

**The Food Supply**

Think about the origin of all of the items in your most recent meal. Where did each item come from? How many hands did it pass through from the source to your plate? Spontaneously write anything that you know about the topic.

**Writing Tips**

Follow these steps to freewrite:

- Try to write for ten minutes without stopping.
- Let your thoughts flow freely. Do not worry about organization, grammar, or spelling.
- Instead of planning, let each word or idea lead to another.

**Freewriting**

This writing activity prompts students to think about the origins of the ingredients in a recent meal. Students' freewrites will vary in form and content. Look for ideas that are original, compelling, and have potential for development.

**Activate Prior Knowledge**

**Explore the Photo**

Caption Answer: Answers will vary. Encourage students to share their responses with the class. Students who have experience growing food may say they have a garden in their backyard or have worked on a farm.

Discussion: Ask students: If you grow your own food, what factors are necessary for the food to grow? (Answers include a healthful environment with sunlight, water, and nutritious soil.)

**CHAPTER 3**

**Chapter Overview**

*Introduce the Chapter*

In this chapter, students learn about factors that influence food supply, such as natural resources, economics, farming method, fuel shortages, and politics. Students examine global food and water problems, and learn about potential solutions.

**Build Background**

Ask students if they have heard any news stories about food and water supplies. Are any of the issues new, or have they been issues in the past?
Main Idea
The world's food supply varies from place to place, and is influenced by many factors.

Content Vocabulary
You will find definitions for these words in the glossary at the back of this book.
- ecosystem
- food chain
- herbivore
- carnivore
- biodiversity
- shelf-stable
- domestic
- periodic

Graphic Organizer
Use a graphic organizer like the one below to take notes about the four main components of the food chain.

THE FOOD CHAIN

<table>
<thead>
<tr>
<th>SUN</th>
<th>PRODUCERS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COMPOSERS</th>
<th>DECOMPOSERS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Academic Standards

**English Language Arts**
- NCTE 12 Use language to accomplish individual purposes.

**Mathematics**
- NCTM Data Analysis and Probability Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.

**Science**
- NSES D Develop an understanding of energy in the earth system.

**Social Studies**
- NCSS VIII Science, Technology, and Society Study relationships among science, technology and society.

Before You Read
Tell students that many different factors can affect how much food is available for people all over the world. Some of these factors include climate, economics, and politics.

Develop Concepts
Main Idea Discuss the main idea with the students. Ask students: With today's global economy, why do you think food supplies vary by place? Explain. (Answers will vary, but may include that transportation and other infrastructures may not be completely reliable and that political and economic factors may prevent food from reaching certain areas.)
Ecosystems

The story of food begins with biology. All organisms, including humans, live as communities in environments. An environment can be as small as a pond or as large as a forest or ocean. An environment and its community of organisms, which all depend upon each other for survival, is called an ecosystem. The food we eat depends on the health of the world’s ecosystems.

The Food Chain

In an ecosystem, organisms get food from other organisms and from the environment. The food chain is the flow of food energy from simpler to more complex organisms. The food chain is one part of a complex web of life. This web has four main components.

Sun The sun supplies the original energy for the planet in the form of light. This energy is needed to make food.

Producers Some organisms make, or produce, food. Green plants are important producers. Plants use the sun’s energy to produce food for themselves.

Consumers Consumers are organisms that must eat other organisms to survive. In the ecosystem that includes humans, consumers come in three types. An herbivore (ˈhər-bər-ˌvȯr) is an organism that eats only plants. Cows and sheep are herbivores. While vegetarians are sometimes considered herbivores, the word is better used for animals whose stomachs cannot tolerate anything but plant food. A carnivore (ˈkār-nə-ˌvȯr) is an organism that feeds almost entirely on other animals. Cats, wolves, and hawks are carnivores. An omnivore (ˌə-mn-ə-ˌvȯr) is an organism that eats both plants and animals. Pigs, chickens, and most humans are omnivores.

Decomposers Decomposers are organisms such as bacteria and fungi that break down dead matter and return the nutrients to the environment. Decomposers are sometimes called recyclers, because they provide producers with the raw materials needed to start the cycle again.

