



SCIENCE • GRADE 4

California Content Standards
Life Sciences: 3.A
Life Sciences: 3.B
Life Sciences: 3.C
Life Sciences: 3.D

Above Level

Interdependence in Ecosystems

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•
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Student Book

•
Reproducible
English-language
Arts Activities

Interdependence in Ecosystems

California's Content Standards Met

GRADE 4 SCIENCE

LIFE SCIENCES: 3—Living organisms depend on one another and on their environment for survival. As a basis for understanding this concept:

- a. Students know ecosystems can be characterized by their living and nonliving components.
- b. Students know that in any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.
- c. Students know many plants depend on animals for pollination and seed dispersal, and animals depend on plants for food and shelter.
- d. Students know that most microorganisms do not cause disease and that many are beneficial.

GRADE 4 ENGLISH LANGUAGE ARTS

1.0 WORD ANALYSIS, FLUENCY, AND SYSTEMATIC VOCABULARY DEVELOPMENT

Vocabulary and Concept Development 1.2—Apply knowledge of word origins, derivations, synonyms, antonyms, and idioms to determine the meaning of words and phrases.

2.0 READING COMPREHENSION

Structural Features of Informational Materials 2.1—Identify structural patterns found in informational text (e.g., compare and contrast, cause and effect, sequential or chronological order, proposition and support) to strengthen comprehension.

Comprehension and Analysis of Grade-Level-Appropriate Text 2.2—Use appropriate strategies when reading for different purposes (e.g., full comprehension, location of information, personal enjoyment).

Comprehension and Analysis of Grade-Level-Appropriate Text 2.3—Make and confirm predictions about text by using prior knowledge and ideas presented in the text itself, including illustrations, titles, topic sentences, important words, and foreshadowing clues.



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Student Book

Interdependence in Ecosystems

Print pages 5 – 18 of this PDF for the student book.

How to Make the Student Book

- The student book is contained on pages 5–18 of this PDF. It begins on the next page.
- To make one student book, or a two-sided master copy that can be photocopied, you will print on both sides of seven sheets of 8.5" x 11" paper.
- Do a test printout of one book first to familiarize yourself with the procedure.
- Follow these instructions carefully.

First—Select the Paper

Since you will be printing on both sides of the sheets of paper, select a good quality white paper. We recommend using at least a 22 lb sheet.

Second—Check Printer Settings

Be sure you have the correct page setup settings for your computer and printer. You will print these pages in landscape format.

Third—Print EVEN Pages

Open the PDF of the book you want to print. Select print from your file menu. In your printer's dialogue box enter pages 5–18 to print. Then select EVEN pages only. It is important to print only the EVEN pages first. Click "Print" to print the even pages. (**Important note:** The first page that prints will be blank. DO NOT discard this page. It will be needed to print the cover in the next step.)

Fourth—Print ODD Pages

When the even pages have printed, flip the stack of pages over to print the odd pages. Place the stack back in your printer. Select print from the file menu again. In your printer's dialogue box, select pages 5–18 to print. Then select ODD pages. Click "Print" to print the odd pages.

Fifth—Fold the Book

You now have a complete book. Check to be sure the pages are in the correct order with the book's cover as the top page. Then fold the stack of paper in half.

Sixth—Staple the Book

Use an extended-length stapler to staple the pages together. Place two staples in the spine of the book.

Please Note

Printers vary in how they output pages. Do a test printing of one book and adjust the procedure as necessary.

If you want to make a one-sided master copy, print ALL pages 5–18 at once. Then select "one-sided to two-sided" on the copy machine.

