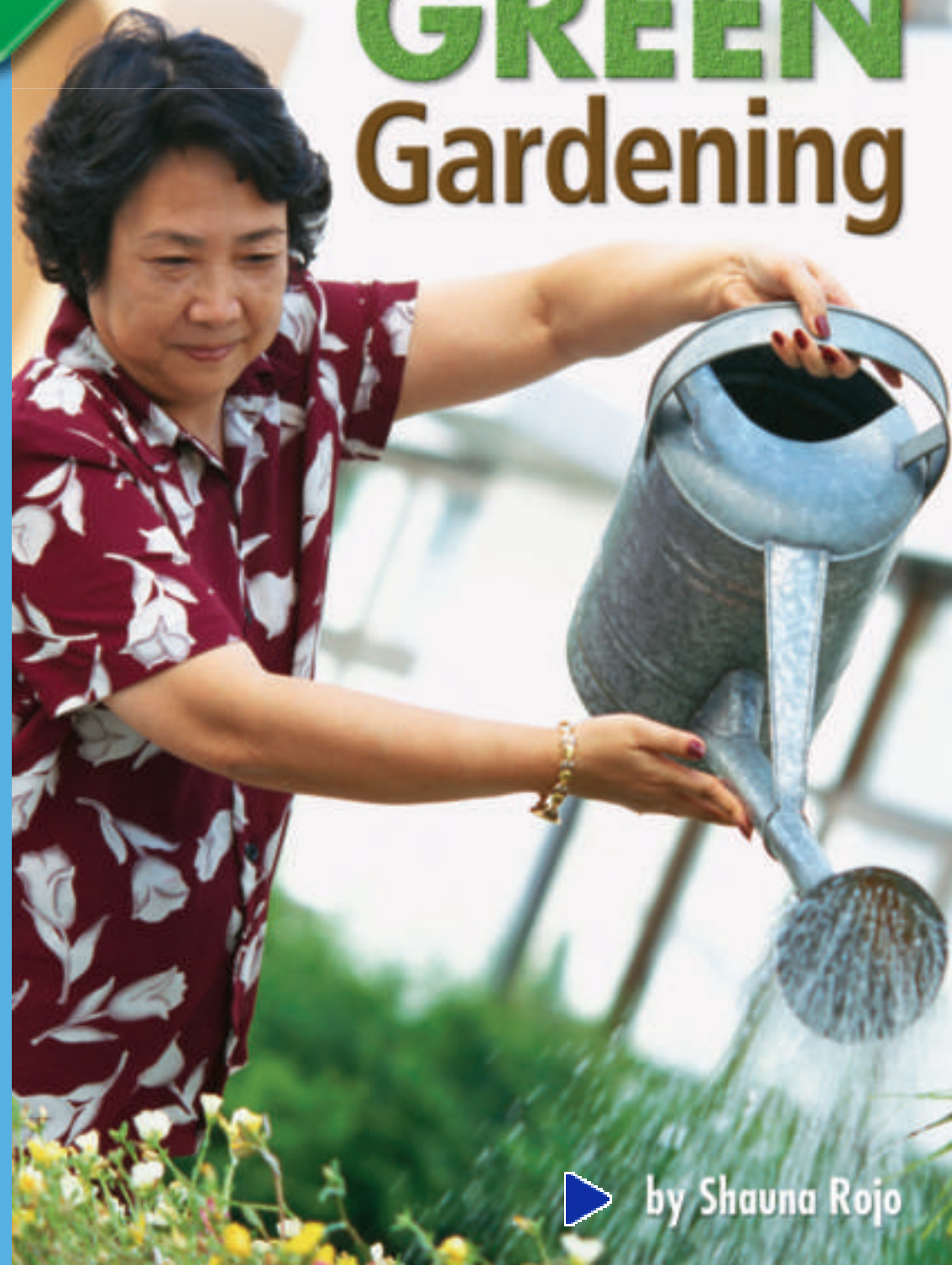


Science

Science

Earth Science

GREEN Gardening



Genre	Comprehension Skill	Text Features	Science Content
Nonfiction	Main Idea and Details	<ul style="list-style-type: none"> • Labels • Captions • Diagrams • Glossary 	Protecting Resources