Biodiversity

In a healthy ecosystem, all elements work together. Living organisms have a continuous set of relationships with every element within their ecosystem. If any part of an ecosystem disappears, food supplies are threatened.

To function properly, every ecosystem needs biodiversity, a wide variety of species. Biodiversity lessens the risk of a break in the chain, because each role is filled by more than one organism. For example, butterflies carry pollen from plant to plant so they can produce fruit. Recently, an unusually harsh winter killed many monarch butterflies in North America. With biodiversity, other butterfly species, as well as bees, could carry on the role of pollinating plants.

Natural Resources

Every ecosystem is supported by natural resources. Essential resources include land, water, and climate.

Land Nutrient-rich soil is needed for plant life, even underwater. Growing crops takes nutrients from the soil. Fertilizers can replenish nutrients, but they can also create pollution. Too much pollution can affect plants’ ability to synthesize sunlight.

Water Clean water is crucial to all ecosystems, even deserts. Marine life needs clean fresh or salt water. On land, plants and animals get water from rainfall and snowmelt, which feeds lakes and rivers. Most farms and ranches are irrigated with water taken from lakes, rivers, or streams.

Climate Different plants and animals grow best in different climates. Mushrooms thrive in cool, moist surroundings. Citrus prefers heat. Brahman cattle are well adapted for the heat and humidity of their native India, while sheep prefer the cooler, wetter climates of Ireland and New Zealand. If global warming changes the climate, food production suffers.

Universal Access

Auditory Learners

Bees and Food Supplies Tell students that the bee population has declined throughout the world. Ask students to discuss what this might mean for global food supplies. (Bees help pollinate crops to produce fruits and vegetables. A drop in the bee population might mean problems pollinating crops and a drop in food supplies.)
The Food Supply in the United States

The earth provides resources in abundance, but these resources are not evenly distributed. The United States is fortunate to have abundant resources for raising food. Along with a temperate climate and a plentiful water supply, the U.S. has a wide expanse of good farmland and pastureland.

Food Producers

Farms, ranches, and fisheries produce much of the food you eat. Some foods may travel thousands of miles over land or sea to get to your table.

Farmers in the United States produce enough food not only for domestic use but also for export. A century ago, rural America was dotted with many small family farms. Today, many family farms have been absorbed into large operations.

Large farms often specialize in a single crop. Growing a single crop over a huge area is efficient, but harms biodiversity. Large operations may also apply more fertilizer and pesticides than small farms. Food shipped great distances may have reduced quality and flavor.

Food Processors

Once harvested, most food is shipped to processors to be cut, cooked, canned, dried, or frozen. When corn is shipped to a processor, for example, the kernels may be dried and ground to make cornmeal or soaked, pulverized, and treated with acids to release corn oil. When animals are processed for food, they are slaughtered and then processed into different forms of meat. Fruits and vegetables can be harvested at their peak of ripeness and frozen at that level of quality.

One important role of processing is to keep perishable foods from spoiling. Processing makes food shelf-stable, able to be stored at room temperature for weeks or months in the original, unopened containers. Such foods also have a longer shelf life, the length of time food holds its flavor and quality.

Transportation of food also contributes to global warming.

The growth of industrial farms has contributed to a renewed interest in locally grown food. Many people are turning to farmers’ markets, Community Supported Agriculture (CSA) projects, urban gardens, and other programs that make it possible to “eat local.”

In the United States, most food comes from large farming and ranching companies. What difficulties do small family farms face today?

Food on a Massive Scale

In the United States, most food comes from large farming and ranching companies. What difficulties do small family farms face today?

Explore the Photo

Caption Answer Many family farms have gone out of business due to increased competition from large, industrial farming operations that can grow food more efficiently. However, family farms are becoming more popular due to a renewed interest in locally grown food.

Discussion Ask students: Can you think of other environmental concerns that can contribute to the loss of biodiversity? (Answers will vary, but may be related to overpopulation, deforestation, pollution, or global warming and climate change.)