AL

Interdependence in Ecosystems California's Content Standards Met

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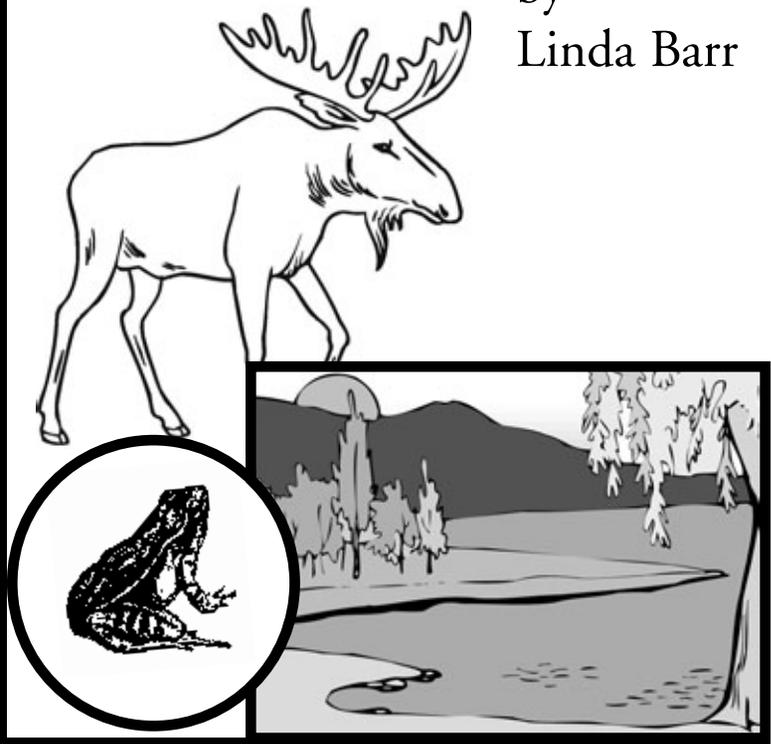


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Interdependence in Ecosystems

by
Linda Barr





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INTRODUCTION

Parts of an Ecosystem

An ecosystem is all the living and nonliving things in one area. The living things around you are people, other animals, plants and many other kinds of living things. The nonliving things include such things as water, sunlight, soil, and air. Together, these living and nonliving things make up your ecosystem.

The nonliving parts of an ecosystem affect which things can live there. For example, a tropical rain forest has lots of water and sunlight. It's also warm. Many kinds of living things thrive there.

Other kinds of forests, such as evergreen forests, are drier and cooler. They are home to trees, deer, birds, and other living things. Yet far fewer kinds of plants and animals live in these forests than in the tropical rain forest. In fact, the winters in evergreen forests are very cold and snowy. Few animals can survive them.

ecosystem: a large community of living things and their environment; can include many different habitats

The nonliving parts of a desert also limit the living things there. Few plants and animals can live with high heat and little water. Grasslands, or prairies, are cooler and drier than deserts. Still, they do not get enough rain for trees to grow. That's why they are called grasslands.

Coral reefs are underwater. Only fish, animals that make coral, and certain other living things can survive here. The coral reefs are produced by small marine animals called polyps. The reefs provide shelter for a type of algae that needs sunlight to make food. Some of the food helps the polyps live and grow. So, one requirement of a coral reef ecosystem is plenty of sunlight.

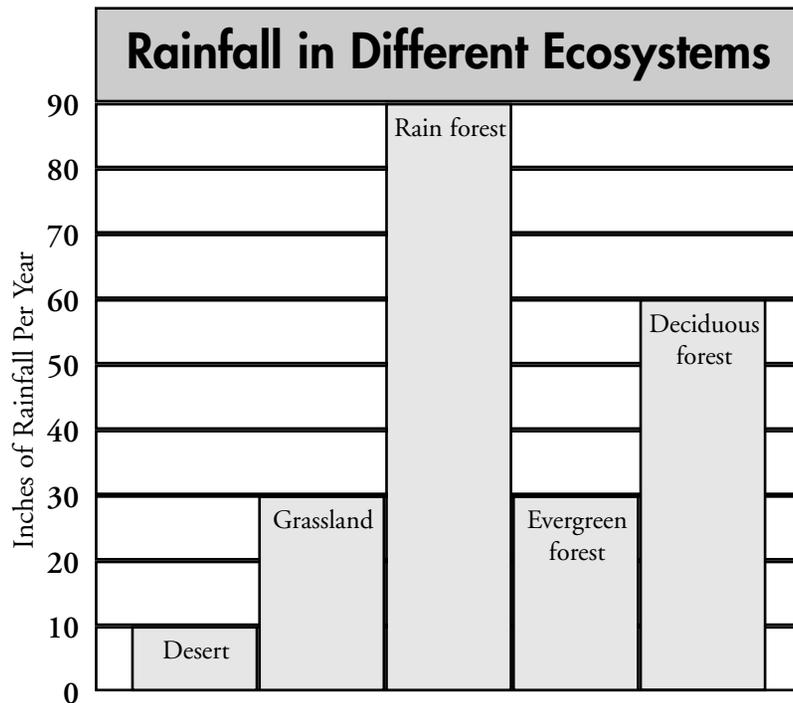
Many living things can live only in certain ecosystems. Elephants would not survive in an evergreen forest. Palm trees could not grow in a coral reef. Yet some living things, such as cockroaches, can live in many **habitats**. Over time, they **adapt** to those habitats.

