But this was not the end of the story. The **disaster** that followed was a massive **oil spill**.

When the rig exploded, oil began flowing freely from inside the earth. Because it was so far underwater, nobody knew how to stop the oil from flowing. Within days, the waters near the damaged well were heavily **polluted** with thick, black oil. Oil continued to spill into the water for three months and the oil quickly spread.

The Deepwater Horizon *explosion*

The ocean ecosystem is fragile. Everything from microorganisms to plants and fish rely on clean water in order to survive. The oil threatened fish and all other life in the nearby waters. Within days, oil from the **oil spill** washed up all along the Gulf Coast of the United States. The oil washed up on beaches in Texas, Louisiana, Mississippi, Alabama, and Florida. At the same time, the oil threatened the lives of fish, birds, and other wildlife in or near the water.

The oil threatened wildlife.

The grassy, shallow wetlands along the Gulf Coast are home to a fragile ecosystem with a huge **variety** of wildlife. People were especially worried about the **effects** oil might have on this area.

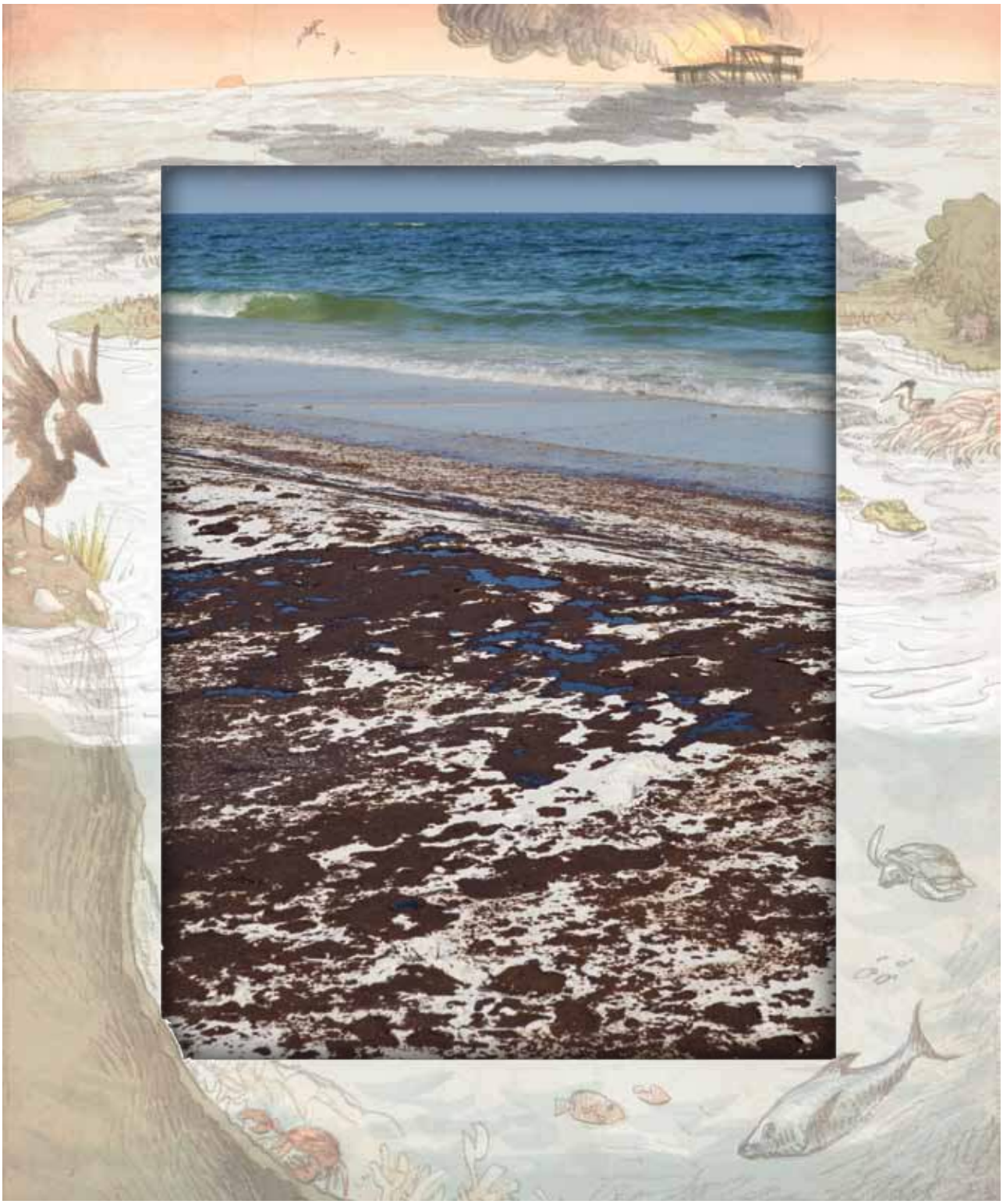
In the wetlands, you can find all sorts of shellfish, including oysters, crabs, and shrimp. You can find many birds, including herons, pelicans, and egrets, like the ones in this image. Reptiles such as alligators and snakes, as well as many mammals, also rely on the Gulf Coast wetlands for food and shelter. All of these animals can be harmed if they get covered in oil or if they eat other animals that are covered in oil.

