

Chapter 14

Resources

Hoover Dam, near Las Vegas, Nevada, towers more than 200 meters above the raging Colorado River. This gigantic concrete structure is known as one of the greatest engineering projects in the world. Hoover Dam is called a *hydroelectric plant* because it turns the energy of falling water into electricity. The dam is important to the American southwest, because it brings water and electricity to millions of people. Using a natural resource like water to make electricity is one way to meet our growing demand for energy. What other natural resources do we use in our daily lives? Read this chapter to find out!



Key Questions

1. *What are some of Earth's resources?*
2. *Where do we get the energy for making electricity and for running automobiles?*
3. *What does it mean to conserve Earth's resources?*



14.1 Natural Resources and Energy

For tens of thousands of years, people have depended on Earth's resources for food, clothing, shelter, energy, medicine, and even entertainment, arts, and riches. What are the basic resources that Earth has to offer?

Natural resources

Material resources A **natural resource** is a feature of Earth that benefits people. Earth's natural *material* resources are things like air, fresh water, and soil. What would happen if any of these resources were missing? Study the scenes below and find the material resources. How does each of these benefit people?



Energy resources Some natural resources are used to supply energy to our busy world. Important *energy* resources are:

Energy Resources	
the Sun	tides
wind	coal, oil, natural gas
moving water	nuclear (radioactivity from uranium)
Earth's internal heat	biomass fuel (such as wood)

VOCABULARY

natural resource - a feature of Earth that benefits people.

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A forest can be considered a natural resource. Why do you think this is so?

Write an essay that answers this question.



Energy and daily life

Energy use Your alarm clock rings and you wake up for school. You shower, brush your teeth, dress, and grab a quick breakfast before catching a bus. This is how the day starts for hundreds of thousands of students all across the country. What part of that simple morning routine requires electricity and transportation energy? Almost all of it!

Electricity The first electric light company in the U.S. was started in 1878. Since then, our use of electricity has grown each year. What do you need to make electricity? You need an energy source. Earth's natural energy sources are used to make electricity. Think of all the ways you use electricity each day. The average American household uses about 10,000 kilowatt-hours of electricity each year. How much energy is that? If your body were able to utilize electricity as an energy source (rather than food) that much energy could keep you running for almost five months!

Transportation Electricity is not the only modern use of natural energy sources. Transportation uses a lot of energy too. In the United States alone, about *130 billion gallons* of gasoline are consumed each year. Where does gasoline come from? Gasoline is made from crude oil, which is pumped out of the ground, either on land or from the ocean floor.

Heating and consumer products In addition to being used for gasoline, oil can be used to heat homes. **Petroleum** is another name for oil, which is often used to heat homes. *Petrochemicals* are compounds made from oil. Petrochemicals are used to make plastics, medicines, cosmetics, and paints. Look around you now and see how many items are made of plastic. It takes petroleum to make all of those things.

VOCABULARY

petroleum - another name for the natural resource called *oil*.

CHALLENGE

Why do we need petroleum?

Petroleum is not just used to make gasoline—it is used to make many products we use daily. Here are some examples:

- plastic
- asphalt for paving roads
- synthetic rubber
- paraffin wax
- fertilizer
- detergents
- photographic film
- packaging materials
- paint
- carpet backing
- synthetic clothing fibers such as kevlar, nylon, polyester, acrylic, and spandex
- cosmetics

Make a sketch of one room in your home, and label all of the things made from petroleum.

14.1 Section Review

1. Define the term *natural resource*, and list all of the natural resources that exist in the area directly around your school.



2. List at least four major natural resources that you see in *each* scene above.
3. What two things in our modern lives require a lot of Earth's natural energy sources?
4. What is gasoline made from?
5. What is a petrochemical? What types of products can be made from petrochemicals?
6. What natural resource is plastic made from?
7. Study the bar graph in Figure 14.1 and answer the following questions.
 - a. What type of information does this graph give you?
 - b. How would the graph look if many more people in the United States used public transportation?
 - c. "Americans love their cars." Does this graph support that statement? Why or why not?