Scott Foresman Science 5.10



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by Shauna Rojo

Vocabulary

biomass
fossil fuel
geothermal
hydroelectric
nonrenewable resource
renewable resource
resource
solar energy

Extended Vocabulary

companion planting
compost
crop rotation
organic
peat
pesticide
sustainable

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GREEN Gardening

by Shauna Rojo





What You Already Know

A resource is a supply that fills a need for materials or energy. Some resources, such as trees, are renewable resources. This means that they can be replaced. Other resources, such as coal, are nonrenewable resources. These either cannot be replaced at all or they cannot be replaced as fast as we use them.

Coal, oil, and natural gas are all resources known as fossil fuels. All fossil fuels are made from the remains of organisms. Fossil fuels are easy to store and they release lots of energy, but their supplies are limited and they cause pollution.

Fortunately, there are alternative sources of energy. One is energy from the Sun, or solar energy. Solar energy is a renewable resource that doesn't cause pollution. However, sunlight is not always available, and systems that make electricity from solar energy are expensive.



Wind turbines use the wind's energy to produce electricity.



Wind and water are two more alternate sources of energy. Wind turbines use the wind's energy to spin generators that produce electricity. Moving water spins generators to produce hydroelectric power. Both of these energy sources are pollution free, but they are not always available.

Geothermal energy uses high temperatures inside the Earth to make steam, which powers electrical generators. The disadvantage is that there aren't many places where hot rocks are close enough to the Earth's surface to be useful.

Burning biomass is a promising source of energy. Biomass is the remains of material that was recently alive. Although burning biomass causes some pollution, it is a renewable resource. Much of our garbage can be used as biomass fuel.

Making power isn't the only place where resources can be conserved and renewed. In this book, you'll learn how farming and gardening can be done in an Earth-friendly way. Let's get our hands dirty with a little green gardening!





Introduction

It's probably true that when most people think about renewable and nonrenewable resources, they first think about sources of energy. But we use resources for many things besides making power. They are used every day in homes, on construction projects, in factories, and on farms.

In fact, humans use resources when they do anything at all. Can you think of one resource that you need for everything you do, from playing catch to riding the bus to taking a nap? No matter what you do, you need food. And to grow food, people need to use other resources, such as water, soil, and energy. So even when you're sound asleep, you're still using resources!

There are billions of people on Earth, and every single one of them needs food. It takes a lot of resources to grow all that food, so renewing and reusing in gardens and on farms makes a lot of sense. And it's not just important

on huge farms; what you do in your backyard garden makes a difference too. About 25 percent of people in the United States garden as a hobby. That's more than 70 million people! If each of them did a little bit to help the environment, it would really add up.

Gardening is a very popular hobby in the United States.





Backyard Basics

Picture this scene in your mind. There is a garden filled with rich soil, colorful flowers, green leafy plants, and a few trees. Nestled in the garden is a small wooden shed with gardening tools, a chair to rest on, and a winding stone path. At first glance, this landscaped garden seems to be a place filled with renewable resources. However, a garden such as the one described might have used many nonrenewable resources.

For example, the chair in the garden might have been made from plastic. The shed might have been built from trees that were not replaced after they were cut down. Peat used to improve the soil is nonrenewable. The fertilizer that made the plants healthy was manufactured using a nonrenewable resource. Even the stepping stones and pebbles used for the path are nonrenewable resources.

Does all this mean that gardens are harmful to the environment? Of course not. There is a way to garden without using nonrenewable resources. It's called *green gardening*. Green gardeners think carefully about all the nonrenewable resources that can go into gardens. Whenever possible, they replace them with substitutes made from renewable resources. Let's see how this can be done.



garden shed



watering plants

The stepping stones and pebbles used to landscape this garden are nonrenewable resources.