Furthermore, the wetlands are very important for people. They are an important **source** of seafood, such as the shrimp you might order in a restaurant.

The wetlands are important for other reasons as well. The grass roots keep the sand and soil in place. If the grasses get covered in oil, they could die. Then, the sand and soil would wash away. As a result, the **coastline** could erode, harming nearby towns and cities.

Egrets

So, oil from the **oil spill** posed a threat to life at sea and on land, including people. This was a huge problem and everyone knew something had to be done to protect the wetlands and wildlife from the oil. In the next chapter, you will learn what people did to save the Gulf Coast from the **oil spill**. You will also learn about other things people can do to protect all kinds of ecosystems from human activities.



*The **oil spill** posed a threat to life at sea and on land.*

Chapter 8

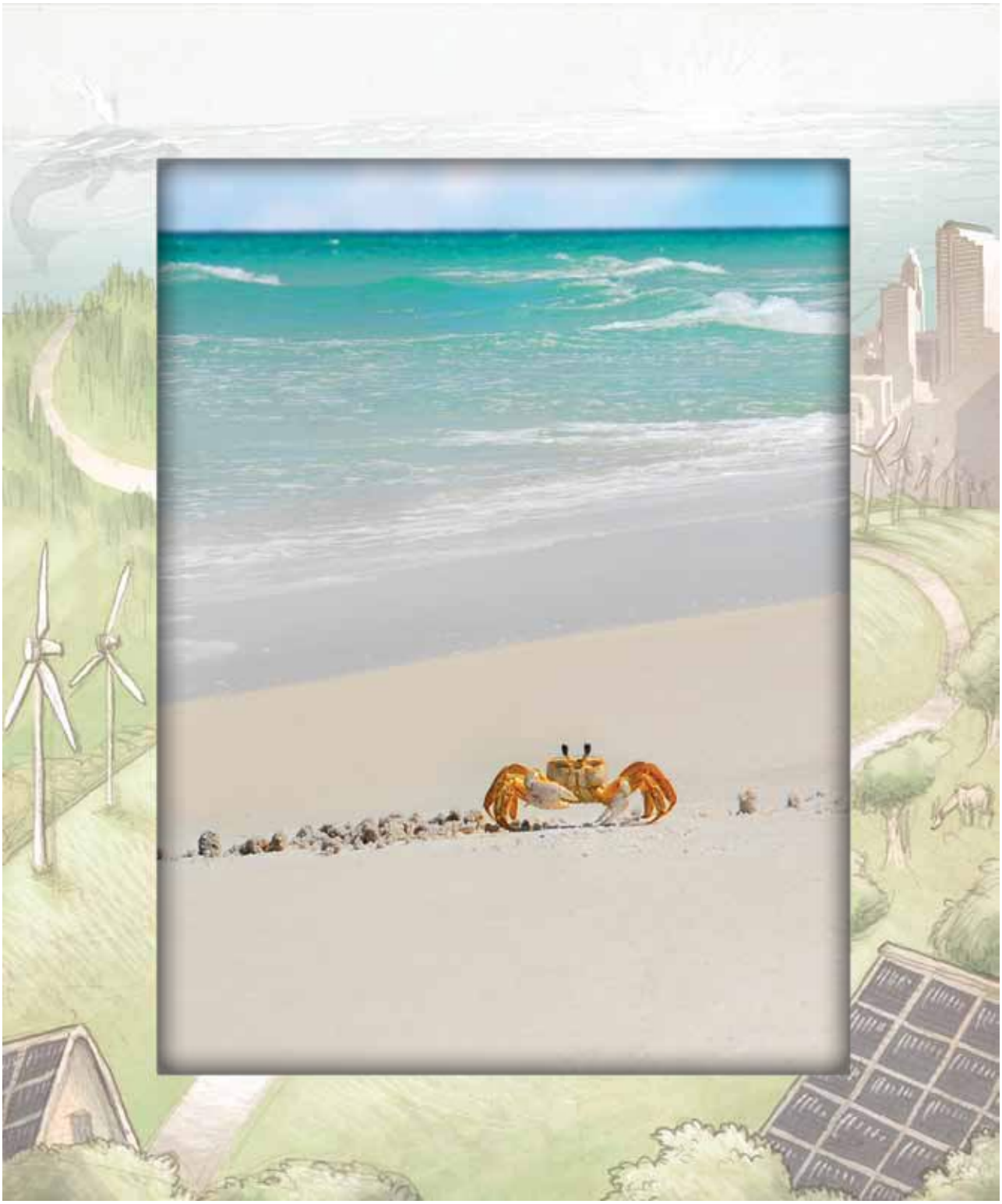
Protecting the Environment

After three months, engineers, scientists, and other experts from all over the United States and around the world finally managed to stop the oil spill from the *Deepwater Horizon* oil rig. They **sealed** off the well so the oil does not leak into the water anymore.

Through those difficult months, people worked hard to protect the waters and beaches around the Gulf of Mexico. One of the first things they did was to spread **oil booms** in the water. An **oil boom** is like a floating wall or barrier used to contain the spread of oil. **Oil booms** were spread all along the coast in an effort to keep oil away from the beaches and wetlands. Once the oil was trapped within the **oil booms**, special boats came along and cleaned the oil out of the water.

