SCIENCE • GRADE 4

California Content Standards
Life Sciences: 2.A
Life Sciences: 2.B
Life Sciences: 2.C

Below Level

Energy in Ecosystems

LOOK INSIDE FOR:

- California's Academic Content Standards Covered
- Reproducible Student Book
- Reproducible English-language Arts Activities

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Energy in Ecosystems
California's Content Standards Met

GRADE 4 SCIENCE

LIFE SCIENCES: 2—All organisms need energy and matter to live and grow. As a basis for understanding this concept:

a. Students know plants are the primary source of matter and energy entering most food chains.

b. Students know producers and consumers (herbivores, carnivores, omnivores, and decomposers) are related in food chains and food webs and may compete with each other for resources in an ecosystem.

c. Students know decomposers, including many fungi, insects, and micro-organisms, recycle matter from dead plants and animals.

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.

SCIENCE • GRADE 4

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Student Book

Energy 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 22lb 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.)

Forth–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 ODD pages. Click "Print" to print the odd the 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 three staples in the spine of the book.

Please note that printers vary in how they output pages. Do a test printing with 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.

BL

Energy in Ecosystems

California's Content Standards Met

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GRADE 4 ENGLISH LANGUAGE ARTS

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FOCUS ON CALIFORNIA STANDARDS

SCIENCE • GRADE 4

California Content Standards
Life Sciences: 2.A
Life Sciences: 2.B
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Energy in Ecosystems

by Linda Barr

SCIENCE • GRADE 4

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Energy in Ecosystems

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Linda Barr

FOCUScurriculum

Curriculum materials for **your** content standards

Table of Contents

What do you think you will learn from this book?

INTRODUCTION

Energy on the Move

Are you full of energy today? Or do you feel hungry and need more "fuel?"

Living things need energy to **survive**. In this book, you'll learn about the energy that living things need to survive. You'll learn that this energy starts with the sun.

Sunlight is needed for plants to make their own energy. Next, that energy moves from plants to animals. Then, the energy may flow to more animals, including you. This is called a food chain.

Did you know that people are part of many food chains? If you weren't part of them, you could not survive!

survive: to continue to live

CHAPTER 1

Plants and Sunlight

Plants make their own food. They use a process called **photosynthesis**. *Photo* means "light." *Synthesis* means "put together." During photosynthesis, plants use sunlight to put things together.

Sunlight is one type of light energy. The leaves on plants trap this light energy. They use the light energy to "put together" carbon dioxide from the air and water from the soil to make sugar. Plants use this sugar to live and grow.

When an animal eats the plant, it gets energy from the plant. The animal uses this energy to stay warm, move, and grow.

photosynthesis: the process by which plants use sunlight, carbon dioxide, and water to produce food energy