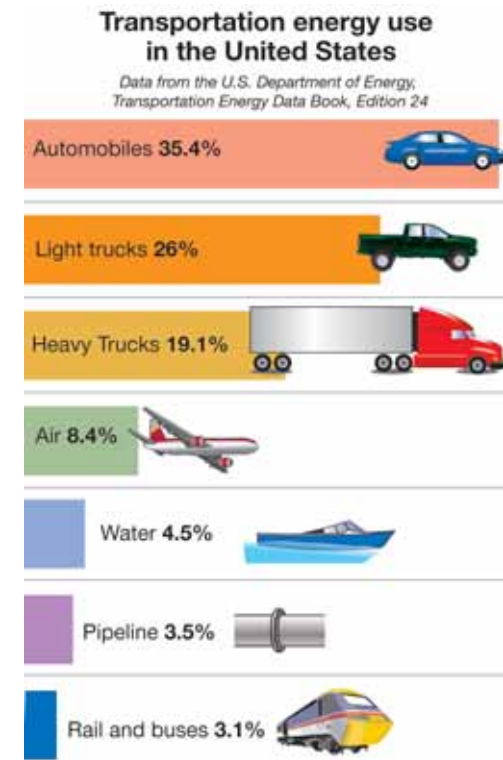


Figure 14.1: Use this bar graph to answer question 7.



14.2 Supplying Our Energy Needs

Think of how much you need electricity and how much you rely on motor vehicles every day. Making electricity and driving motor vehicles cause us to use Earth's energy resources.

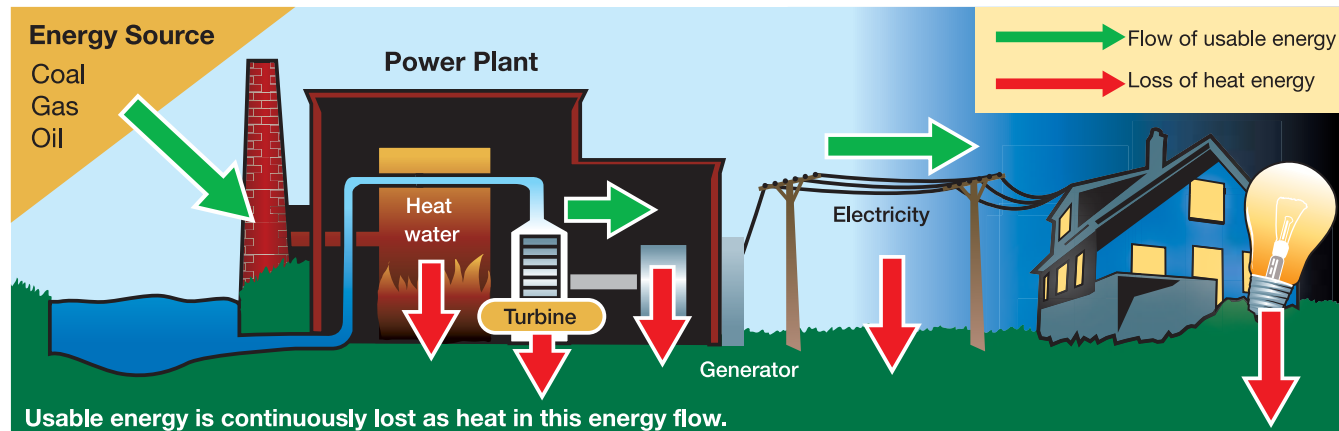
Making and transporting electricity

Starting at the power plant To find out how electricity is made and transported, let's trace the energy pathway. Look at the diagram below. Electricity is made in a power plant. Most power plants burn fossil fuels (natural resources like coal, oil, or natural gas) to produce heat. Next, this heat is used to boil water. The steam from the boiling water turns a turbine. The turbine turns a generator which produces electricity.