What parts of your ecosystem are different from a rain forest? What parts are different from a desert?

habitat: the place where a living thing can meet all of its needs
adapt: to change as conditions change

Adaptation

This graph shows the average rainfall in several ecosystems. Which ecosystem receives the most rain? Which receives the least?



How does the amount of rainfall affect the living things in each ecosystem?

Body Parts

Over many generations, animals adapt to the ecosystem where they live. Some birds in the Arctic have developed thick feathers. Walruses and seals have a thick layer of fat along with thick fur to keep them warm. Adaptation for thick fur occurs when one arctic fox, for example, is born with thicker fur. The added warmth allows it to hunt longer in the cold and get more food. With more food it becomes stronger and can live longer and produce more pups which will also have thicker fur.

Animals in the desert have adapted to that ecosystem. They are able to survive with very little water. The scales covering snakes and lizards help keep the water in their bodies.

Other body parts help animals survive, too. Flippers help whales and sea lions dive deep. Webbed feet help frogs and ducks swim fast. A jaguar's muscular legs and sharp claws and teeth allow it to run fast and capture its prey.

Behaviors

When winter comes, some animals must change their behavior. The plants or animals they eat will soon be hard to find. They cannot keep warm enough to survive icy weather, so they **migrate** to a warmer place.

Many birds head south for the winter. Whales migrate to have their babies in warm places. In spring, the birds and whales head back north.

Some animals survive winter by **hibernating**. First, they store fat in their bodies by eating a lot. Next, they find a hole in a tree or the ground and go into a deep sleep. Their heart rates slow way down, their bodies get cooler, and they breathe less often. Their bodies use energy from the stored fat. Hibernators include mice, chipmunks, ground squirrels, and bats.

migrate: to travel from one place to another and back again
hibernate: to go into a very deep sleep-like state for a long while

CHAPTER 2

Interdependence

Interdependence means that things depend on each other. You know that animals depend on plants. Some animals eat plants. Some animals eat other animals that ate plants. All animals depend on plants for food. If plant-eaters cannot find enough plants to eat, they will die. Then the meat-eaters will go hungry, too. Plants also provide shelter for many animals.

Did you know that plants also depend on animals? To produce seeds, flowers must receive **pollen** from other flowers. To make sure they get this pollen, many flowers produce **nectar**. As bees, birds, and bats try to get the nectar, they pick up pollen on their bodies. When they land on the next flower, some of the pollen rubs off. That flower can now produce seeds.

pollen: the male sex cell for plants
nectar: a sweet liquid found in many by flowers

Changes in Ecosystems

Changes in Living Things

The living parts of an ecosystem can change. The number or types of plants and animals may increase or decrease. Because of interdependence, a change in one living thing affects the other living things in that ecosystem.

For example, a herd of deer may become so large that it strips a forest of its plants. Then the deer and other plant-eaters there may starve and die. Next, the wolves and other meat-eaters will have trouble finding food.

What if the hawks in a forest leave or die? Then the number of mice, squirrels, and rabbits there will rise. All of these small animals will eat more of the forest's grass and plants. Fewer plants will affect the other plant-eaters in that ecosystem. Thus, an increase in deer or a decrease in hawks can upset an ecosystem.

How do you depend on plants?

How might the living parts of your ecosystem change?

The number of plants in an ecosystem can increase, too. The wind may bring seeds from **non-native** plants such as kudzu. Kudzu can grow so quickly that it crowds out other plants. Its vines can cover trees. The vines keep the plants and trees from getting the sunlight they need.

These new plants also absorb nutrients from the soil. That affects the growth of other plants. As these native plants struggle to grow, the animals that eat them suffer, too. While kudzu may provide food for a few animals, it destroys the plants that feed and shelter many other animals.

Because of interdependence, a change in plants can also upset an ecosystem.



non-native: organisms that normally live somewhere else

Changes in Nonliving Parts

The nonliving parts of an ecosystem can also change. Those changes directly affect the living things there. For example, a habitat may become drier or wetter. Too little rain for months or years can kill many plants. That means less food for plant-eaters. In time, fewer plant-eaters mean fewer meat-eaters.