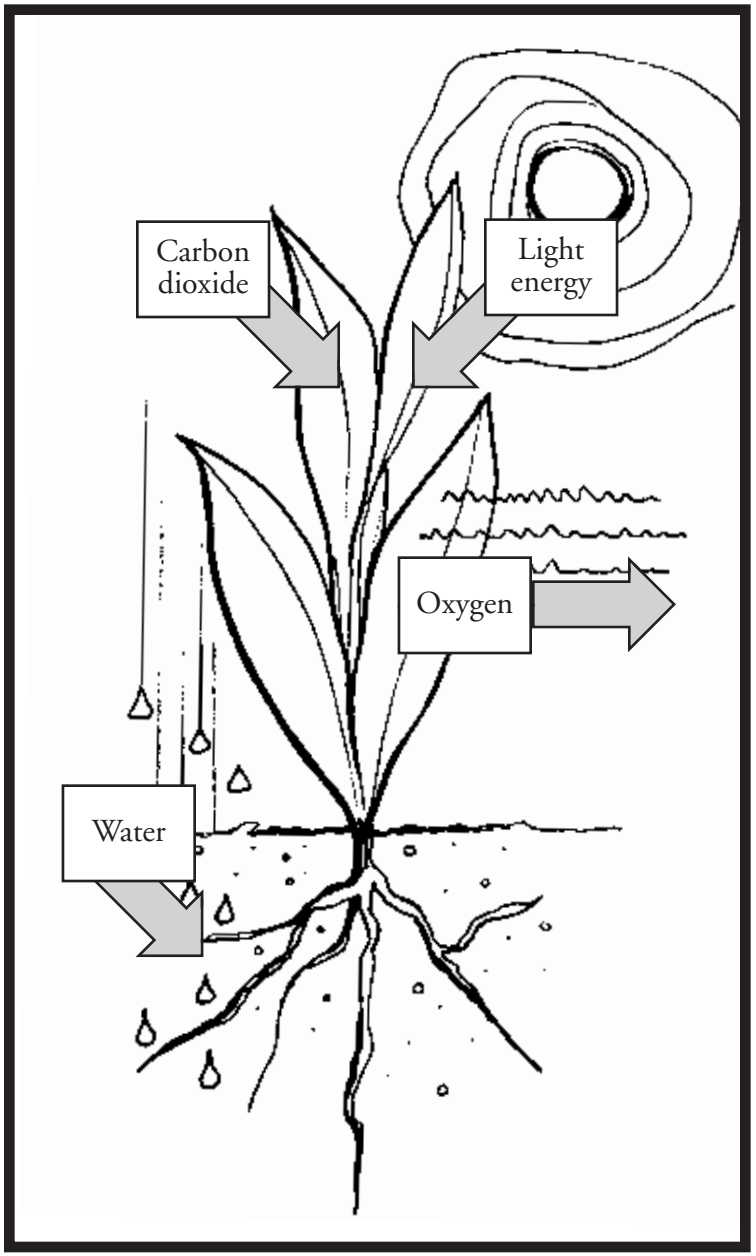
Look at the diagram on the next page. It shows that plants use light energy from the sun to put together carbon dioxide from the air and water from the soil. This makes sugar that plants use to live and grow.

You can see that plants release oxygen. People must breathe oxygen to stay alive.

People eat apples, bread, and other parts of plants and food made from plants. Many of us eat meat, eggs, and milk, too. Those foods come from animals that ate plants, such as pigs, cows, and chickens. In fact, our survival depends on plants.

If there were no plants, we would not have to worry about eating. Why not?

Photosynthesis



CHAPTER 2

Classifying Consumers

Plants are **producers**. They produce their own food. Living things that cannot make their own food are **consumers**. You are a consumer.

Herbivores

An herbivore is an animal that eats only plants. Herbivores include grasshoppers, rabbits, and deer.

Carnivore

A carnivore is an animal that eats only other animals. Wolves, hawks, and lions a re carnivores.

producer: a living thing that makes its own food energy
consumer: a living thing that gets its energy by eating other living things

Omnivore

Omnivores eat both plants and other animals. You are probably one of them. Other omnivores include bears and raccoons.

Decomposers

Decomposers help decay, or rot, dead things. Mushrooms, buzzards, worms, and bacteria are decomposers. They get nutrients and energy from dead things. The “leftover” nutrients become part of the soil. Then plants, or producers, can use them again.

Describe a meal for an omnivore.

CHAPTER 3

Food Chains and Food Webs

An **ecosystem** is a community of living things in a certain place. An ecosystem may be a desert, a pond, and so on. Food chains show how energy flows through an ecosystem.