Draw the Connection

Universal Access

English Language Learners

Reinforce Vocabulary

Some students may have difficulty understanding the difference between shelf-stable and shelf life. Have students use the library to find the definitions for each term. Have students write the words and their definitions on a sheet of paper; then write two or three sentences that feature each word and demonstrate its meaning. (Students’ definitions may vary. Ask for volunteers to write their definitions on the board.)
Five common preservation processes are:

**Canning** Canning seals food in airtight metal or glass containers, which are then heated to destroy microorganisms that could cause spoilage or illness. Fruits, vegetables, legumes, meat, poultry, fish, and juices are examples of foods that are canned.

**Freezing** Foods are frozen quickly to slow the growth of any harmful organisms. Fruits and vegetables are often frozen shortly after picking. Meat, poultry, and fish are frozen to preserve their freshness until they are ready to be prepared. Many convenience foods come in frozen form.

**Curing** Salt, spices, sugar, and sodium nitrite are added when foods are cured. Nitrites prevent meat from turning grey. Curing is used to create products such as salami, pickles, sauerkraut, and kimchi. Many cured foods are high in sodium.

**Drying** Drying removes moisture from food, inhibiting the growth of harmful organisms. Grains, beans, milk, and fruit are often dried. Many dried foods require the addition of water during their preparation.

**Freeze-Drying** Freeze-drying first freezes and then dries food. This process retains more flavor, texture, and nutrients than drying alone. Freeze-drying is used to make instant coffee and dried soup mixes.

**Controlled Atmosphere Storage** This technique extends shelf life by holding foods in a cold area with specific amounts of nitrogen, oxygen, and carbon dioxide. Humidity and temperature are carefully regulated, inhibiting the growth of harmful organisms. It is especially useful for fruits.

---

### Food Additives

Have you ever wondered how jellybeans get their brilliant colors? Food additives are the answer. A **food additive** is a substance added to food for a specific reason during processing. Some additives have natural sources. Others are chemicals created in laboratories. The U.S. Food and Drug Administration monitors the safe use of additives. You can find information on specific additives by checking the FDA’s web site at www.fda.gov.

Besides adding coloring, food additives are frequently used for these five reasons:

**Adding Flavors** Natural and artificial flavors, including sweeteners, enhance food’s taste. Many packaged foods and beverages contain some sort of added flavoring. Try reading the labels of the foods you have on hand at home to see how many contain added flavors.

**Improving Nutrition** Vitamins and minerals are added to many foods, such as milk, juice, and breakfast cereal. These foods are often labeled “fortified.” Many people rely on these types of food additives to meet their daily requirements for certain nutrients like vitamin D, calcium, and niacin.

---

**Activity correlated to Social Studies standards.**

---

**TEACH** cont.

**Skill Practice**

**Guided Practice**

**Identify** Have students identify and describe one form of preservation processed food that they have eaten. (In one sentence, students should identify the food and form of preservation and explain how and when it was served. Sample answer: I eat dried fruit and canned nuts when I go on camping trips.)

**Connect** Have students identify five common forms of food preservation and connect each type to a specific food that they have eaten. (Paragraphs will vary, but may include: canning, canned green beans; freezing, frozen corn; curing, ham; drying, beef jerky; freeze-drying instant noodle soup.)

**Apply** Have students write a paragraph to describe forms of food preservation that would be most conducive to the types of food they would take on a camping trip. Encourage students to use specific examples. (Paragraphs will vary, but may include a variety of canned, dried, freeze-dried, and cured foods. Have students share their paragraphs with the class.)

**Reading Strategy**

**Identify Additives** Have students visit the FDA’s Web site to research the types of additives used in foods. Encourage students to take notes and use a chart to organize their data. (Charts will vary, but might include natural and artificial flavors, vitamins and minerals, food preservatives, or emulsifiers and stabilizers.)
Increasing Shelf Life  Some additives delay spoilage. These are also known as preservatives. Sulfur dioxide, for example, is a preservative that keeps dried fruit from turning brown. Foods without preservatives must be consumed more quickly than those with them.

Maintaining Texture  Additives are used to make the texture of processed food more appealing. Substances such as emulsifiers, stabilizers and thickeners are all added to make foods smooth, creamy, or spreadable. A chemical is even added to some pickles to keep them crisp after canning.

