FOCUS ON SCIENCE

Life Science

Animals and Plants in Their Environment

Advanced Level

Energy in Ecosystems

LOOK INSIDE FOR:

- Core Curriculum Covered
- Student Book
- Assessments and Reading Activities

FOCUScurriculum

866-315-7880 • www.focuscurriculum.com

Energy in Ecosystems

What roles do plants and animals play in their environments?

CORE CURRICULUM STATEMENTS

Plants and animals depend on each other and their physical environment.

Green plants are producers because they provide the basic food supply for themselves and animals.

All animals depend on plants. Some animals (predators) eat other animals (prey).

Animals that eat plants for food may in turn become food for other animals. This sequence is called a food chain.

Decomposers are living things that play a vital role in recycling nutrients.

Plants manufacture food by utilizing air, water, and energy from the Sun.

Life Science

Animals and Plants in Their Environment

Advanced Level

Student Book

Energy in Ecosystems

AL

Energy in Ecosystems

What role do plants and animals play in their environments?

CORE CURRICULUM STATEMENTS

Plants and animals depend on each other and their physical environment.

Green plants are producers because they provide the basic food supply for themselves and animals.

All animals depend on plants. Some animals (predators) eat other animals (prey).

Animals that eat plants for food may in turn become food for other animals. This sequence is called a food chain.

Decomposers are living things that play a vital role in recycling nutrients.

Plants manufacture food by utilizing air, water, and energy from the Sun.

FOCUScurriculum

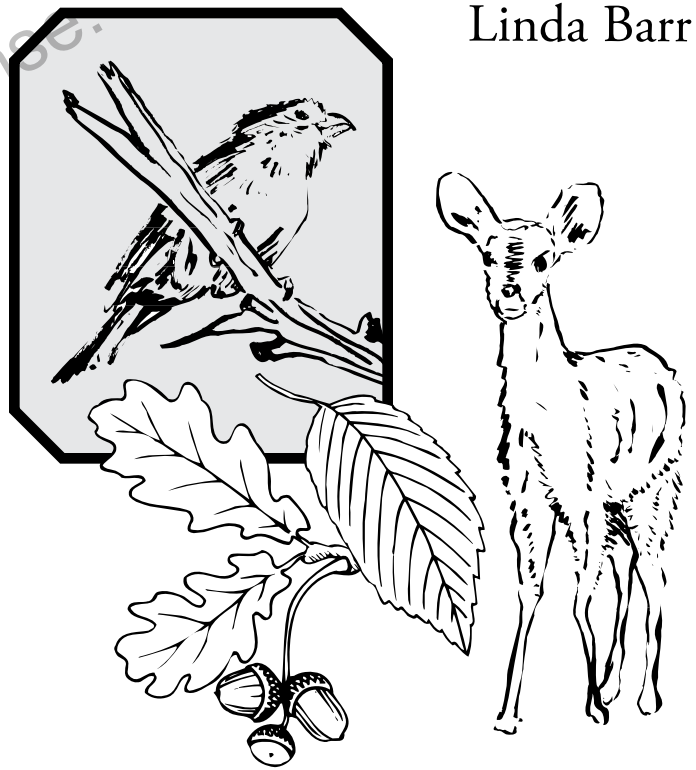
FOCUS ON SCIENCE

Life Science

Animals and Plants in Their Environment

Energy in Ecosystems

by
Linda Barr



FOCUS ON SCIENCE

Life Science

Animals and Plants in Their Environment

Energy in Ecosystems

by
Linda Barr

FOCUScurriculum

Curriculum materials for **your** content standards

Table of Contents

– Predict –
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"?

You and every other living thing need energy to keep on living. How you get your energy makes you either a producer, a consumer, or a decomposer. You'll learn more about all three of these in this book.

You'll also learn how the energy that keeps you and all living things alive starts with the sun. You'll read how plants turn sunlight into food energy. You'll find out how that energy flows to animals and then to more animals, including you.

Did you know that you are part of food chains? You also have a place in an energy pyramid. If you weren't part of these things, you could not survive!

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.

During photosynthesis, green matter in leaves, called chlorophyll, traps the energy in sunlight. Then the leaves use this light energy to "put together" carbon dioxide from the air and water from the soil. This produces a type of sugar called glucose. This sugar is rich in chemical energy. Plants use this energy to grow and reproduce.

When an animal eats the plant, its body changes the chemical energy from the plant into other forms of energy. One is heat energy. The animal uses these forms of energy to stay warm, grow, and reproduce. In the same way, the plants and animals that we eat give us the energy to stay warm, grow, and reproduce.