Electricity is carried by wires Electricity leaves the power plant and is carried to your house by wires. The fuel energy from the coal, oil, or natural gas changes its form several times on the way to your home. With each change, some energy is converted to heat. In fact, most of the energy that is transferred from fuels like coal, oil, and natural gas will eventually become heat energy. Some will be used, but most will be unusable.



Do some research and find out how far the nearest power plant is from your house. What is the name of the power plant? What energy source is used to make electricity at this power plant?



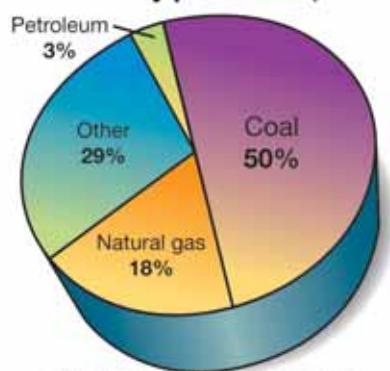
Electricity from fossil fuels

What is a nonrenewable resource?

A **nonrenewable resource** is not replaced as it is used. **Fossil fuels** are good examples of nonrenewable resources. Fossil fuels are found within the rocks of Earth's surface. They are called fossil fuels because they were formed hundreds of millions of years ago by processes acting on dead plants and animals. The three major fossil fuels are coal, oil, and natural gas.

Fossil fuels

U.S. energy resources used in electricity production, 2004



Source: Energy Information Administration, Form EIA-906, "Power Plant Report."

including the United States. Oil, coal, and natural gas can all be used to make electricity.

The future of nonrenewable resources

Nonrenewable resources like coal, oil, and natural gas are not replaced as they are used. This means that someday we will not have enough coal, oil, and natural gas to produce the electricity we need. How are we preparing for the future when these resources are no longer available? Perhaps we can use the energy of atoms, wind, or sunlight. Did you notice the "other" category in the pie chart above? Read on to find out about this category.

VOCABULARY

nonrenewable resource - a natural resource that is not replaced as it is used.

fossil fuels - substances found in Earth's crust that were formed over millions of years from the remains of dead organisms.



SOLVE IT!

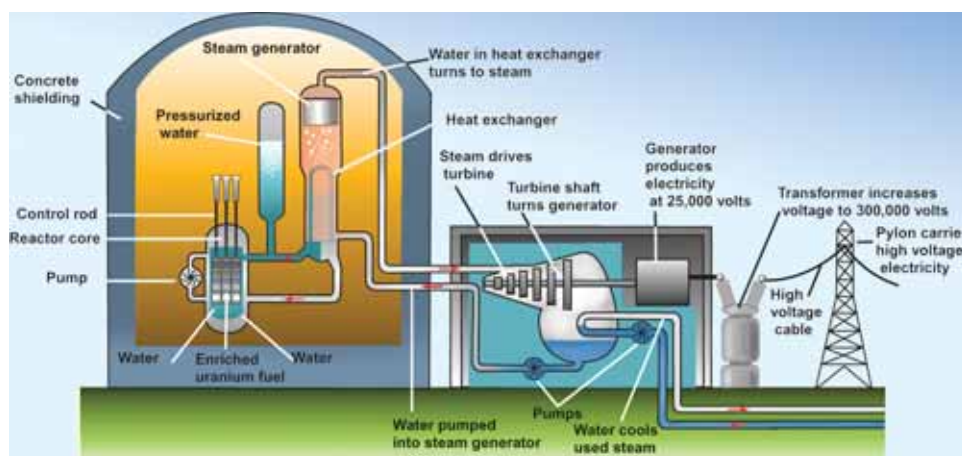
Study the pie chart (also known as a circle graph) and answer these questions.

1. Which fossil fuel is used the most to make electricity?
2. Which fossil fuel do you think is found in the largest amount in the United States?
3. What resources do you think make up the "other" category? (Hint: read ahead to learn about renewable resources that can be used to make electricity.)