Helping Foods Age  Many foods, including cheese, meats, and flour, are aged before they are sold. Additives can speed the aging process. Foods that are aged can be desirable because aging lends them a distinct flavor or texture. Food additives are not new. Salts and spices have been used to cure meats for thousands of years. The use of artificial additives, however, has increased. Some people believe that added chemicals are unnecessary and possibly harmful. As a result, some food processors make products that are free of chemical additives.

Apples on a Journey  Foods pass through several stages before reaching a location where you can buy products and take them home for your table. What are some factors that can affect the price of applesauce?

Ripe for the Picking  Apple growers try to wait until fruits are near or at their peak of ripeness before picking them. This ensures that the apples will bear as much fruit as possible. Once picked, apples are transported to a factory.

Processed and Packaged  At the factory, apples are cleaned. They may also be packaged, canned or crushed for applesauce. Additives may be added to increase the shelf life of packaged apple products. From there, apples and apple products are transported to grocery stores and supermarkets.

Time to Eat!  Once at the store, apple products may remain on shelves for months before being purchased and brought home where they may be consumed. Fresh apples kept in a refrigerator can last for weeks. Packaged apple products can last for months.

Figure 3.1  Food Distribution Cycle

Caption Answer  Answers will vary but may include damage to crops, cost of machinery at factories, gas prices, and labor.

Discussion  Ask students: Why do you think prices should be changed when production costs change? (Students may say that producers must maintain a profit or go out of business.)
Packaging

Packaging, or putting food in containers, is the final step in processing. Containers help preserve the quality, shape, and appearance of food. They also make it easy to ship large quantities of a product. Familiar packaging materials include paper, plastic, glass, aluminum, and lightweight steel. Packaging methods are continually updated, allowing food manufacturers and processors to offer new products. Some containers allow a product to remain on a shelf for long periods of time.

Food Distributors

Food is shipped by truck, train, and plane to distribution centers throughout the world. Distribution centers are huge warehouses with controlled temperatures. Figure 3.1 shows a food distribution cycle. From here, food takes the last leg of its journey, to the store where you buy it.

Some distributors work regionally, while others work nationally or internationally. Some specialize in baked goods, meats, frozen foods, or gourmet items. Some distribution centers are owned by supermarket companies. Others are separate businesses that contract out space to different food sellers.

Food Retailers

Distributors ship food to retailers, which sell food directly to you. Supermarkets are the most popular food retailers in the United States. Specialty shops, neighborhood markets, farmer’s markets and produce stands are examples of smaller food retailers.

Food processors and manufacturers constantly develop new products in an effort to win consumers. Some stores review as many as 100 new products a week. Because shelf space is limited, however, only the most promising items are accepted. New foods that do not sell well are pulled from the shelves.

Global Food Problems

Some nations enjoy an abundant food supply, but other nations do not. In an industrialized nation, a country with a developed economy and a high standard of living, a sophisticated food industry provides people with a varied and nutritious diet. Industrialized nations that cannot produce enough food, such as Japan, Kuwait, and Switzerland, can afford to import it.

In developing nations, the situation is different. Developing nations are countries that are not yet industrialized or that are just beginning that process. People in these countries face many obstacles to feeding themselves and their families.

Imagine that one out of every seven people you know has only one meal a day and eats nothing for days at a time. That is the reality for about 15 percent of the world’s population, some 800 million people. The most severe form of a food shortage is famine, which can last for months or years and cause thousands of deaths. Unfortunately, some people in industrialized countries face hunger and poverty too.

Global hunger has many complex causes, including economics, poor use of resources, rapid population growth, and political conflicts.

Economics

In developing countries, many people are too poor to buy food. Many families raise their own food on a small plot of land, a practice known as subsistence farming. Families live on what they can produce. They usually have a limited food supply with little variety and poor nutrition.

Some farmers accumulate enough land to grow cash crops—crops they can sell. However, since food prices change frequently, many cash-crop farmers cannot depend on a steady income.