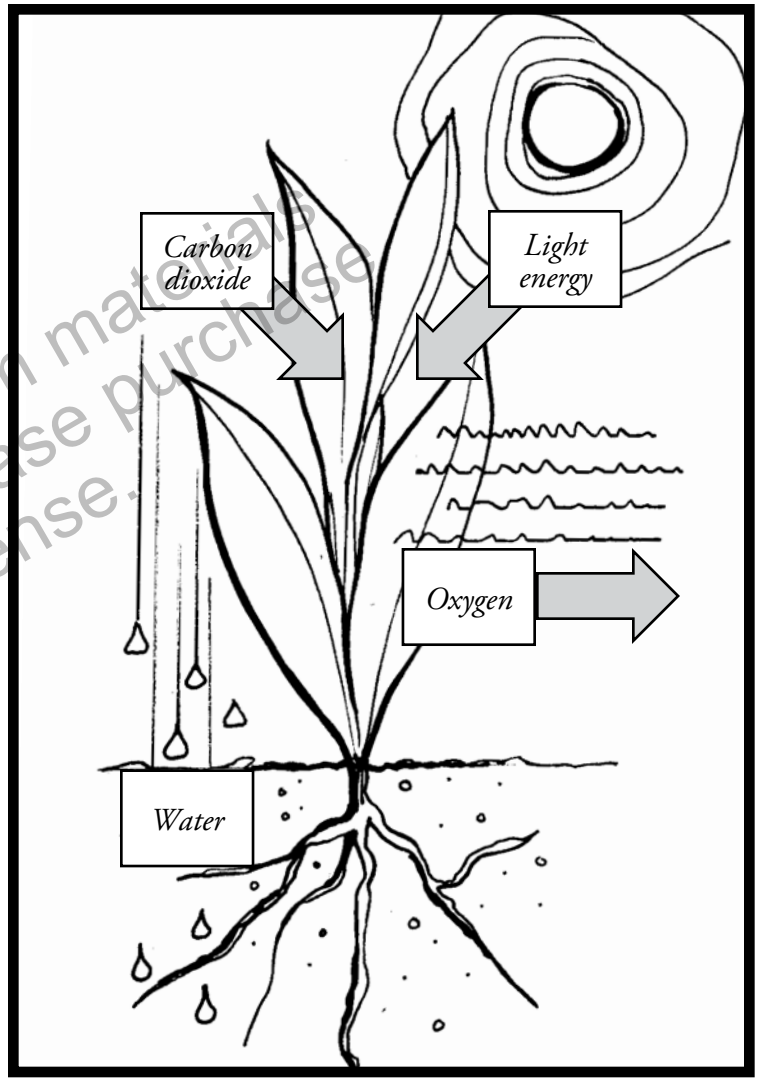
photosynthesis: the process by which plants use sunlight, carbon dioxide, and water to produce food energy

The diagram of photosynthesis on the next page shows that plants also produce oxygen, which we must breathe to survive. As grass, trees, and other plants make food for themselves, they also make oxygen for us. Most of the oxygen we breathe comes from tiny plants floating on the ocean.

Our survival depends on plants. We eat plants when we munch on an apple or enjoy a peanut butter sandwich. Of course, many of us also eat meat, eggs, milk, and cheese. Those foods come from animals that eat grass, corn, and other plants. If those animals did not have plants to eat, we would not have hamburgers or scrambled eggs. If there were no plants to make oxygen, we would not have to worry about eating.

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

Photosynthesis



Plants combine sunlight, carbon dioxide, and water to make food. As they make food, they release oxygen into the air. We need to breathe in oxygen to survive.

CHAPTER 2

Classifying Consumers

Plants are called **producers** because they produce, or make, their own food. Living things that cannot make their own food, including you, are called **consumers**.

It's true that you can make yourself a sandwich. However, you start with two slices of bread and some peanut butter, not sunlight, carbon dioxide, and water. You and all other animals must eat, or consume, plants and/or animals to get the energy you need to live. There are four main types of consumers.

Herbivores

An herbivore is an animal that eats only producers (plants). *Herb* means "plant." *Vor* is from a Latin word that means "to eat." So an herbivore is a plant-eater. Herbivores include grasshoppers, rabbits, and mice. Horses, cattle, zebras, giraffes, and deer are also herbivores.

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

Carnivore

A carnivore is an animal that eats only other animals. Carne means "meat." Wolves, hawks, and lions are carnivores. So are robins and owls.