Fertilizers

Green gardeners avoid using non-natural chemical fertilizers. They do this for two reasons. One is that the process of making these fertilizers often uses natural gas—a nonrenewable resource. The second reason is that chemical fertilizers can be harmful to plants, animals, and water supplies in the environment. As an alternative to chemical fertilizers, green gardeners make a homemade fertilizer called compost. To make compost, gardeners mix all sorts of plant and animal-based waste materials. Layers and layers of these materials are built up, often inside a closed container, and allowed to rot. Here are some common ingredients in compost.

- **Animal waste:** Cow waste is best in compost, but waste from sheep, goats, chickens, rabbits, and other animals is also usable.



seaweed



orange rind

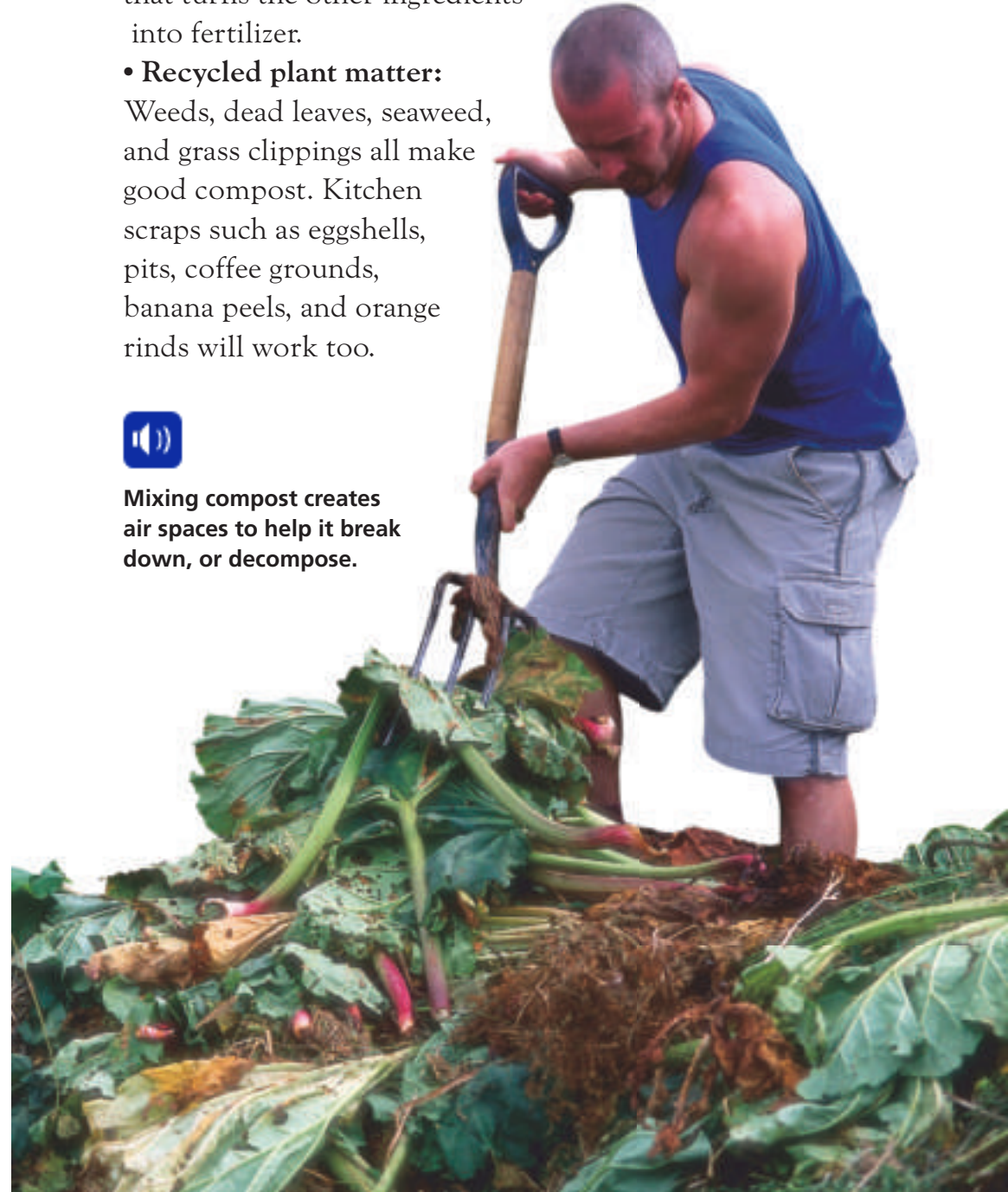


- **Soil:** Soil contains the bacteria that turns the other ingredients into fertilizer.

- **Recycled plant matter:** Weeds, dead leaves, seaweed, and grass clippings all make good compost. Kitchen scraps such as eggshells, pits, coffee grounds, banana peels, and orange rinds will work too.



Mixing compost creates air spaces to help it break down, or decompose.



Rotting Vegetables



day 1



day 5



day 8



day 10



day 15

As vegetables rot they release “foods,” such as nitrogen, phosphorus, potassium, and other minerals, that are used by growing plants.





The Colorado beetle is a pest that eats garden plants.



Pesticides

A pest is an animal that causes damage. Pests are a problem for gardeners. They damage vegetable plants by munching on their leaves and stems. Pesticides are chemicals that kill these animals. Unfortunately, when pesticides are applied to plants, they don't just kill the unwanted pests. The chemicals can spread through air and water, killing other wildlife. Because of these dangers, green gardeners don't use chemical pesticides. Instead, they often use a natural pest control method called companion planting. In companion planting, plants that help or protect other plants are planted near one another.

Varieties of marigolds are often used as companion plants. Marigolds and bush beans have been called "Nature's Partners" because the odor of the marigold drives away the kind of beetle that eats bean plants.



cabbages



French marigolds

The brilliant colors of French marigolds lure insects away from cabbage plants.