In many countries, governments and utility companies cannot provide the services needed for a reliable food supply. Imagine trying to run a food processing plant in a city where the electricity shuts down for a few hours every day.

Universal Access

English Language Learners

Distribution Differences

Students learning English may struggle with the distinction between distributors and retailers. Have them write both words, each at the top of a column. Then provide them with examples of each. Have students add five more examples to each list.
Inefficient Methods

Subsistence farming makes use of ancient methods. Animals supply power. Farm tools are simple. Food production is low. Modern equipment and methods are costly, however, and not always suited to the crops and conditions.

Developing countries also lack modern food storage facilities. Food is stored unprotected, where it can be damaged by animals, insects, and mildew. Refrigeration may be unavailable, so dairy foods, fresh produce, and meat spoil quickly.

Good roads are rare in developing nations, especially in the countryside. Bicycles and donkey carts are more common than trucks. City dwellers may have enough to eat, while villagers a few miles away are struggling. In times of famine, poor distribution keeps food aid from reaching starving people.

Natural Disasters

A natural disaster can cripple a region’s food supply for years. A drought, an unusually long period without rain, kills crops and animals. Floods and hurricanes wash away soil and roads. In areas with poor food production and distribution systems, a natural disaster can bring about famine and starvation.

Rapid Population Growth

The world population is growing steadily and will reach nine billion by 2050. The most rapid population growth is in developing countries. As populations grow, so does the demand for food. Yet more land is taken for housing, leaving less land for farming. The population in many developing nations is too large for the food supply.

Fuel Shortages

Most food must be cooked to be eaten, so cooking fuel is essential. In developing countries, wood is the main fuel source. In many areas, the wood supply is dwindling as forests are cut for farming or construction. Gathering enough wood for a day’s meal can mean walking for half a day. Without trees and shrubs for fuel, people use dung, dried animal manure. Dung produces a lot of smoke but little heat.

Conflict and Politics

Armed conflict can devastate food supplies. Animals are killed and crops are destroyed. Farmers are driven from their land, and fighting disrupts food distribution.
Fighting can disrupt planting and harvest seasons. Seed for the following season may be destroyed. Workers who help with harvest may be driven away.

To escape the danger, many people flee to nearby regions. Thousands of refugees stream into an area, where the local food supply cannot support the surge in population. Everyone suffers.

Food is also used as a political weapon, to punish opponents or reward supporters. A ruling party may limit food distribution only to urban areas. This forces people to leave rural homes, which are then given to political allies. Efforts by relief agencies like the Red Cross, may be thwarted by ruling governments or warlords. Food aid may be stolen and sold on the black market, never reaching those in need.

In recent decades, such tactics have left millions starving in Uganda, Rwanda, Zimbabwe, and Congo in Africa and Bosnia in southeastern Europe.

**What Would You Do?** You are helping your family with household chores. You mop the floor using a bucket full of strong cleaner. When you are done mopping, what should you do with the cleaner remaining in the bucket? Should you pour it down a sink drain, outside on the grass, into the gutter, or elsewhere?

**Reading Check** Contrast What is the difference between industrialized nations and developing nations?

**SAFETY MATTERS**

**Causes of Contamination**

Pollution is a serious threat to the world’s water supply. Even in industrialized countries with sanitation systems and water treatment plants, pollution is a problem. Rainwater carries oil, gasoline, and garden chemicals from streets and lawns into storm sewers. Animal waste from farms washes into streams. Factories release chemicals into rivers and the air, causing acid rain. In developing countries, more than two billion people have no sanitary system. Toxic chemicals and wastewater are dumped into rivers and lakes, which feed wells and streams where people draw water. Every year, contaminated water kills 1.4 million children under age five.

**What Would You Do?** You are helping your family with household chores. You mop the floor using a bucket full of strong cleaner. When you are done mopping, what should you do with the cleaner remaining in the bucket? Should you pour it down a sink drain, outside on the grass, into the gutter, or elsewhere?