Omnivore

Omnivores eat both plants and other animals. You are probably one of them. Omni means "all." Other omnivores include bears and raccoons. Pigs, chickens, and flies are also omnivores.

Decomposers

Decomposers get their energy by breaking down dead plants and animals. Decomposers help decay, or decompose, dead things. Mushrooms, buzzards, worms, and bacteria are decomposers. They use some of the nutrients they get from dead things to live and grow. The "leftover" nutrients become part of the soil. Then producers can absorb these nutrients through their roots and use them to grow. In this way, decomposers help recycle nutrients.

– Describe –
What would a meal for an omnivore be like?

CHAPTER 3

Food Chains and Food Webs

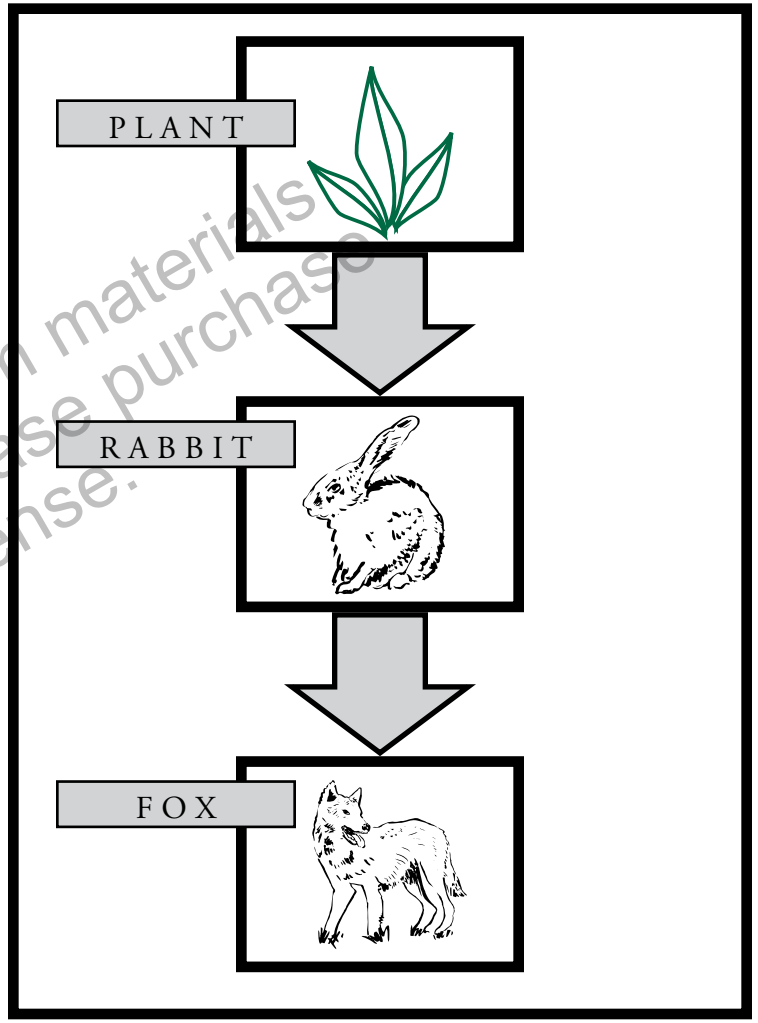
How does energy flow through an **ecosystem**? Plants, such as grass, use the energy from sunlight to make food energy for themselves. The grass uses much of this energy to live and grow and then stores the rest.

When a rabbit eats the grass, the energy stored in the grass enters the rabbit's body. The rabbit uses much of this energy to live and grow and stores the rest. When a fox eats the rabbit, the energy stored in the rabbit's body passes to the fox. The fox uses much of the energy to live and grow and stores the rest. When the fox dies, decomposers get the remaining energy in its body.

Food chains, like the one on the next page, show this flow of energy.

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

Food Chain



– Apply –
Describe a food chain that ends with you.

Food chains also exist in the water. Ocean food chains begin with **microscopic** organisms that float on top of the water. These are the plants that produce most of the oxygen you breathe. These plant-like organisms are eaten by microscopic consumers that also float on the surface of the ocean.