*An **oil boom***

Still, thousands of gallons of oil from the oil spill washed up on land. Workers spent months cleaning oil from the beaches. Luckily, thanks to lots of hard work and determination, people were able to prevent a total environmental disaster. We will never know exactly how many fish, shrimp, and other animals were killed by the oil spill, but we do know that it could have been worse. Most importantly, most of the wetlands were saved and those that were damaged will probably **recover**.



Workers spent months cleaning oil from the beaches.

There are many things you can do to help protect the environment. To make the things we use every day—like bottles, cans, and paper—we need to use **natural resources**. To make cans, people need to dig mines in the earth and remove metals like aluminum and iron. To make paper and cardboard, people cut down trees. Think about all the plastic you use: bottles, bags, toys, furniture, and so many other things. Plastic is made from oil, the same kind of oil that goes into your car's engine.

Cans, bottles, papers, and boxes can be **recycled** and turned into new cans, bottles, papers, and boxes. This means less metal needs to be mined, fewer trees need to be cut down, and less oil needs to be used to make plastics. This helps protect the environment!

Recycling is important, but unfortunately, it is not enough to protect the earth's ecosystems. Today, there are over 7 billion people on the planet. About half of all the land on Earth is used to grow food for all those people. Towns, cities, and roads cover a lot of the remaining land. That does not leave much room for forests, grasslands, and other natural ecosystems.

Recycling *is important.*

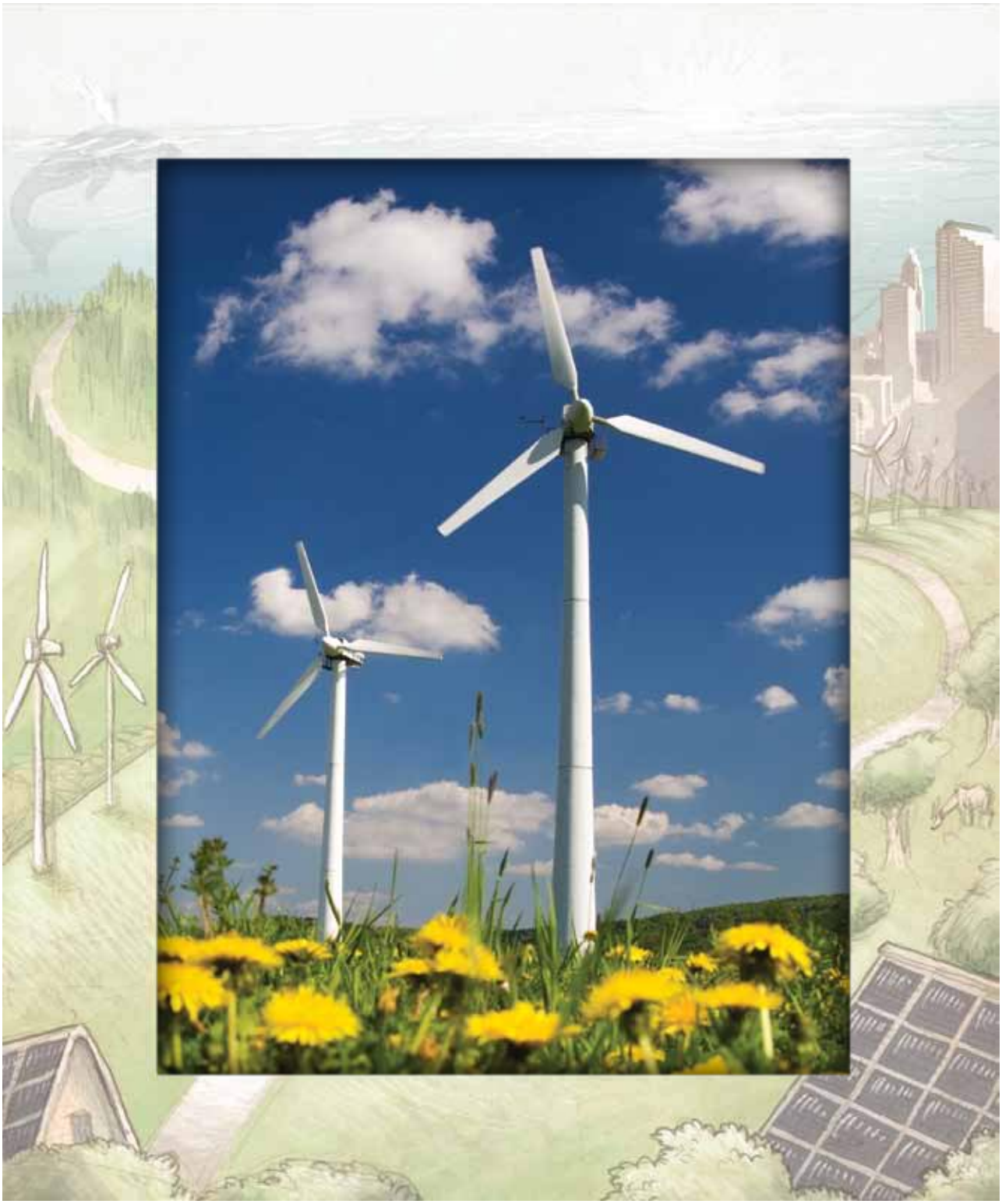
This is a tree farm. It is one example of the many ways in which people can protect nature while using its valuable resources. The tree farm has three sections. In one section, you can see where the loggers recently cut down all the trees. In another section, they left the trees standing. They will come back and cut those trees down in a few years. In the third section, they planted new trees. Some day, those trees will be big enough to cut down. By then, the loggers will have planted more trees. Using tree farms like this, people can keep using the same land to get the wood they need without having to find new forests to cut down.