Too much rain can cause floods. That can drown both plants and animals. Flooding can destroy the food supply and shelter for the animals that survive.

An ecosystem can also become warmer or cooler. If the average temperature drops, plants that need warmth might not survive. If temperatures go up, other plants may struggle to grow. Animals that eat only certain plants might lose their food supply. Then they, too, will struggle to survive.

Adapting to Changes

Slow Changes

An ecosystem may change slowly. Then some plants and animals will have time to adapt.

Let's say that every year an ecosystem receives a little less rain. Young plants or animals that can cope with less water will survive. Some of the plants might send their roots deeper. Some of the animals might be born with a thicker skin that stops water from leaving their bodies.

These survivors will produce young or seeds. Many of these new plants and animals will be able to survive with less water.

The young plants or animals that cannot cope with a drier **climate** will die. Most will not live long enough to produce young. In time, only plants and animals that can cope with less water will live here.

*How might the nonliving parts
of your ecosystem change?*

climate: the average weather conditions of a place over a period of years

Fast Changes

Yet change often happens quickly. In a month or two, a drought may kill most of the plants in an ecosystem. These plants and the animals that eat them will not have enough time to adapt.

Instead, some animals may move to a nearby habitat. Yet this habitat might already have enough plant-eaters or meat-eaters. Adding more animals will upset that ecosystem. Fewer animals in this habitat will be able to meet their needs and survive.

When changes happen fast, many plants may die. Yet animals, wind, and water may pick up some of their seeds and carry them. Then these plants may start growing in a new ecosystem. They might help feed the animals there. They might also crowd out the plants that already grow there.

Human Changes

Fast changes can be the result of human actions, such as **pollution**. Chemicals sometimes wash into rivers and lakes. A few kinds of plants and animals may survive. Yet some chemicals may make it harder for animals to get oxygen from the water. Other chemicals might interfere with the life cycles of frogs and other animals.

Burning gasoline and coal releases harmful gases into the air. These gases can rise and form clouds of **acid rain**. This rain may harm or kill trees or plants.

Cutting down a forest destroys habitats. Again, some animals may move to a nearby forest. Yet many living things cannot move. The forest no longer provides the food or shelter they need. They may die before they can adapt.

What other human actions can quickly change the conditions in an ecosystem?

pollution: harmful substances that enter the environment
acid rain: rain, snow, or sleet that has been made acidic by pollution in the air

Sometimes one plant or animal makes changes to survive. For example, during a drought, a bear might eat a kind of fruit that it usually ignores. When the rains come, though, the bear will return to its usual diet. This change is called **accommodation**.

Some plants and animals require certain conditions. They are the most likely to die when their ecosystem changes. For example, one kind of moth eats only the nectar of a certain flower. What if drought, disease, or human developers kill those flowers? Then the moth is helpless. It cannot adapt and will die.

In the same way, giant pandas eat mostly bamboo. Bamboo forests are disappearing. So are the pandas.

When an ecosystem changes, some plants and animals survive. Others cannot.

accommodation: a temporary change for survival

Other Types of Organisms

Monerans, fungi, and protists are three large groups of living things that are very different from plants and animals. Some are microorganisms so tiny that you cannot see them without a microscope.

However, they greatly affect ecosystems.

Monerans

Almost all monerans are one-celled microorganisms called **bacteria**. There are probably more bacteria on Earth than any other living thing. Some bacteria can cause illness. For example, bacteria called Salmonella are often found on eggs that have not been washed properly. They can make you really sick. Yet cooking kills these bacteria. Staph bacteria cause pimples on your skin.

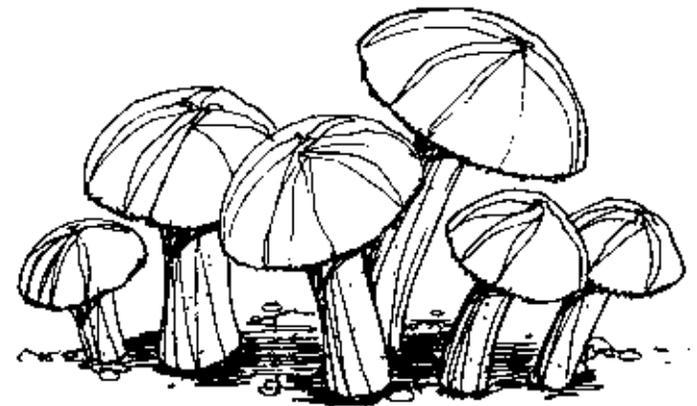
Yet other bacteria, such as a type of E.coli, live in your digestive system. They help your body break down food so you can use nutrients in it. Some kinds of bacteria help plant roots absorb nutrients from the soil. Other kinds of bacteria turn milk into yogurt. Bacteria can be helpful!