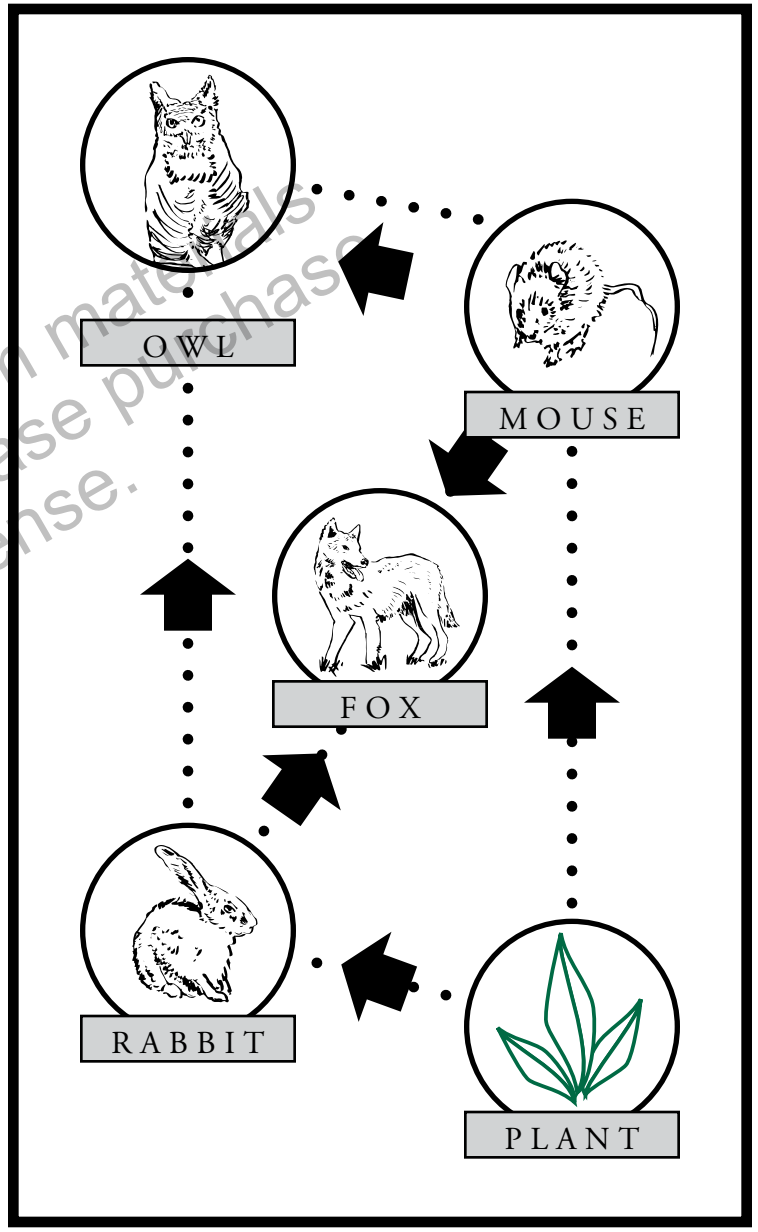
Then small fish eat the microscopic consumers and are, in turn, eaten by larger fish. An ocean food chain may end with a killer whale!

However, a food chain does not tell the whole story. The relationships among living things are much more complicated than food chains. For example, foxes eat other animals besides rabbits, such as mice and birds. Most animals are part of several food chains. Together, these chains make a food web.

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

microscopic: too small to be seen without a microscope

Food Web



Food Webs

In a forest, a bear might be at the top of a food web, but people are at the top of many food webs. For example, cows eat grass, and then we drink milk and eat steaks and hamburger which are made from cow's meat. Chickens eat corn and grain, and then we eat eggs and chickens. The energy from sunlight is passed from plants to the cow or to the chicken and then on to us.

All of the energy that keeps your body alive starts with plants. All of the energy that is stored in plants starts with sunlight. All living things, including people, depend in many ways on the sun that shines on us every day. Without the sun, Earth would soon become a very cold, dark, lifeless place.

– Infer –
How can plants continue to grow when the sky is cloudy?

CHAPTER 4

The Energy Pyramid

As energy flows through a food chain, each link in the chain uses most of the energy it receives to live, grow, and reproduce. Animals also use energy to find food and stay warm. In fact, each link uses up 90 percent of the energy that it receives. Thus, each link passes along only 10 percent of that energy.