Green gardeners have learned to plant French marigolds near cabbage plants and other leafy vegetables. Their bright yellow color lures insects away from nearby vegetable plants, and their roots give off a natural chemical that is poisonous to harmful pests.

Because of their strong odors and flavors, herbs are often used as companion plants. Dill is often planted near squash because it drives away bugs that eat squash leaves.

Introducing natural predators into gardens is another way of dealing with pests. For example, toads and ladybugs feast on Colorado potato beetles. Attracting them into a garden is a way to eliminate these beetles without using chemical pesticides.

Netting over plants is one way to keep out flying insects.



One Year's Water



United States
411,400 gallons



Australia
332,200 gallons



United Kingdom
45,100 gallons



Kenya
18,920 gallons

The amount of water used by one person in a year varies by country. People living in the United States use more water than those in any other country of the world.

Water

Fresh water is another nonrenewable resource. Although the amount of water available never changes, the amount of people using the water keeps growing. We are using water faster than the Earth can recycle it. Some scientists have warned that by the year 2025, two out of every three people will not have enough water.

All plants need a certain amount of water to live, so gardeners can't reduce the amount they use. But they can make the most of the water around them by recycling rainwater.

During a storm, a lot of rainwater flows off roofs and is lost as it runs into streets and drains into underground sewer systems. Using a simple system of rain spouts on roofs, people can collect rainwater in barrels and use this to water their gardens. Several barrels of water can be collected during a steady rainfall.



Green gardeners usually plant only native plants. Plants that grow naturally in an area are less likely to need extra water or fertilizer.



Pure rainwater is better for plants because it contains fewer chemicals than tap water.





Landscaping

Do you remember the garden from the beginning of this book? It contained some wooden and stone items. Green gardeners might use wooden and stone items in their gardens, but they would be very picky about where these



Protective sleeves help newly planted trees survive.

materials came from. For example, they could use wood products made from trees grown on sustainable wood plantations. On these plantations, new trees are planted to replace every tree that is cut down. Wood grown in this way is a renewable resource.