bacteria: a group of one-celled microorganisms; can be shaped like a sphere, a rod, or a spiral

Fungi

Fungi are another group of organisms. (The singular form is *fungus*.) Fungi include mushrooms, yeast, and molds. Like animals, fungi get their energy by eating plants and animals. However, fungi often eat dead, decaying things. You have probably seen spots of mold on bread or fruit.

Fungi help us by speeding up the decay process. They get rid of dead plants and animals, breaking them down and returning their nutrients to the soil. Some fungi live alongside tree roots and help them absorb nutrients and water. Bakers use the fungi yeast to make bread. Many people enjoy eating mushrooms and other fungi.



fungi: a group of microorganisms that get their energy by breaking down dead plants and animals

However, harmful forms of fungi can ruin crops. They can spoil food we intended to eat. Fungi cause disease, too. One is itchy athlete's foot. Another is ringworm, which is not caused by a worm. Some kinds of fungi can also cure diseases. The discovery of penicillin in fruit mold has saved millions of lives.

Protista

A third group of organisms is called protista. Some tiny protists are like animals. They get their energy by eating other living things. A large group of protists is especially important because they are like plants. They can turn sunlight into energy.

Billions of protists float on the ocean. Like plants, they take carbon dioxide from the air and produce oxygen. In fact, they produce most of the oxygen we breathe.

Should we find ways to kill all fungi? Why or why not?

protista: a major group of organisms; some are plantlike and some behave like animals

Algae are protists that can make their own food. You probably have seen green algae floating in ponds.

Protists also serve as food for tiny organisms. These organisms are then eaten by small fish. Small fish are eaten by bigger fish, and so on. Protists are the first link in every ocean food chain. With the discovery of the rich ocean life at the bottom of the deep ocean, came the discovery that some sulfur-based microorganisms are the first link in that ecosystems food chain. Without them, we would have fewer fish to eat. More importantly, we would have less oxygen to breathe.

Linked Together

You have read how people and other animals depend on plants, including tiny protist in the ocean. Many plants, in turn, depend on the actions of animals. The number and kinds of plants and animals in an ecosystem can increase or decrease. Each change affects the other living things there. We are all truly linked together!

Write a paragraph that summarizes what you learned in this book.

Glossary

accommodation—a temporary change for survival

acid rain—rain, snow, or sleet that has been made acidic by pollution in the air

adapt—to change as conditions change

bacteria—a group of one-celled microorganisms; can be shaped like a sphere, a rod, or a spiral

climate—the average weather conditions of a place over a period of years

ecosystem—a large community of living things and their environment; can include many different habitats

fungi—a group of microorganisms that get their energy by breaking down dead plants and animals

habitat—the place where a living thing can meet all of its needs

hibernate—to go into a very deep sleep-like state for a long while

migrate—to travel from one place to another and back again

nectar—a sweet liquid found in many flowers

pollen—the male sex cell for plants

non-native—organisms that normally live somewhere else

pollution—harmful substances that enter the environment

protista—a major group of organisms; some are plantlike and some behave like animals

To Find Out More . . .

Want to learn more about interdependence in ecosystems?

Try these books

Animal Adaptations by Elizabeth Rose. PowerKids Press, 2006.

Changing Climate by Sally Morgan. Franklin Watts, 2005.

Climate Change by Shelley Tanaka. Groundwork Books, 2006.

How Do Animals Adapt? by Bobbie Kalman. Crabtree, 2000.

What Do Animals Do in Winter? by Melvin and Gilda Berger. Ideals, 1995.

What Is Migration? by John Crossingham and Bobbie Kalman. Crabtree, 1997.

Access these Web sites

Go to this site to learn more about different kinds of habitats.

www.nationalgeographic.com/geographyaction/habitats/

Find out more about how animals adapt at the Online Learning Haven.

www.learninghaven.com/science/articles/animals_and_adaptation.htm

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Comprehension and Analysis of Grade-Level-Appropriate Text: 2.3

Above Level

English-language Arts Activities

Interdependence in Ecosystems

Print pages 20–24 of this PDF for the reading activities.