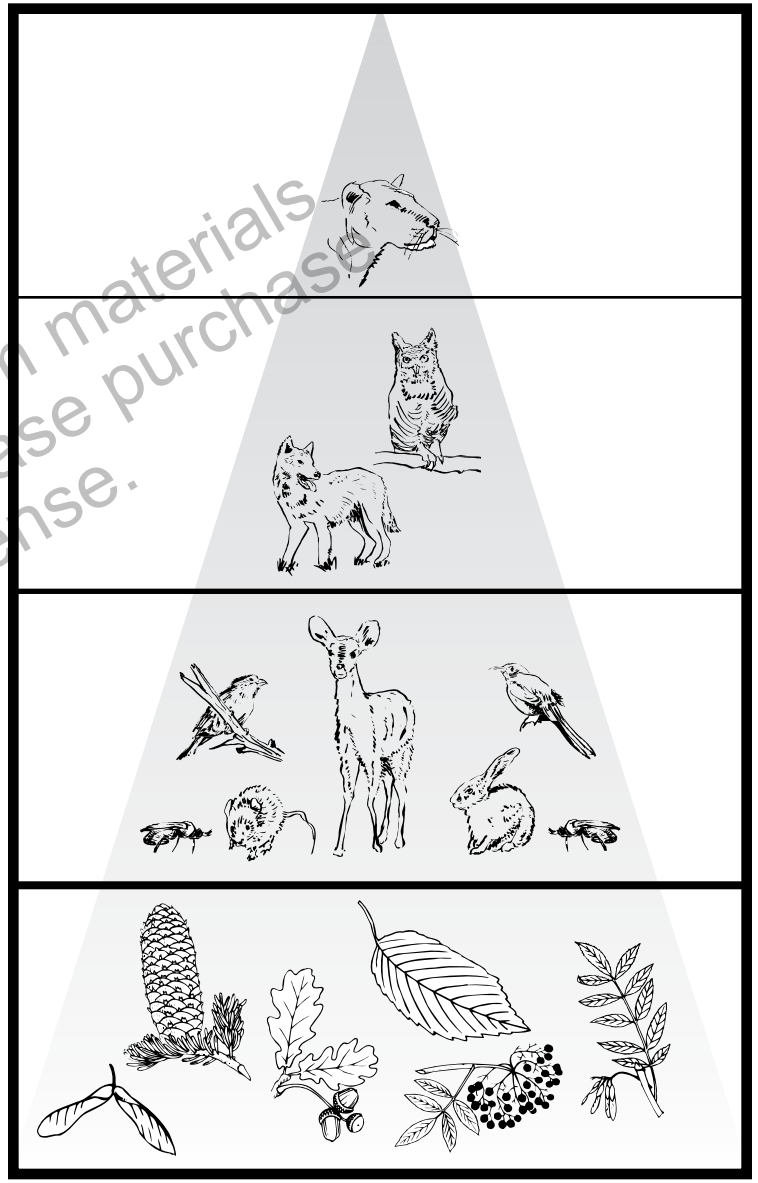
For example, a leaf uses up most of the energy it receives from sunlight. When a rabbit eats that leaf, it gets only 10 percent of the energy that the leaf received from sunlight. Thus, the rabbit must eat many leaves to get all the energy it needs. The rabbit uses up 90 percent of that energy. So a wolf must eat many rabbits to get the energy it needs.

An energy pyramid shows the amount of energy that is passed from one level of a food chain to the next. You can see a forest energy pyramid on the next page. Going up the pyramid, each level has fewer animals. That's because each living thing in the level below passes on only a small amount of energy. It takes all these living things to support one cougar!

An energy pyramid in the Antarctic would look much different. The bottom level would contain millions of the tiny plant-like organisms that float on the ocean's surface. These are the organisms that produce most of the oxygen we breathe. The next level would contain a much smaller number of fish that eat those plants. The third level up might contain seals, penguins, and squids. At the top might be a killer whale.