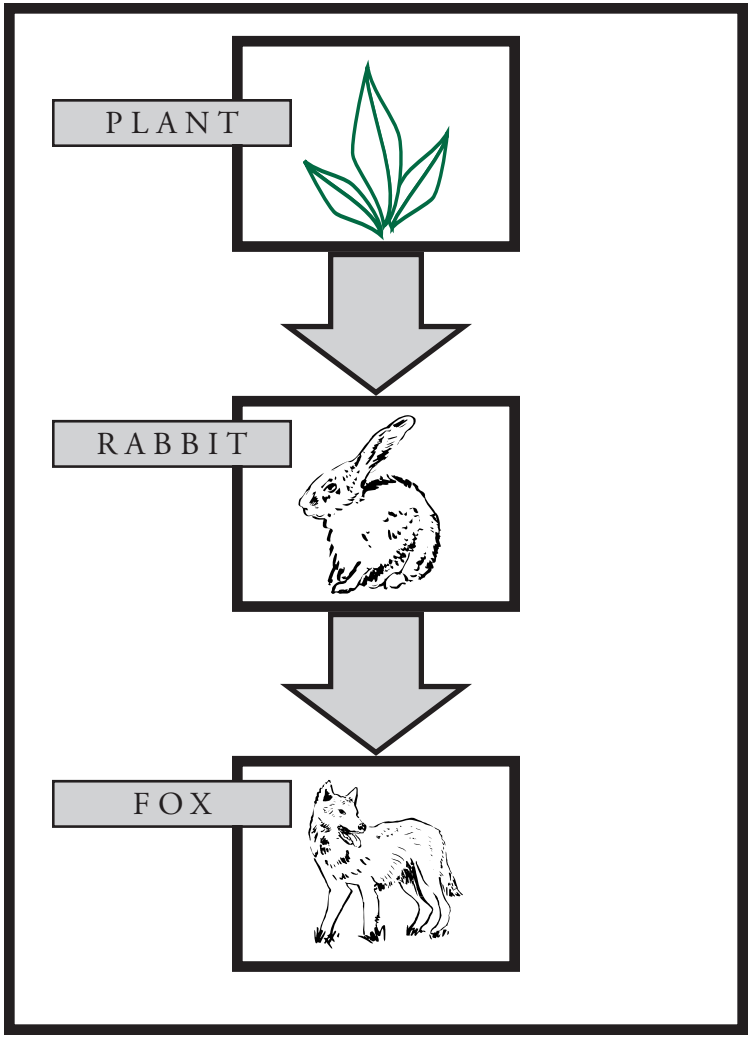
Look at the food chain on the next page. It shows a forest ecosystem. Follow the flow of energy through the ecosystem. First, a plant uses much of the energy it makes to live. It stores the rest.

Next, a rabbit eats the plant and gets the plant's stored energy. The rabbit uses much of this energy and stores the rest.

Then, a fox eats the rabbit and gets the rabbit's stored energy. The fox uses much of the energy and stores the rest.

ecosystem: all living and nonliving things that live in a certain location

Food Chain



Describe a food chain that ends with you.