This is a tree farm.

People are also working hard to find cleaner, safer ways to fuel our vehicles and provide electricity for our homes, schools, and businesses. Today, most fuel comes from oil and coal. As you learned, getting these fuels can lead to terrible accidents.

Fortunately, oil and coal aren't our only choices. We can also use the wind and sun to generate electricity. This picture shows a wind farm. The giant windmills are used to generate clean, safe electricity for people's homes. We will continue to use oil and coal for many years to come, but little by little we are finding safer, cleaner **alternatives**.

It is possible to protect the environment and get all the food and fuel we need in order to live happy, healthy lives. To do this, we need to understand what we can do to help maintain the balance of nature and avoid causing **unnecessary** damage.



This is a wind farm.

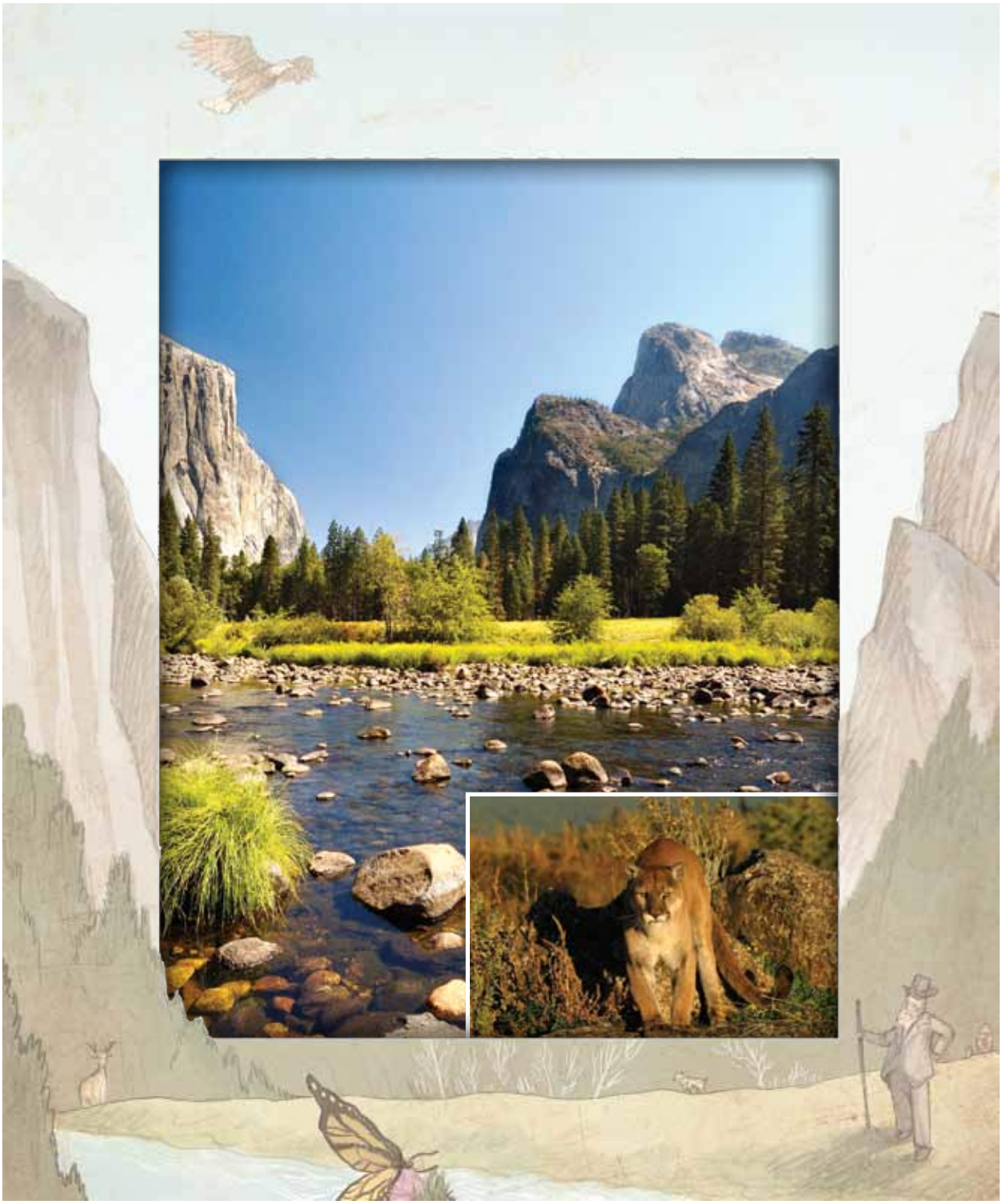
Chapter

9 John Muir

This is a picture of the grand Yosemite Valley. It is in Yosemite National Park, a huge national park in California. It is easy to see why people fall in love with Yosemite and consider it to be America's most beautiful national park. Yosemite is also home to a rich ecosystem.