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

Forest Energy Pyramid



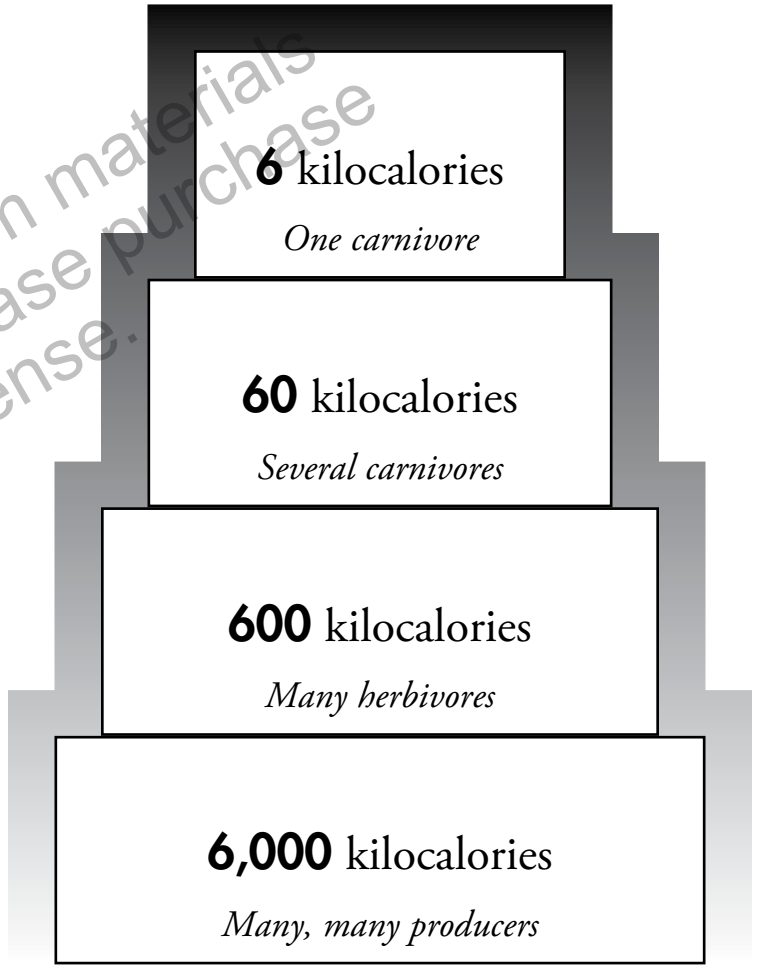
An energy pyramid in a desert or in a wetland would include different living things. Yet all of these pyramids begin with plants and show the flow of energy. They also show that it takes many producers to support a few consumers!

You have learned that, as energy moves through a food chain, it is mostly used for living or released as heat energy. Most food chains have no more than four links because little energy is available by the fourth link. That fourth link might be one animal. That's why we need lots of sunshine to allow more plants to grow. Sunlight provides new energy to flow through food chains.

Look at the diagram on the next page. It shows how little energy is left at the top of a pyramid.

– Apply –
What would one energy pyramid on a farm look like?

A calorie is a measure of energy. A **kilocalorie** is 1,000 calories. You probably eat food containing 1.5 to 2 kilocalories each day.



kilocalorie: a measure of energy; equal to 1,000 calories

CHAPTER 5

Humans Affect Food Chains

For many years after World War II, farmers, foresters, and gardeners used the chemical DDT to kill harmful insects. For example, 79 million pounds of DDT were sprayed on crops in 1959. Yet by the early 1970s, scientists realized that DDT was also wiping out helpful insects, such as bees. It was killing fish and birds, too. In fact, DDT killed nearly all of the bald eagles.

DDT did not kill the eagles directly. Instead, it worked its way through the food chain. A large lake in Africa showed how that happened. The lake was sprayed with DDT to kill mosquitoes that carry disease. The amount of DDT in the water was only 0.002 parts per billion. That's very little DDT, less than one drop.

However, plants in the lake absorbed the DDT. The amount of DDT in them rose to 2.5 parts per million. Small fish ate many plants. Then bigger fish ate many small fish and ended up with 5 to 10 parts per million of DDT in their bodies. Crocodiles that ate many big fish had levels as high as 34 parts per million.

In the same way, eagles ate many big fish with DDT in their bodies. The high amounts of DDT did not kill the eagles. Instead, it made their eggshells too thin, so few chicks hatched.

As scientists learned more about DDT, they warned people not to use it. In 1972, DDT was banned in the United States, but other nations still use it.

– Apply –
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

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

kilocalorie—a measure of energy; equal to 1,000 calories

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

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

Index

Published by FOCUScurriculum

866-315-7880

www.focuscurriculum.com

Order Number: LS-31AL

Created by Kent Publishing Services, Inc.

Designed by Signature Design Group, Inc.

Life Science

Animals and Plants in Their Environment

Advanced Level

Assessments

Energy in Ecosystems

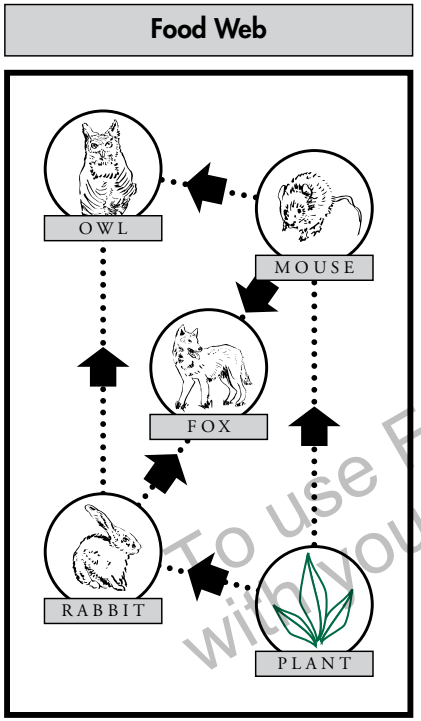
Print pages 20–22 of this PDF for the assessments.