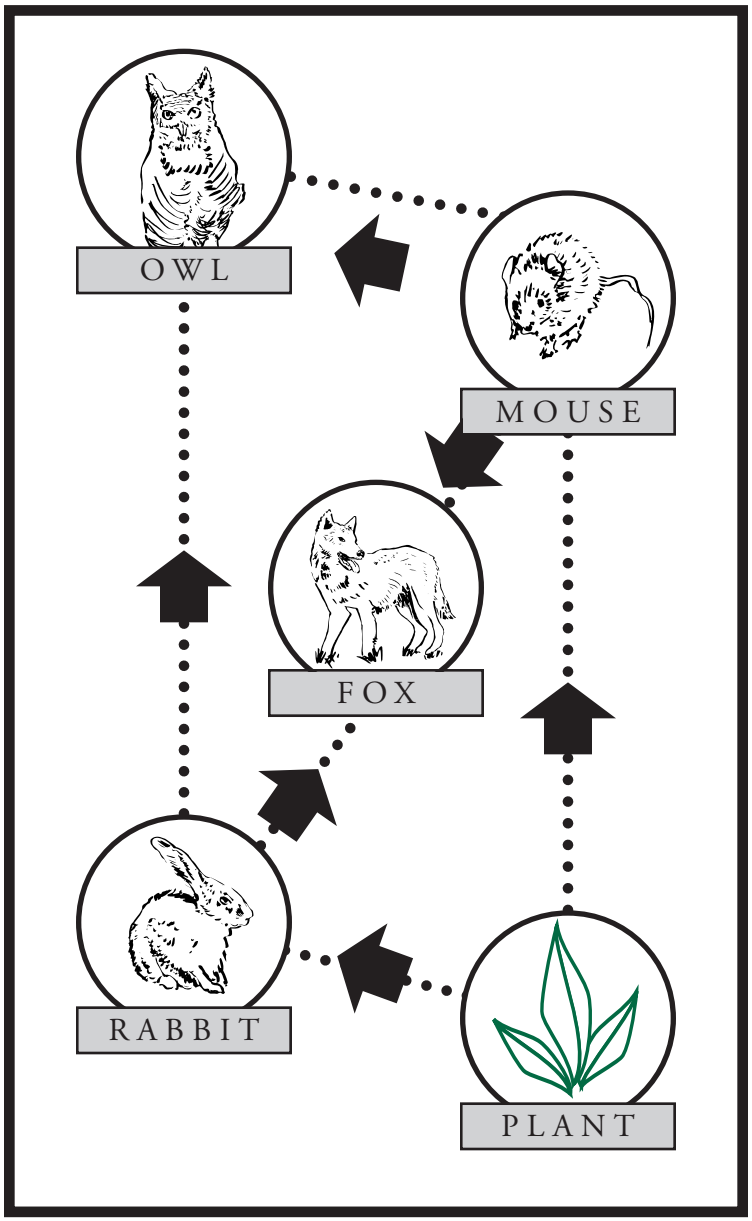
Food Webs

Most animals in an ecosystem are part of many food chains. Several food chains connected together make a food web. Look at the diagram of a food web on the next page.

Mice eat plants and then foxes eat mice. This is one food chain that includes mice. Mice eat plants and then owls eat mice. This is another food chain that includes mice. What other food chains do you notice in the food web?

How do you know that you are part of a food web?

Food Web



People are at the top of many food webs. For example, cows eat grass. Then people drink milk and eat steaks and hamburger. The energy from sunlight is passed from the grass, to the cow, and then on to us.

All of the energy that keeps us alive starts with plants. All of the energy stored in plants comes from sunlight. Without the sun, Earth would soon become a very dark, cold, lifeless place.

CHAPTER 4

The Energy Pyramid

Energy flows through a food chain. Each link uses most of the energy it receives to live, grow, move, and stay warm. As a result, only a little of it reaches the last link in the chain.

Look at the food chain diagram on page 11 again. A leaf receives energy from sunlight. The leaf uses most of it. It stores only a little. For this reason, when a rabbit eats the leaf, it receives only a little energy from it.

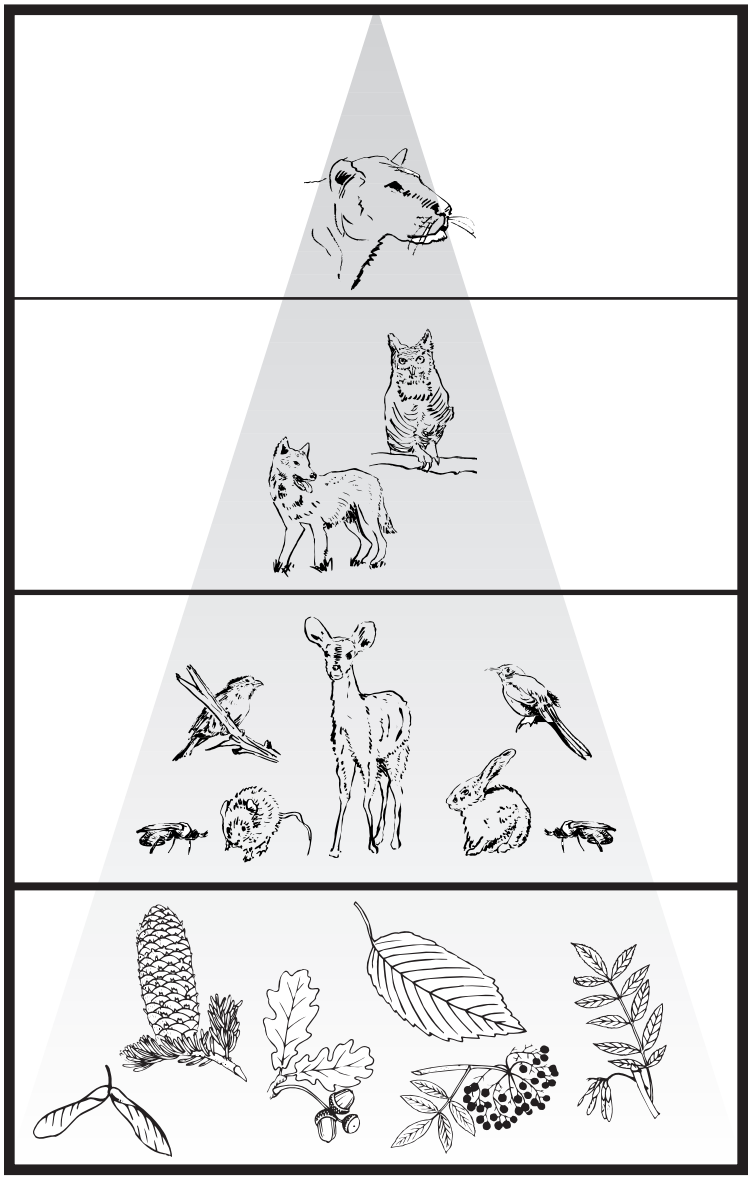
One rabbit must eat many leaves to get the energy it needs. By the time the energy gets to the last link, there is very little left. So one fox must eat many rabbits to survive.