In 1993, a worldwide committee called the Forest Stewardship Council (FSC) was set up to check on where lumber comes from and whether or not it is grown in a way that protects a forest's future. If the lumber meets the FSC's approval, it is stamped with a logo and the letters *FSC*. This makes it easy for people to identify and buy only products made from wood grown in sustainable forests.

Lots of stones and rocks are dug from rock beds for use in landscaping. Using rocks and stones that are naturally in an area, rather than bringing in rocks that have been dug from the ground, is a better use of a nonrenewable resource.

Recycled materials such as pottery, shells, sea glass, and driftwood are environmentally friendly additions to any garden.





On the Farm

If you think of a farm as a giant garden, you'll see that farmers face the same challenges as backyard gardeners—only on a much bigger scale. Pests, for example, are a small annoyance for gardeners, but a huge problem for farmers. To keep harmful insects off plants, many farmers use small planes to spray pesticides on their crops. In addition to landing on plants, these chemicals are often carried into nearby rivers and lakes, causing major pollution problems.

Planes are a quick way to spray pesticides over a large area.



Algae are tiny, plantlike organisms that grow very fast in chemically polluted water. They can form a thick layer called an algal bloom. This can keep sunlight from getting to water plants. Algae can also use up lots of oxygen that is needed by fish. This can cause the fish to die.

Water usage on a farm is another very big challenge, because big fields need huge amounts of water. Normally, farmers clear nearly all the trees and stones from their fields. To conserve water, some green farmers have chosen to keep these things in their fields. Large rocks and trees provide shade for plants. Plants that are sheltered from the sun need less water. Also, the roots of trees hold moisture in the soil.

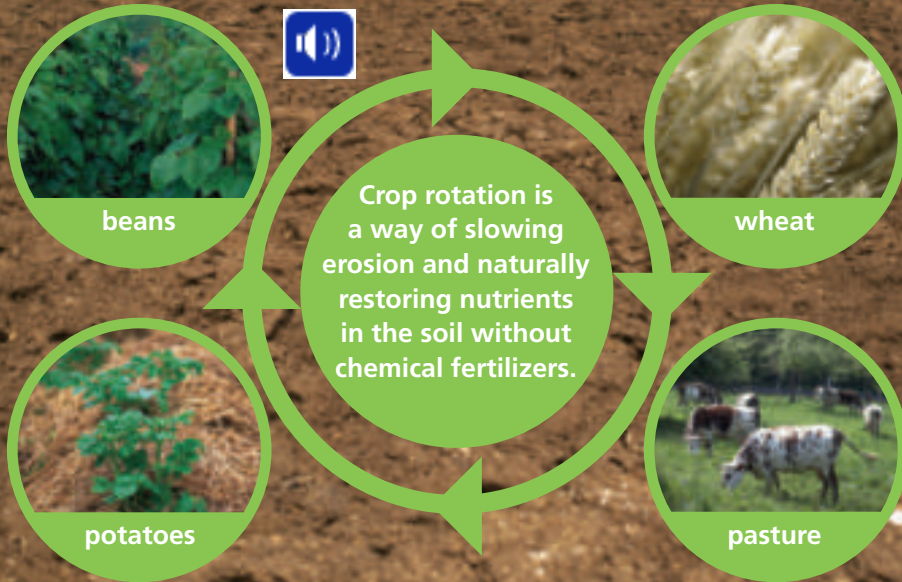




Soil Management

In nature the amount of soil being made and the amount of soil that erodes in an area are usually balanced. However, farming activities such as plowing cause soil to erode quickly. When soil erodes faster than it is made, it becomes a nonrenewable resource. Green farmers practice crop rotation to reduce erosion, keep soil healthy, and eliminate the need for chemical fertilizers.

Plowing fields can cause soil to erode rapidly.