Energy in Ecosystems

Check Understanding

Shade the circle next to the correct answer.

Use the food web below to answer question 1.



1. Which organism captures the sun's energy?

Ⓐ plant

Ⓑ rabbit

Ⓒ fox

Ⓓ mouse

2. What is the main role of producers in the transfer of energy?

Ⓐ to turn light energy into heat energy

Ⓑ to turn light energy into chemical energy

Ⓒ to produce food for carnivores

Ⓓ to produce food for decomposers

3. Which is the original source of the energy that allows a hawk in New York to fly?

Ⓐ grass

Ⓑ mice and other small animals

Ⓒ sunlight

Ⓓ fish

4. Which of these is a food chain?

Ⓐ acorn → squirrel → oak tree → fox

Ⓑ acorn → mouse → black snake → coyote

Ⓒ minnow → algae → trout → bear

Ⓓ hawk → snake → insect → bush

Energy in Ecosystems

Check Understanding

Write your answer on the lines provided.

5. Describe the major differences between organisms that are producers and those that are consumers.

_____

_____

_____

_____

_____

_____

6. Explain why the populations are smaller for animals that are at the highest level in an energy pyramid.

_____

_____

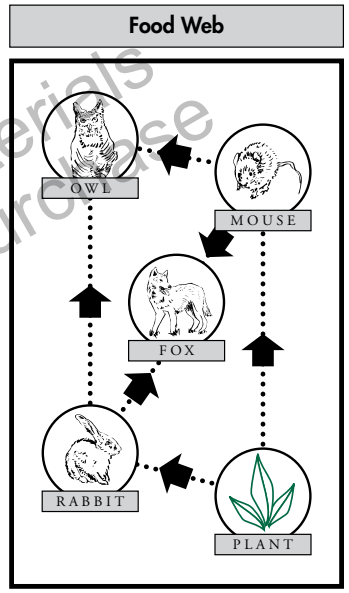
_____

_____

_____

_____

7. The diagram below shows a food web.



Complete the chart by identifying the relationship between each organism in the food web.

Organism	Relationship
Plant	
Rabbit	
Owl	

Energy in Ecosystems

Assessment Scoring Guidelines

1. Answer A is correct.

2. Answer B is correct.

3. Answer C is correct.

4. Answer B is correct.

5. Producers are living organisms such as plants that produce, or make, their own food.

Living things that cannot make their own food are called consumers.

6. There are fewer animals as you go higher in the energy pyramid because there is less food energy available for those animals.

7. The plant provides food for the rabbit.
The rabbit provides food for the fox and owl
The owl uses the mouse and rabbit for food.

Life Science

Animals and Plants in Their Environment

Advanced Level

English Language Arts Activities

Energy in Ecosystems

Print pages 24–28 of this PDF for the reading activities.

Use Context Clues

Some words have several meanings. You can use context clues to decide which meaning is being used in a certain sentence. For example, *bark* can mean "the outside of a tree trunk" or "the sound a dog makes." Which meaning is used in the sentence below?

The woodpecker found insects under the bark.

The words *woodpecker* and *insects* are clues to the meaning of *bark* in this sentence. The insects are under the bark of a tree. Here, *bark* means "the outside of a tree trunk."

Read each word and its meanings. Then read each sentence. Shade in the letter of the correct meaning of that word in the sentence.

flies Ⓐ an insect with wings Ⓑ moves through the air

1. Flies eat whatever they can find, so most of them are omnivores.

matter Ⓐ a substance Ⓑ a subject being considered

2. Green matter in plants traps light energy from the sun.

TRY THE SKILL

story Ⓐ a floor in a building Ⓑ a retelling of events

3. A food chain does not tell the whole story.

store Ⓐ a business that sells things
Ⓑ to save something

4. Plants store the energy of the sun.

leaves Ⓐ goes away Ⓑ parts of a plant
Ⓒ extra sections to make a table longer

5. Photosynthesis takes place in leaves.

left Ⓐ a direction Ⓑ did leave Ⓒ not used

6. Very little energy is left at the top of an energy pyramid.

Make Inferences

Authors often do not tell you everything you need to know. To figure out more or answer questions, you can make inferences. To do that, you think about what you read and what you already know. Then you reach a decision or answer your question.