An energy pyramid shows the amount of energy passed along a food chain. Look at the energy pyramid on the next page. All energy that keeps things alive starts with plants. So plants are at the bottom of a food pyramid.

The next link shows that animals like deer, birds, and rabbits get energy from the plants. Then foxes and owls eat these animals. Their energy is passed on.

Finally, the cougar eats foxes and owls to get energy. It takes many living things to support one cougar!

Forest Energy Pyramid



Another example of an energy pyramid is one in the ocean at the South Pole. Here an energy pyramid would start with millions of tiny, floating, plant-like organisms.

On the next level would be many fish that eat those plants.

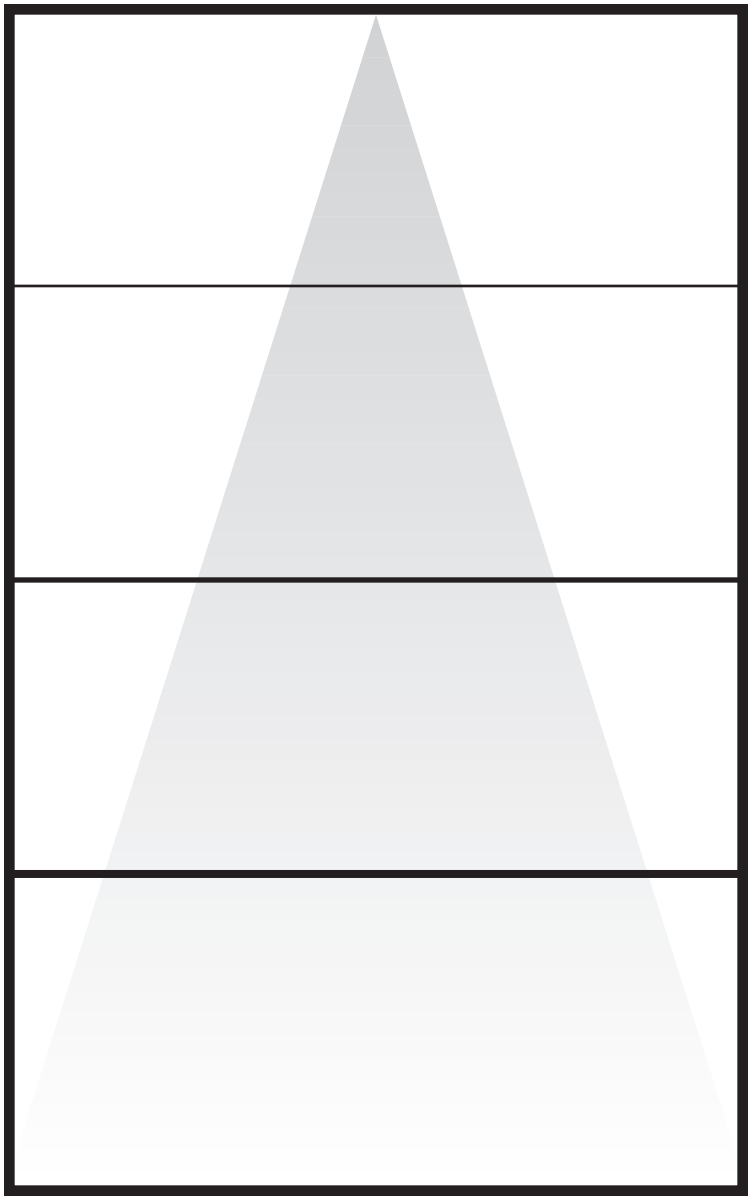
The third level might contain seals, penguins, and squids.