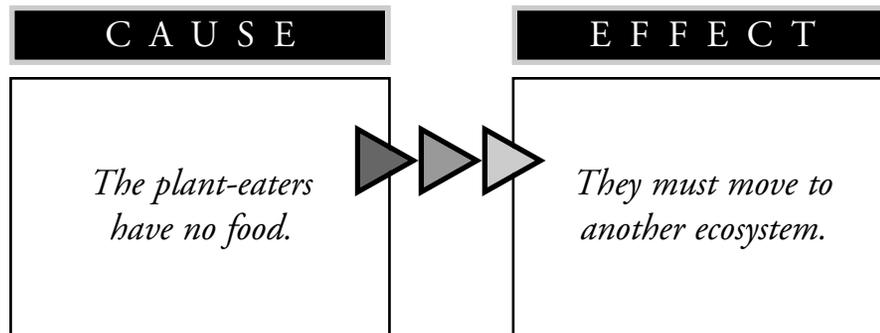
Cause and Effect

TRY THE SKILL

You will better understand what you read if you figure out what causes what. To identify a cause, you ask, “Why did that happen?” To identify an effect or result, you ask, “What happened?” Read the following paragraph:

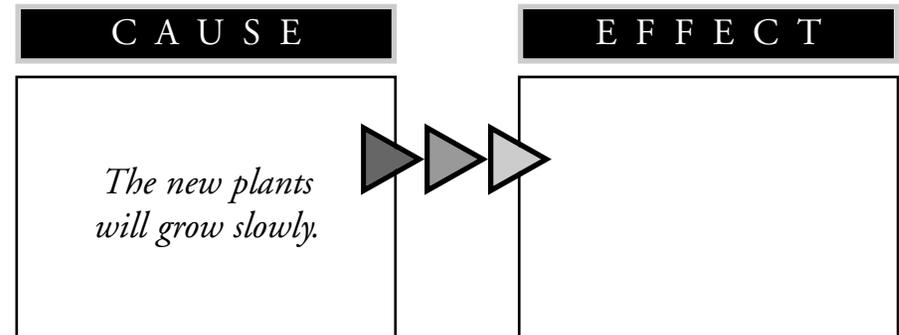
After wind, water, or fire destroys trees and plants, some animals that ate those plants will survive. Yet they need to eat and cannot wait for new plants to grow, so many of them will move to another ecosystem. There, they must compete for food, water, shelter, and space with the plant-eaters that already live there.

This graphic explains one cause-and-effect relationship in this passage.

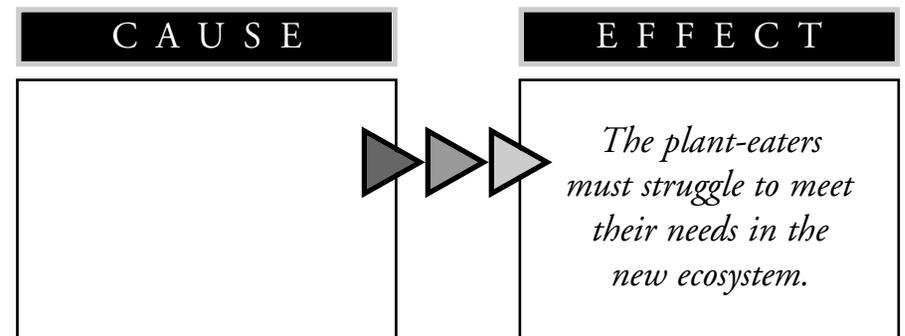


Read the paragraph again. Then complete each graphic.

1. Tell how the cause affected the plant-eaters.



2. Tell why the plant-eaters will have problems in their new ecosystem.



Synonyms and Antonyms

TRY THE SKILL

Words and phrases that mean the same, such as *old* and *ancient*, are synonyms. Words and phrases that mean the opposite, such as *old* and *young*, are antonyms.