To practice, read this paragraph:

In a forest, a bear might be at the top of a food web, but people are at the top of many food webs. For example, cows eat grass, and then we drink milk and eat steaks and hamburger. Chickens eat corn and grain, and then we eat eggs and chickens. The energy from sunlight is passed from plants to the cow or to the chicken and then on to us.

Why are people at the top of many food webs?

You can infer the answer to this question. You read that in a forest, a bear is at the top of a food web. Think about why that's true. Nothing eats bears—except some people, maybe. That's why people are at the top of many food webs, too. Nothing eats people—except the occasional bear.

TRY THE SKILL

Read this paragraph. Then answer the question that follows it.

When an animal eats the plant, its body changes the chemical energy from the plant into other forms of energy. One is heat energy. The animal uses these forms of energy to stay warm, grow, and reproduce. In the same way, the plants and animals that we eat give us the energy to stay warm, grow, and reproduce.

Plants produce chemical energy. Do they produce heat energy, too? Infer your answer and explain it.

_____

_____

_____

_____

_____

_____

Compare Details

TRY THE SKILL

When you look for information for a report, you should check several sources. However, they might offer different information. What can you do?

First, you must check the source. Is the author an expert? Does the information come from a trustworthy organization? Was the information written recently?

For example, you read in this book that only 10 percent of energy is transferred from one level of an energy pyramid to the next level. You find the same information in one Web site. This site is approved by a science teachers' organization.

However, another Web site says that "about half" of the energy is passed along. Readers can change the information in this Web site. You compare the sites and decide that the second one is not trustworthy.

You read in this book that most food chains have only four links. Read the information from the two Web sites below.

- One Web site explains a 2002 study by a professor at Cornell University. She found that living things in the water use less energy holding themselves up. That means they can pass along more energy to the next level. She says that a land food chain rarely has more than three links. With less energy lost, a water food chain can have six links.
- The second Web site is approved by science teachers. This Web site says that most food chains have no more than four or five links. Otherwise, the animals at the end of the chain would not get enough energy to stay alive.

1. Which Web site do you think is correct? Or are they both correct? Explain your answer.

_____

_____

_____

Identify Relevant Information

TRY THE SKILL

When you are looking for the answer to a question, relevant information helps you. Irrelevant information is not helpful, at least right then. As you answer questions, you must be able to zero in on the relevant information. For example, read this paragraph and look for the answer to this question: What are two ways that people depend on plants?

Our survival depends on plants. We eat plants when we munch on an apple or enjoy a peanut butter sandwich. Of course, many of us also eat meat, eggs, milk, and cheese. Those foods come from animals that ate grass, corn, and other plants. If those animals did not have plants to eat, we would not have hamburgers or scrambled eggs. If there were no plants to make oxygen, we would not have to worry about eating.

All of the sentences except the last one explain the first way that people depend on plants: plants provide food for us. However, these sentences also include examples of the plants and animals that we eat. You do not need that information to answer this question. The last sentence explains the second way that people depend on plants: plants make the oxygen we breathe.

Read the paragraph below. Look for relevant information to answer this question: What do plants need in order to make their own food?

During photosynthesis, green matter in leaves, called chlorophyll, traps the energy in sunlight. Then the leaves use this light energy to "put together" carbon dioxide from the air and water from the soil. This produces a kind of sugar. This sugar is rich in chemical energy. Plants use this energy to grow and reproduce.

1. Shade in the circle next to the sentence that is most relevant in answering the question.

Ⓐ Leaves are able to trap the energy in sunlight.

Ⓑ Sugar is a form of chemical energy.

Ⓒ Leaves use light energy, carbon dioxide, and water.

Ⓓ Plants use chemical energy to grow and reproduce.

Answer Key

Use Context Clues

1. A
2. A
3. B
4. B
5. B
6. C

Make Inferences

Possible answer: No, plants do not produce heat energy. They do not need heat energy because they do not keep themselves warm. Animals do keep themselves warm, so their bodies change some of the chemical energy from plants into heat energy.

Compare Details

Possible answer: They are both probably correct. The second Web site has the same information as this book and is approved by science teachers. However, the first Web site is also trustworthy. The study was done recently by an expert. This book and the first Web site don't compare land and water food chains. If they did, they might agree that water food chains could be longer than four links.

Identify Relevant Information

1. C