At the top might be killer whales.

Try drawing an ocean energy pyramid on the next page or in your journal.

Why is an energy pyramid big at the bottom and small at the top?

Ocean Energy Pyramid



CHAPTER 5

DDT and Food Chains

When something harmful becomes part of a food chain, it can hurt or kill the living things in the food chain. For years, the chemical DDT was used to kill harmful insects. Millions of pounds of it were sprayed on crops. In time, scientists realized that DDT was also killing helpful insects, fish, and birds.

For example, DDT worked its way through the bald eagles' food chain. It nearly killed all the bald eagles. Read on to find out how this happened.

First, rain washed DDT off crops and into lakes. The amount of DDT in one large lake was very small, less than one drop.

However, algae in that lake absorbed, or soaked up, the DDT. As small fish ate lots of algae, the amount of DDT in their bodies rose. As bigger fish ate many smaller fish, the amount of DDT in their bodies rose even higher.

Bald eagles ate many big fish. The high amounts of DDT in the bald eagles' bodies made their eggshells too thin. Few bald eagle chicks hatched. Bald eagles began to disappear because of harmful DDT in their food chain.

People worked together to pass laws to help save the bald eagle. In 1972, DDT was banned in the United States.

Can you think of another example of how conclusions and ideas change as new knowledge is gained?

Glossary

consumer—a living thing that gets its energy by eating other living things

decomposer—an organism that gets its energy by breaking down dead plants and animals

ecosystem—all living and nonliving things that live in a certain location

herbivore—an animal that gets all of its energy from producers (plants)

microscopic—too small to be seen without a microscope

photosynthesis—the process by which plants use sunlight, carbon dioxide, and water to produce food energy

producer—a living thing that makes its own food energy

survive—to continue to live

To Find Out More . . .

Want to learn more about energy in ecosystems?

Try these books

Desert Food Chains by Louise Spilsbury. Heinemann, 2004.

Food Chains by Peter Riley. Franklin Watts, 1999.

Food Chains and Webs by Holly Wallace. Heinemann, 2006.

Learning About Food Chains and Food Webs with Graphic Organizers by Jonathan Kravetz. PowerKids Press, 2006.

Access these Web sites

You can learn more about food chains and the energy pyramid at this Web site. You can even create your own food web.
www.vtaide.com/png/foodchains.htm

This Flying Turtle Web site will tell you more about food chains, the energy pyramid, and the flow of energy through plants and animals.
www.ftexploring.com/me/me2.html

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ENGLISH-LANGUAGE ARTS • GRADE 4

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English-language Arts Activities

Energy in Ecosystems

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

Defining New Words

When you read a new word, you have many ways to figure out its meaning. The sentence or paragraph might give you clues. The word might be defined on that page. It might be explained in a glossary. The author might tell you a synonym for that word.

Read the passage below. See if you can figure out what the word *compete* means.

As you go up, each level has fewer living things. Why? Each living thing passes only a little energy up to the next level. All of these plants and animals keep just one cougar alive!