Some day you might get a chance to visit Yosemite. If you are very lucky, you may see a mountain lion. This is America's big cat. It's not as big as an African lion but it is still at the top of the Yosemite food chain.

You are far more likely to see squirrels in Yosemite. There are oak trees and acorns in Yosemite, but there are also plenty of other seeds and grains to eat and bury.



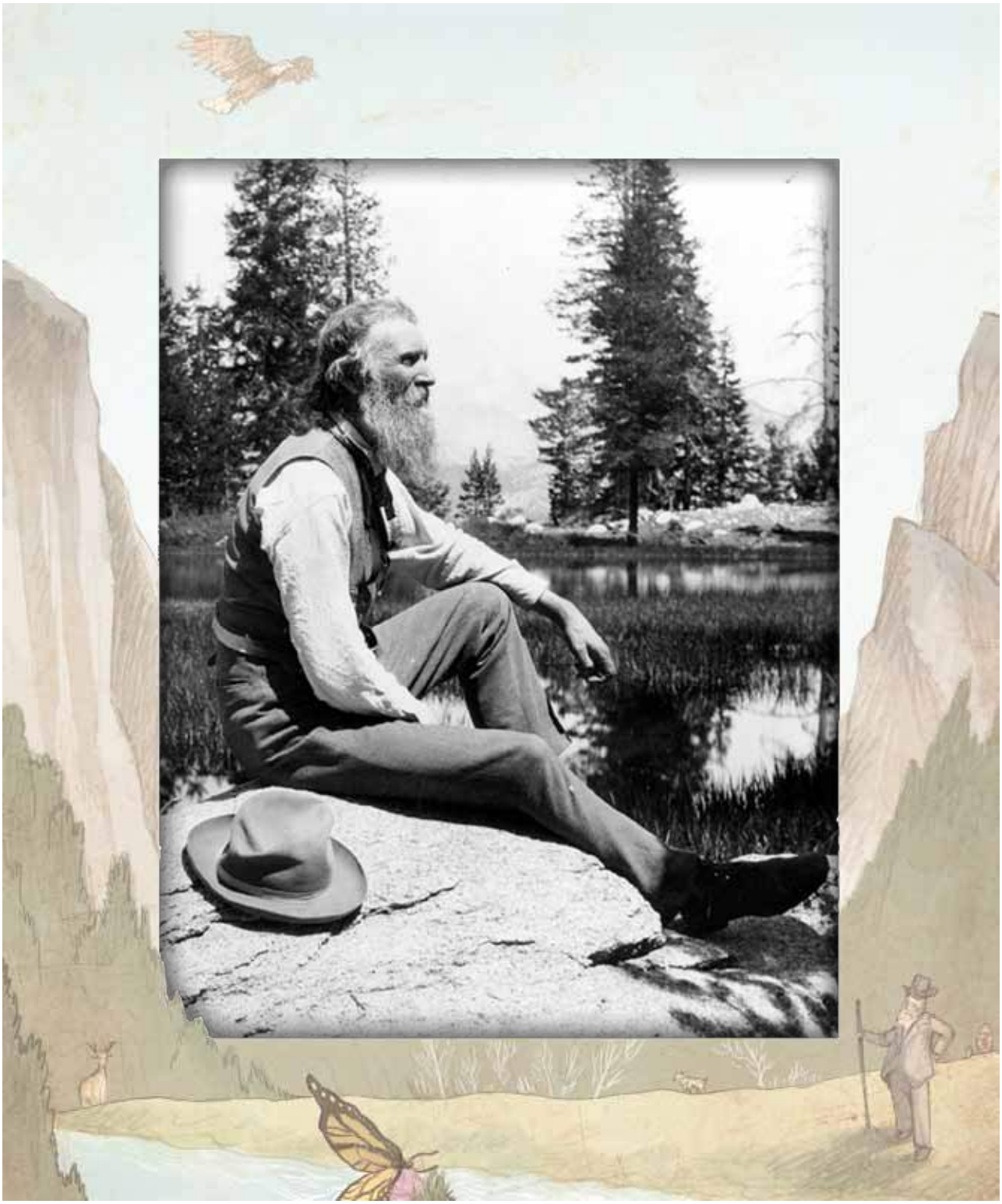
Yosemite National Park

John Muir was not the first American to discover the beauty of Yosemite. However, he was one of the first to declare that it was a natural **treasure**. More importantly, he worked to make sure Yosemite and other special lands were protected forever.

John Muir was born in Scotland. In 1849, when he was 10 years old, his family moved to the United States. They lived on a farm in Wisconsin. John Muir loved reading as much as he loved nature. He grew up reading books by famous American **naturalists**. These books were all about plants, animals, and the forces of nature. Muir read books by two of America's most famous **naturalists**: Henry David Thoreau and Ralph Waldo Emerson.