Knowing the synonyms and antonyms of the words you read can help you understand them. Knowing synonyms and antonyms can also help you write reports and stories. Here are more examples:

<u>Word</u>	<u>Synonym</u>	<u>Antonym</u>
exchange	trade	keep
unite	join	separate
surrender	give up	fight
allow	permit	deny
repair	fix	destroy
remote	distant	close
novice	beginner	expert
frequently	often	rarely
melt	thaw	freeze
vacant	empty	occupied

Read the sentence and the clue in parentheses. Then write the correct word from the box on the line. You will write some of the words twice.

vanish compete clog
produce adapt

1. The plants spread enough to _____ the stream. (a synonym for *block*)
2. Flowers need pollen in order to _____ seeds. (an antonym for *destroy*)
3. The morning sun caused the fog to _____. (an antonym for *appear*)
4. A beaver dam can _____ a number of changes in a habitat. (a synonym for *create*)
5. Plants that cannot _____ may die. (a synonym for *adjust*)
6. Two hawks often _____ for the same nesting space. (an antonym for *cooperate*)

Make Predictions

TRY THE SKILL

If you understand what you read, you should be able to predict what will happen in a certain situation. For example, let's say that a large herd of deer has moved into a forest. How will the rabbits there be affected? Here are four possible predictions:

1. The rabbits in the forest will have more to eat, so they will thrive.
2. The rabbits will have less to eat, so some may starve or move to another ecosystem.
3. The hawks in the forest will eat deer now instead of rabbits.
4. Deer do not eat rabbits, so the rabbits will not be affected.

Think about what you know and what you have learned from this book.

You know that deer and rabbits both eat plants. That means they will compete for the same food. Choice 1 is incorrect because the rabbits will not have more to eat. Choice 2 seems correct because the rabbits will be competing with the deer for food. Choice 3 is incorrect because hawks are too small to eat deer. Choice 4 is wrong because even though deer do not eat rabbits, they do eat the same food as rabbits. Choice 2 is the correct prediction.

Shade in the circle that makes or supports your prediction.

1. A road is built through a forest. Fences along the sides of the road keep animals from crossing it and getting hit by cars. What is the most likely way that the animals in the forest will be affected?
 - Ⓐ The road will make it easier for them to get from one part of the forest to another.
 - Ⓑ Small animals will be safe from the predators on the other side of the road.
 - Ⓒ People driving along the road will stop and feed the animals.
 - Ⓓ The road will force many animals to find a new source of food or shelter.
2. Let's say that the temperatures worldwide rise two degrees over the next twenty years. How do you know that both plants and animals would be affected?
 - Ⓐ Plants and animals can adjust to changes if they happen slowly.
 - Ⓑ Plants are more affected by changing temperatures than animals.
 - Ⓒ That increase is more than has taken place over the last one hundred years.
 - Ⓓ Plants and animals would both grow better in warmer temperatures.

Locate Information Online

TRY THE SKILL

Search engines can help you find information on the Internet. However, look at how many results each of these keywords produced:

- ecosystem (14,500,000)
- interdependence (4,040,000)
- interdependence ecosystems (313,000)

Did you notice what happened as the keywords got more specific? The number of hits got smaller. Using specific keywords—and pairing keywords—will narrow your search. Yet even if you narrow your search to 300,000 sites, you must choose carefully among them. Here are some tips:

1. Avoid personal Web sites.

No one makes sure the information on the Web is accurate. Many personal Web sites include someone's name or members, users, or people. Some sites are sponsored by elementary school classes. Their address often includes the code k12 and the state abbreviation. The information on these sites might be excellent—or not.

2. Seek out sites sponsored by government agencies.

Look for web sites with (.gov), colleges and universities (.edu), or other reliable organizations.

You are writing a report about interdependence in ecosystems. Answer these questions.

1. Which keyword or phrase is most likely to produce helpful Web sites?

(A) adaptation	(C) protist
(B) nonliving	(D) bacteria
2. Which site is most likely to have helpful information?

(A) Grand Oak School Neighborhood ecosystems surround us... <i>www.grandoakschool.com</i>
(B) Activity: Interdependence Creating a system of interdependence....food chain, food web, web of life.... <i>www.nps.gov/</i>
(C) The Official Homesite of Harold King To protect all of Earth's creatures, we must form an interdependent ecosystem... <i>www.haroldking.org</i>
(D) You are part of an ecosystem! When you look at an ecosystem, say one like this meadow... <i>www.youtube.com</i>

Answer Key

Cause and Effect

Effect: The plant-eaters cannot wait and must move to another ecosystem.

Cause: The new ecosystem already has many plant-eaters.

Synonyms and Antonyms

1. clog
2. produce
3. vanish
4. produce
5. adapt
6. compete

Make Predictions

1. D
2. C

Locate Information Online

1. A
2. B