A level can have too many living things. A forest might have too many deer. Then they must compete with each other for grass and leaves.

What does *compete* mean?

The second paragraph provides a clue. If a forest has too many deer, they have to struggle to find enough food. They have to find and eat the food before other deer find it. So the word *compete* means that the deer have a contest, or competition, to get enough food. *Competition* is another form of the word *compete*.

TRY THE SKILL

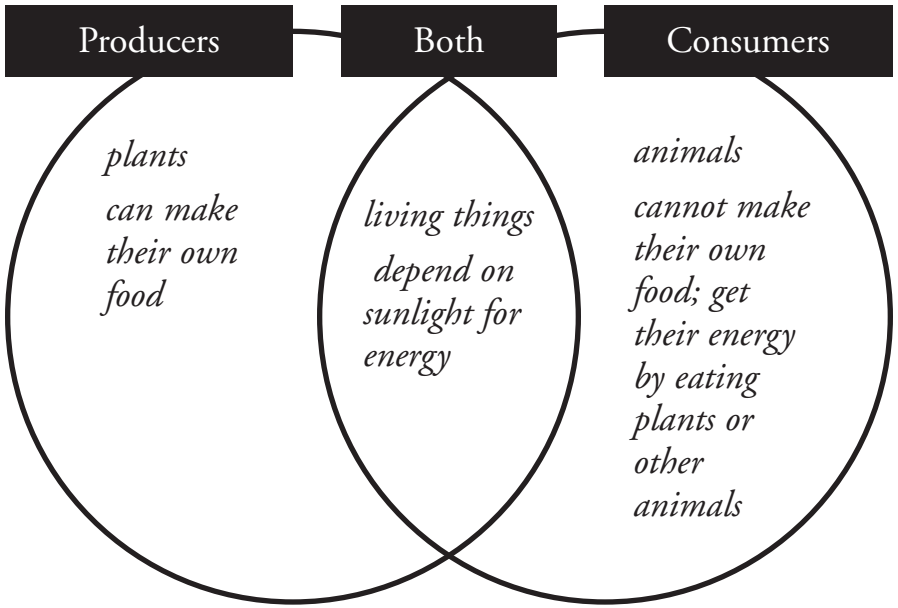
Read the sentence below from page 10.

An ecosystem is a community of living things in a certain place.

The word *ecosystem* is defined on page 10 and in the Glossary. Reread all of page 10 and the definition of *ecosystem*. Then explain what an ecosystem is. Give specific examples of the living things in one ecosystem. Name the ecosystem you are describing.

Compare and Contrast

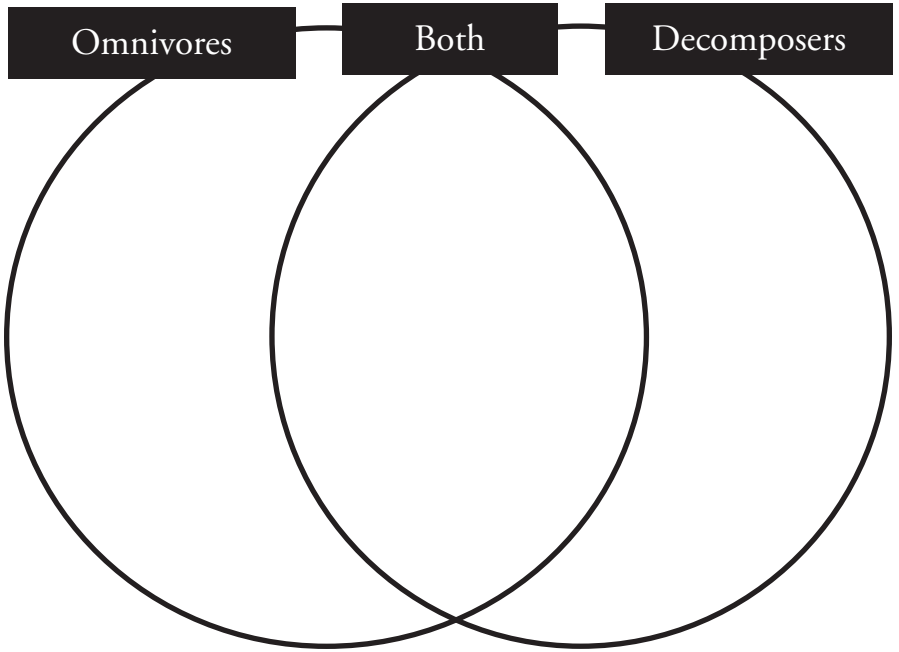
When you compare two things, you tell how they are the same. When you contrast them, you tell how they are different. A Venn diagram can help you compare and contrast. This Venn diagram compares and contrasts producers and consumers.