When he was about 30 years old, Muir walked over one thousand miles from Indiana to Florida. He took what he called the "wildest, leafiest" way he could find and he loved every minute of it! A few years later, he wandered out to California.

In California, Muir hiked in the Sierra Nevada Mountains. This incredible landscape inspired him to start the Sierra Club. Today, the Sierra Club is America's oldest and largest environmental organization. It has thousands of members.

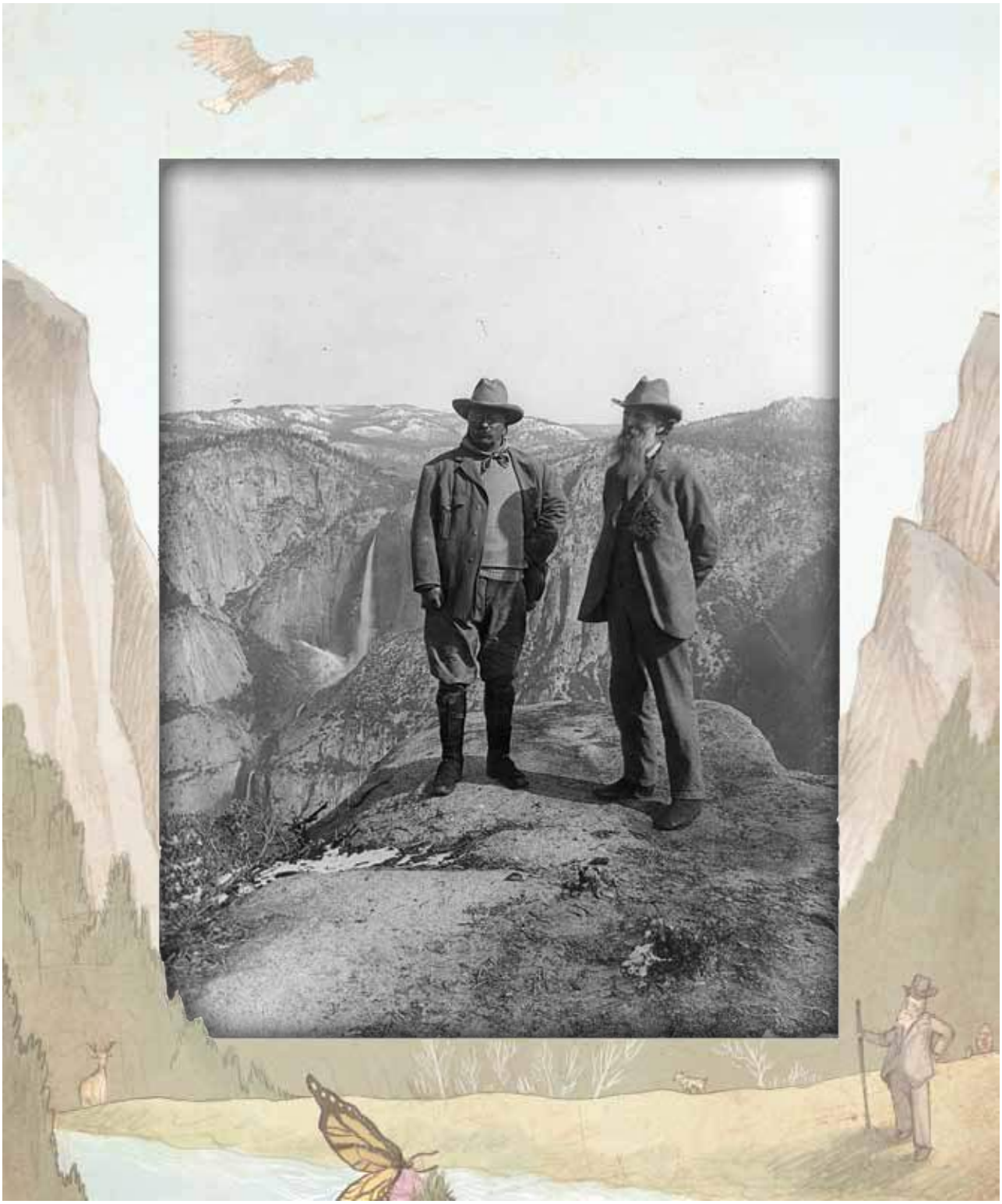


John Muir

Muir became a well-known writer. He wrote books and articles about America's natural **treasures**. A few years after Muir started the Sierra Club, a man named Teddy Roosevelt was elected President of the United States. In the image on the next page, Roosevelt and Muir are posing for a picture in Yosemite.

Teddy Roosevelt and John Muir had a lot in common. They both loved nature. They were both **conservationists**, which means they wanted to protect natural **treasures**. Teddy Roosevelt used the power of the presidency to protect over 200 million acres of American **wilderness**.

American **conservationists** like Muir and Roosevelt have saved millions of acres from being paved over by cities and roads. They have also saved many important animals from extinction.