Soil Erosion



1. Water is poured into two pots. One has only soil, and the other has a plant in the soil.

2. More water drains through the pot without the plant in it. The water carries soil away with it.



Crop rotation is a process of growing a different type of plant in one place each year. All plants need a gas called nitrogen to live. Most plants, such as potatoes, take nitrogen from the soil. Beans, however, are plants that replace nitrogen in the soil. If a farmer grows potatoes, the soil lacks nitrogen after the growing season. If the farmer grows beans the following season, part of the nitrogen used by the potatoes gets replaced.

After a season of growing beans, a farmer might plant a different crop, such as wheat. This is to control pests. Pests are usually attracted to a particular kind of plant. If the same crop is grown in the same field year after year, insects that eat that plant keep coming back. But if that plant is not grown in a field for several years, the insects leave.

Then, during the fourth year, a farmer might let animals graze in the field. This allows the soil to rest, and the waste left by the animals fertilizes the soil.



Solutions

In many cases, farmers need to use fertilizers and pesticides to grow large crops of food. However, there are some ways that they can limit dangers to the environment. For example, some farmers fertilize plants only with animal waste and decomposed plant materials, never using any non-natural chemicals at all. This is known as organic farming. Organic fruits and vegetables may not look as colorful and shiny as those grown with chemicals, but they often taste better. Without a doubt, they are friendlier to the environment.

An organic farmer is checking his crops.



Like green gardeners, organic farmers often use plants as natural pesticides. For example, farmers sometimes plant whole fields of sunflowers. The reason for this is that sunflowers give off a natural chemical that keeps weeds from growing. If sunflowers are grown in a field before other crops, weeds will be reduced naturally.

Corn and clover are also partners that farmers plant together. They plant clover between rows of corn. After the corn is harvested, the clover grows during the fall and the winter. Since clover is a legume, it replaces the nitrogen in the soil that the corn took out.

Farmers also plant “trap crops” to fool pests. For example, cucumber beetles like to eat cucumbers, but they like radishes even better. A farmer might plant radishes as a trap crop that the beetles will eat instead of the cucumbers.

Birds can be pests if they eat seeds and fruit. An environmentally friendly way of scaring them away is by placing scarecrows in fields.



organic carrots





Going Green

Green gardening is a way of gardening that uses as few nonrenewable resources as possible and avoids chemicals that can harm the environment. Green gardeners use recycled rainwater instead of tap water. They do not use non-natural chemical fertilizers. In place of these they make a homemade fertilizer called compost. The use of chemical pesticides is also avoided. Instead, they use companion planting. Green gardeners also drive away pests with natural predators and other pest controls such as scarecrows.



Green farming is similar to green gardening, only on a much larger scale. Green farmers rotate crops to reduce erosion, keep soil healthy, and eliminate the need for chemical fertilizers. Legumes are an important part of crop rotation because they replace nitrogen used by other plants. Farmers also plant companion plants and trap crops to control pests and reduce the need for chemical pesticides.

Green gardening and farming are important ways of protecting our world. And they will become more important as our population grows and more people need food. Green gardening is easy to do, and it starts in your own backyard!



Compost is used in place of chemical fertilizers.



Recycled rainwater is used instead of tap water.



Scarecrows are a means of natural pest control.



The use of sustainable wood with the FSC logo protects a valuable resource.



Glossary

companion planting	using one type of plant to protect or help another by planting them near each other
compost	a homemade fertilizer made from animal waste, soil, and recycled plant matter
crop rotation	the practice of planting a different crop each year in a single field
organic	grown without the use of any non-natural chemicals
peat	decayed plant matter
pesticide	chemical that kills the animals that damage plants
sustainable	able to be maintained into the future

What did you learn?

1. What is a “trap crop”? How does it protect other crops?
2. Why are beans an important stage of crop rotation?
3. Too much fertilizer in a body of water can cause problems. Explain why.
4. **Writing in Science** Some farmers practice organic gardening as a way of limiting harmful effects to the environment. Explain organic gardening in writing. Include details about it from the book to support your answer.
5. **Main Idea and Details** The main idea of the first paragraph on page 7 is that green gardeners do not use chemical fertilizers. What are two details in this paragraph?