**Explore the Photo**

**Caption Answer** Water for agriculture comes from groundwater and from lakes, rivers, and streams.

**Discussion** Ask students: What are some of the other ways we are dependent on water? (Answers will vary, but may be related to growing food, generating power, cooling machines, carrying waste, bathing, cleansing, drinking, cooking, and watering plants.)
Global Water Problems

Water covers three-fourths of the earth’s surface. Ninety-eight percent of it is salt water, which is unusable for humans, crops, and farm animals. Seventy-five percent of the earth’s fresh water is frozen in the polar regions. Of the total water on this planet, less than one percent is available for human needs.

Fresh water flows in lakes, rivers, and streams. **Groundwater** is water beneath the earth’s surface, in the cracks and spaces between rocks and sediment. Groundwater is brought to the surface by digging wells.

Some areas of the earth have ample water, such as the land along the Amazon River in South America and around the Great Lakes in North America. Many other areas experience **periodic** or even permanent drought.

The earth’s growing population is straining its water supply. Today, one billion people around the world lack access to clean water. About 70 percent of the world’s fresh water is now used for agriculture. As populations grow, however, urban demands for water are expected to exceed rural ones.

**Solutions to Global Food Problems**

Oxfam International, the Food and Agriculture Organization of the United Nations and other organizations work in villages around the world to improve farming methods and provide access to clean water. Many organizations now offer microloans to farmers and other entrepreneurs to buy equipment and start businesses. People who once depended on food aid are starting bakeries, organizing fishing cooperatives, and growing cash crops. Farmers across the world are also creating seed banks of crops native to their region to preserve biodiversity.

**Increase Food Supplies**

To feed the world, we must create more food with the resources we have. Science can provide some solutions. For example, researchers are developing plant varieties that can resist disease and pests and tolerate drought and poor soil. Engineers have designed an irrigation system that uses a foot-powered pump to water a family garden—more efficient than hauling water in buckets. Organic and alternative farming methods can also help by keeping the earth healthy and fertile for future generations.

**Organic Food Production**

**Organic farming** is a way of farming that protects the environment and does not use pesticides or artificial fertilizers. Soil is fertilized with compost and animal manure rather than chemicals. Organically raised animals are treated more humanely and fed healthful feed that is free of chemicals and drugs. Farmers use an ecological approach to pest management and avoid pesticides.

**Alternative Farming Methods**

The goal of alternative farming is to produce more food on less land and with less harm to the environment.

**Agroforestry** is an ancient practice of raising shade-loving crops, such as mushrooms and cocoa, under the shelter of trees. The trees control erosion, improve the soil, and preserve forest habitats. Some trees also provide lumber, oils, and extracts for medicine. Shade-grown coffee is one popular product of agroforestry.

**Hydroponics** is growing plants without soil. Plants are grown in water or a lightweight medium such as coir or rockwool. They are fed with nutrient-enriched water. Hydroponic crops are usually grown in glass greenhouses.

**Aquaculture** is a method of raising seafood in enclosed areas of water. Fish farms may be ponds or enclosed areas of ocean. Aquaculture creates a large amount of food in a small area. It can also help to protect wild fish populations from overfishing. Unfortunately, aquaculture also generates a great deal of animal waste, which pollutes rivers and oceans.

**Conserving Water**

**Identify** What percentage of the planet’s water supply is available for human use?
Develop Alternative Fuel Sources

Most of the world’s energy comes from fossil fuels such as oil, coal, and gas, which are nonrenewable. Alternative energy—from wind, water, and sun—offers the best hope for the future.

Solar Energy
Solar power is renewable, nonpolluting, and practical. Solar panels can be installed on almost any surface. Solar energy has countless uses. Solar water heaters, lights, and water purifiers are used around the world. Solar cookers, made from cardboard and aluminum, are inexpensive, versatile, and good for the environment.

Wind Power
Wind is another source of power. Giant windmills and turbines turn with the wind and convert this motion into electricity. U.S. farmers and other landowners who install turbines are paid by their utility company for any excess electricity they produce.

Practice Sustainable Living

Solving global food and water problems will require a basic change in the way we live. If everyone lived like the average American, we would need six planets to have enough resources to go around! The alternative is sustainable living, making life choices to meet your own needs while still protecting the environment. When you live sustainably, you act with concern for the needs and quality of life of all people.