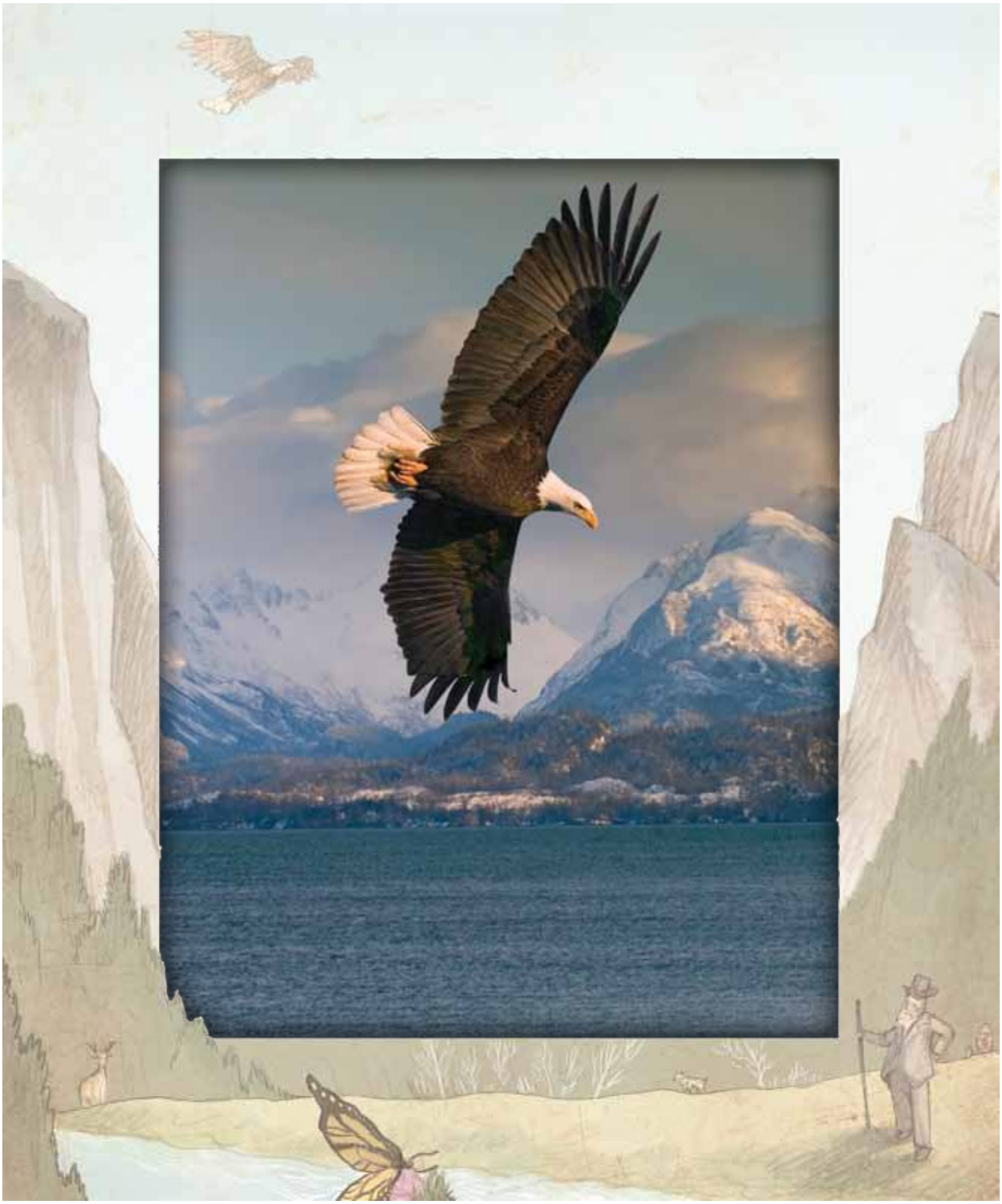


Teddy Roosevelt and John Muir

The bald eagle is the national bird of the United States. The eagle is a symbol of strength and freedom. There was a time not so long ago when the bald eagle was endangered, meaning that scientists were afraid it might become extinct, just like the dinosaurs.

Eagles became endangered for a number of reasons. People used to hunt eagles to make nice trophies for their living rooms. Pesticides and other chemical pollution harmed eagles as well. Lastly, eagles lost a lot of their habitat and nesting grounds due to farming and the growth of cities. About one hundred years ago, there were only a few eagles left.

Then, the U.S. Congress passed laws protecting bald eagles. It is illegal to hunt them. Farmers stopped using certain chemicals. Large areas of land, such as Yellowstone National Park and other parks, were reserved as habitats for eagles and other wildlife. All of this helped save the bald eagle population. Today, they are no longer in danger of becoming extinct, as long as people continue to be careful.



The bald eagle is no longer endangered.

The eagle's history teaches an important story about protecting ecosystems. People almost caused eagles to become extinct. But through hard work and dedication, people also managed to save eagles. Today, we have eagles because some people cared enough to convince other Americans that the eagles were worth saving.

There are many incredible ecosystems to visit in the United States. They are all there thanks to the work of **conservationists** and groups like the Sierra Club. Are you willing to work to help protect America's natural ecological **treasures**?

How can you help?