TRY THE SKILL

Use this Venn diagram to compare and contrast omnivores and decomposers. Read the phrases in the box. Put the phrases in the correct part of the Venn diagram.

- break down dead things
- consumers
- get their energy from producers and other consumers
- help recycle nutrients
- include bears and people



Make Predictions

TRY THE SKILL

You can use the information you read to make predictions. For example, in this book you read how energy moves through ecosystems.

Let's put your knowledge to work. Imagine that a forest fire forces a pair of hawks out of their habitat. They fly to a nearby forest. A family of hawks already lives in that forest.

Predict what will happen in the hawks' new habitat.

Did you predict that the new hawks will compete for food with the hawks that already live there? Hawks must eat many small animals to get all the energy they need. Too many hawks in one forest are a problem. Some of them probably will not be able to find enough to eat. Those hawks will weaken and die—or move to another forest. Adding more hawks puts too many living things on the same level of an energy pyramid.

Read each description. Then shade in the letter that correctly predicts what will happen.

1. A wet, warm spring has helped grasses and small plants grow in one ecosystem. Predict how this growth will affect the carnivores living there.

Ⓐ It will not affect the carnivores because they do not eat plants.
Ⓑ The carnivores will have more herbivores to eat.
Ⓒ The carnivores will have fewer herbivores to eat.

2. One energy pyramid begins with a large field of producers. The next level includes twelve mice, four squirrels, and six rabbits. The third level is a family of five foxes. Predict how many coyotes are on the next level.

Ⓐ one
Ⓑ four
Ⓒ six
Ⓓ none

3. An owl at the top of an energy pyramid dies. Predict how this change will affect the ecosystem in this forest.

Ⓐ It will have fewer herbivores.
Ⓑ It will have more herbivores.
Ⓒ It will have more producers.

Use an Index

TRY THE SKILL

To find information in a book, you don't have to read the whole thing. Instead, you can check the index. You will find it in the back of the book. It lists the topics covered in alphabetical order. It also lists their page numbers.

For example, here is part of an index. This book is about food chains:

Index

carbon dioxide, 6
carnivore, 17–19
consumer, 10–11
decomposer, 21-22
energy, 2–5, 7–9, 11–14, 16–22, 27–30
food chain, 23–30
food web, 25–30
herbivore, 16–17
nutrients, 10–14
omnivore, 19–20
oxygen, 6
producer, 10–11

Study the index. Then answer the questions below.

1. Name one page that probably has information about photosynthesis. Explain your choice.

_____

_____

_____

2. Explain why energy is discussed on so many pages in this book.

_____

_____

_____

3. Name one page that probably has information about mushrooms and bacteria. Explain your choice.

_____

_____

_____

Answer Key

Context Clues

Students should name one ecosystem and list the plants and animals in it. For example: forest; trees, bushes, grasses; squirrels, bears, deer, mice.

Compare and Contrast

Omnivores: include bears and people

Decomposers: break down dead things; help recycle nutrients

Both: consumers; get their energy from producers and other consumers

Make Predictions

1. B

2. A

3. B

Use an Index

1. page 6; carbon dioxide and oxygen are both part of photosynthesis.

2. Energy moves through food chains, and that is the topic of this book.

3. pages 21–22; mushrooms and bacteria are decomposers.