Simple steps can help you live sustainably. For example, you could buy locally grown foods, which require fewer preservatives to stay fresh and less fuel to transport. You could repair appliances and clothes rather than buying new ones. You can bike to school rather than taking a car, using less gas and creating less pollution. You could install low-flow aerators in all the sinks in your home to reduce water waste. Everyday choices like these can help to ensure that future generations can count on the same resources we enjoy today.

Chef’s Salad

Ingredients
- 2 heads iceberg or romaine lettuce
- 2 Tomatoes, cut into quarters
- ½ cup shredded carrots
- 1 Cucumber, sliced
- 4 Tbsp. Red wine vinegar
- 8 Tbsp. Olive oil
- 1 Tbsp. Chopped fresh parsley
- 2 Hard-boiled eggs, cut into quarters
- ½ pound Sliced or cubed low-sodium turkey breast
- 4 oz Sliced or cubed lowfat cheddar cheese

Directions
1. Chop the lettuce into bite-size squares and put into a large bowl with the tomatoes, carrots and cucumber slices.
2. In a separate mixing bowl, combine the vinegar, olive oil, and parsley. Pour the dressing over the salad and toss gently.
3. Divide the salad equally into four bowls. Top each with the quartered eggs, turkey and cheese.

Yield 4 servings
Nutrition Analysis per Serving
- Calories 351
- Total fat 22 g
- Saturated fat 5 g
- Cholesterol 141 mg
- Sodium 607 mg
- Carbohydrate 15 g
- Dietary fiber 9 g
- Sugars 9 g
- Protein 24 g

Recipe Prep Tip
If you demonstrate how to make this salad, you might go through each ingredient with students and ask where each item might have been grown. Regardless of where your lab supplies are purchased, you can discuss with students the distances each ingredient traveled to get to the lab.

Sentence Completion
Ask students to complete this sentence: “When I think about living sustainably, I…” Then have students write a paragraph using their sentence as the topic sentence. Paragraphs should build on the content in the topic sentence, and include details, and examples. After they are finished, ask students: What is sustainable living? Ask students to share their paragraphs with the class.
After You Read

Chapter Summary
Our food supply depends on the health of the world’s ecosystems. Different components of the food chain work in harmony with natural resources to comprise a healthy ecosystem. In the United States, food is abundant. Food problems caused by economics, insufficient farming methods, natural disasters, population growth, fuel shortages, and political conflicts affect many people worldwide. Water contamination is also a global issue. To feed the world, we must create more food with the resources we have.

Content and Academic Vocabulary Review
1. Arrange the content and academic vocabulary words into groups of related words. Explain why you grouped the words together.

Content Vocabulary
- ecosystem (p. 30)
- food chain (p. 30)
- herbivore (p. 30)
- carnivore (p. 30)
- omnivore (p. 30)
- biodiversity (p. 30)
- shelf-stable (p. 31)
- shelf life (p. 31)
- food additive (p. 32)
- industrialized nation (p. 34)

Academic Vocabulary
- developing nation (p. 34)
- famine (p. 34)
- subsistence farming (p. 34)
- groundwater (p. 37)
- organic farming (p. 37)
- agroforestry (p. 37)
- hydroponics (p. 37)
- aquaculture (p. 37)
- sustainable living (p. 38)

Review Key Concepts
2. Explain ecosystems and their relationship to food.
3. Describe the main sources of the U.S. food supply and the steps food takes from farm to consumption.
4. Identify global food problems and explain their causes.
5. Explain global water problems.
6. Describe solutions to global food problems.

Critical Thinking
7. Predict what would happen to the food supply if several plant species within an ecosystem became extinct.
8. Evaluate this situation. Your garden produces an abundant supply of strawberries, and you can not use the entire harvest right away. What would you do to prevent waste and ensure you could enjoy them later?
9. Explain the consequences to the food supply if a war in a developing nation sends refugees into a nearby country.
10. Explain why fuel a necessary resource for the food supply.
11. Paragraphs will vary but should cite specific reasons to support students’ stance in favor of one form or the other.