Glossary for *Introduction to Ecology*

A

abundant—plentiful

acacia—a small tree that has yellow or white flowers (**acacias**)

alternative—another choice (**alternatives**)

anchored—held firmly in place

apex—the top point

B

bacteria—microscopic living things that exist everywhere; Some can be helpful and some can be harmful.

balance—in nature, the maintenance of populations in the proper amounts and conditions

C

coastline—the place where the land and the ocean meet

common—occurring often

conservationist—a person who works to protect animals, plants, and other natural resources (**conservationists**)

consumer—a living thing that eats other living things (**consumers**)

countless—too many to count

D

decay—to rot (**decaying**)

decompose—to rot, decay, or be slowly destroyed and broken down by natural processes (**decomposes**, **decomposed**)

decomposer—a living thing that eats dead plant and animal matter (**decomposers**)

defense—a way to protect against harm (**defenses**)

depend on—to rely on or need (**depends on**)

disaster—a sudden event that causes much damage or loss

E

ecology—the study of relationships between living things and their environment

ecosystem—everything in a particular environment, both living and nonliving

effect—a change resulting from influence or power (**effects**)

endangered—in danger of dying out completely

environment—natural surroundings (**environments**)

erode—to wear away over time due to wind or water (**erosion**, **eroded**)

extinction—a condition in which a kind of plant or animal dies out completely

F

flood—a condition in which a body of water rises and overflows beyond its usual limits (**floods**)

food chain—a relationship of living things as food sources for other living things (**food chains**)

force—something powerful, especially in nature (**forces**)

fragile—weak, easily harmed

fungus—a plant-like organism that lives on dead or decaying things (**fungi**)

G

gazelle—an antelope, or deer-like creature, that runs very fast (**gazelles**)

generate—to make (**generates**)

H

herd—a large group of animals (**herds**)

hydroelectric—using the power of water to make electricity

J

jackrabbit—an animal that looks like a large rabbit with long ears and long hind legs (**jackrabbits**)

L

landscape—an area of land that can be seen in one look

M

microscopic—can only be seen with a microcope

mighty—large in size

mineral—a substance that occurs naturally in some food and contributes to good health (**minerals**)

N

natural resource—a useful or valuable thing found in nature (**natural resources**)

naturalist—a person who studies living things in nature (**naturalists**)

nutrient—a vitamin or mineral that helps living things stay healthy (**nutrients**)

O

oil boom—a floating barrier put in water to keep oil from spreading (**oil booms**)

oil rig—a platform built above the ocean to support drilling for oil underwater

oil spill—an event during which oil is released into nature, usually into water, causing pollution

organic—from or made by living things

organism—a living thing

P

pasture—a field in which animals eat grass (**pastures**)

petrified—slowly changed into stone over time

photosynthesis—the process by which plants make their own food using sunlight

pollen—a yellow substance made by plants that is carried to other plants of the same kind to make seeds

polluted—dirty and unsafe

predator—an animal that lives by hunting other animals (**predators**)

prehistoric—a time before history was written down

prey—animals that are hunted by other animals for food

primarily—mainly

producer—a living thing that makes its own food (**producers**)

protect—to keep safe from harm

pump—to move liquid using a special machine

R

recover—to improve after an accident or difficult time

recycle—to process old things so they can be used again to make new things (**recycled**, **recycling**)

rely on—to depend on or need

reserve—an area of land where plants and animals are given special protection

reservoir—a lake in which water is stored for use

resource—something that is useful or valuable

S

safari—a trip taken to see or hunt wild animals

safety—the state of being free from harm

sapling—a young tree (**saplings**)

seal—to close up (**sealed**)

skitter—to move quickly across something (**skittering**)

soil—dirt

source—where something comes from

species—a group into which animals or plants are divided by scientists

sprout—to begin to grow

survival—the ability to continue living

survive—to continue living

T

technology—the invention of useful things or solving problems using science and engineering

topsoil—the top layer of soil that includes nutrients plants need

treasure—a valuable, important, or special thing (**treasures**)

U

unnecessary—not needed

upset—to interfere with

V

variety—a collection of different types

vitamin—a substance found in food that is necessary for good health (**vitamins**)

W

wander—to move around without a particular direction or purpose

wildebeest—a large, African antelope, or deer-like creature, with long, curving horns (**wildebeests**)

wilderness—a wild and natural area where no people live

wildlife—animals living in nature

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Additional Consulting Services
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Dorrit Green
Carolyn Pinkerton

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Contributors to Earlier Versions of these Materials

Susan B. Albaugh, Kazuko Ashizawa, Nancy Braier, Kathryn M. Cummings, Michelle De Groot, Diana Espinal, Mary E. Forbes, Michael L. Ford, Ted Hirsch, Danielle Knecht, James K. Lee, Diane Henry Leipzig, Martha G. Mack, Liana Mahoney, Isabel McLean, Steve Morrison, Juliane K. Munson, Elizabeth B. Rasmussen, Laura Tortorelli, Rachael L. Shaw, Sivan B. Sherman, Miriam E. Vidaver, Catherine S. Whittington, Jeannette A. Williams

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Credits

Expert Reviewer
Deborah Lawrence

Writers
Michael L. Ford

Illustrators and Image Sources
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Introduction to Ecology

Unit 11 Reader

Skills Strand

GRADE 3

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