12. Answers will vary, but students choosing the energy bar may point to the protein it contains and may note that the energy bars weigh less and will take up less space in her backpack. Students who choose the apples may point to the lower cost, lack of additives and freshness.

13. Suggestions will vary but may include: recycle; buy products made from recycled materials; take shorter showers to conserve water; turn off lights that are not in use; or use a bike rather than a car.

Real-World Skills

Problem-Solving Skills
14. Answers will vary. Students may suggest that Wanda offer to do some of the shopping for her mother. Or, Wanda could make an effort to lead her family’s recycling efforts.

Interpersonal and Collaborative Skills
15. Each group should research a different organization, such as Oxfam, the Food and Agriculture Organization of the United Nations, the Red Cross, the Peace Corps, or the Salvation Army. Presentations should include: when the organization was formed; how it works; the number of workers and volunteers; who it helps; and how it supplies food to those in need.

Financial Literacy Skills
16. Students must first determine how many ounces equal one pound (16). Fresh peaches are $3.50 per pound, or (3.50 ÷ 16 = .22) 22 cents per ounce. Canned peaches are $2.49 per 15-ounce can, or (2.49 ÷ 15 = .17) 17 cents per ounce. Fresh peaches are $3.50 a pound. A 15-ounce can of peaches costs $2.49. Frozen peaches are $2.99 per 16-ounce package. Which is the best value?
**Academic Skills**

**Food Science**

17. **Solar Energy**  
Because solar energy uses no fuel, it is a form of sustainable living. Create sun tea to see solar energy in action.

**Procedure**  
Fill a 1-gallon glass jar with fresh cold water. Add 6–8 tea bags, and close the lid tightly. Place the jar outside in the direct sunlight for at least 4 hours. Remove the tea bags, and sweeten with sugar or honey. Serve over ice, or refrigerate for the next day.

**Analysis**  
What caused the water to change color? How is tea usually made? How was this method different? Write your answers in a paragraph.

**Mathematics**

18. **Graph and Analyze Population Trends**  
Total world population was estimated to reach 5 billion in 1985 and 6 billion in 2000. Experts predict that global population levels will continue to grow, hitting 7 billion in 2015, 8 billion in 2030, and 9 billion in 2050. Draw a line graph showing these past and future population figures.

**Starting Hint**  
Label the horizontal axis with years (use a five-year scale from 1985 to 2050) and the vertical axis with population in billions. Draw a point for each year for which you have data, and connect those points with a line.

**English Language Arts**

19. **Write a Song**  
Write an educational song about the four main components of the food chain: the sun, producers, consumers, and decomposers. Write four verses, each about one of the four different components: the sun, producers, consumers, and decomposers. Write one chorus about the food chain, which will be repeated between the verses. You can set your song to a melody you already know, or create a new one.

**English Language Arts**

19. **Write a Song**  
Write an educational song about the four main components of the food chain: the sun, producers, consumers, and decomposers. Write four verses, each about one of the four different components: the sun, producers, consumers, and decomposers. Write one chorus about the food chain, which will be repeated between the verses. You can set your song to a melody you already know, or create a new one.

**Test-Taking Tip**  
Analogies establish relationships between terms. When you look at the three pairs terms listed here, identify the relationship that is common to all of them. Then try matching each possible answer with the term food. The one that establishes the same type of relationship as the other terms is correct.

**ANALOGY**

Read the pairs of terms. Then choose the best word to pair with the term food.

20.  
sun : plants  
soil : crops  
snowmelt : lakes  
food : ________

- a. organic  
- b. people  
- c. biodiversity  
- d. water

**NCTE 12**  
Use language to accomplish individual purposes.

**TECHNOLOGY Solutions**

Use these technology solutions to streamline chapter assessment!

- **ExamView Assessment Suite**  
CD allows you to create and print out customized tests or ready-made unit and chapter tests, complete with answer keys.

- **Online Learning Center**  
Incorporates resources and activities for students and teachers.

- **TeacherWorks Plus**  
Is an electronic lesson planner that provides instant access to complete teacher resources in one convenient package.