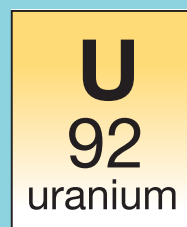
Electricity from nuclear energy

What is nuclear energy? The United States gets about 20% of its electricity production from nuclear power plants. The fuel is a nonrenewable resource called *uranium*. Uranium is an extremely high-energy source of heat. Uranium atoms split apart in the nuclear reactor and the energy released is used to heat water and make steam. The steam drives a turbine, which spins a generator to produce electricity.



Advantages and disadvantages of nuclear energy The main advantage of using nuclear energy to produce electricity is that it doesn't pollute the air like fossil fuel power plants do. We will discuss the problems of pollution in the next section. There are no new nuclear power plants being built in the United States. In fact, all plants that have been scheduled to be built since 1973 have been canceled. Why is this happening? One reason is that used uranium fuel from a reactor stays dangerously radioactive for a long time. Storage of nuclear waste has always been a major disadvantage of nuclear power plants. When scientists find a way to dispose of spent nuclear fuel safely, nuclear energy will be more widely used to produce electricity.

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Uranium is an element, and you can find it listed on the periodic table of elements. Elements are the most basic substances. Uranium has characteristics that make it very useful as a fuel for nuclear reactors. Uranium is naturally radioactive, and it releases particles from its atoms that have a lot of energy.

Do some research on uranium.

1. How is uranium used to produce electricity? (Hint: if you can describe the process shown in the picture to the left, you will have your answer!)
2. Nuclear power plants do not pollute the air like fossil fuel plants do. However, there is a big drawback to nuclear power plants. What is it?

Electricity from renewable resources

Renewable resources A **renewable resource** can be replaced naturally in a relatively short period of time. The Sun and wind are renewable resources that can be used as energy sources. Figure 14.2 shows that nine percent of all resources used to make electricity in 2004 were from renewable resources.

Solar energy The Sun is our biggest source of light and heat. In fact, 99 percent of the energy used to heat Earth and all of our buildings comes from the Sun. The Sun's energy is often called **solar energy**. A solar cell can convert solar energy to electricity. Solar energy is plentiful and clean. However, two of the biggest challenges with using solar energy to make electricity are:

1. a backup energy source must be used on cloudy days
2. solar energy is very spread out, so it must be collected from a huge area to be a significant source of energy

Wind energy A wind energy system captures the energy of motion from moving air (wind) and turns the energy into electrical energy. California was the first U.S. state to build large *wind farms* (areas where wind turbines are located). Today, California produces more electricity from wind energy than any other state in the U.S. In fact, wind is the world's fastest-growing energy source used to make electricity. Wind is a clean, plentiful fuel source. What disadvantages are there to using wind as an energy source? Well, the wind does not always blow when electricity is needed, and right now the cost of building a wind farm is greater than the cost of building a power plant that uses fossil fuel to make electricity.

Other renewable energy sources It is also possible to use moving water (hydroelectric), hot spots near Earth's surface (geothermal), fuels made from once-living things like wood or corn (biomass), and tides to produce electricity.

VOCABULARY

renewable resource - a natural resource that can be replaced.

solar energy - energy from the Sun.

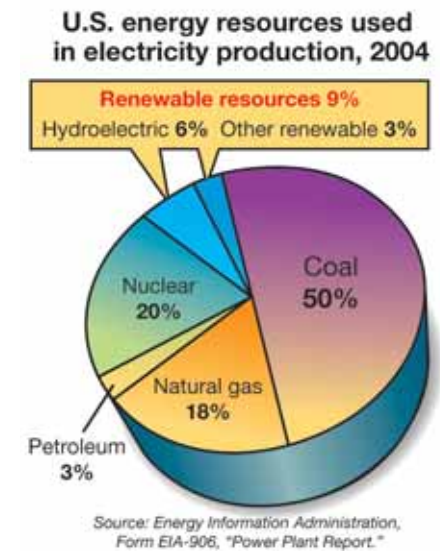


Figure 14.2: Renewable resources were used to make 9% of the electricity produced in 2004.



Evaluating resources used to produce electricity in the U.S.

For discussion This evaluation chart compares different resources that can be used to make electricity in the U.S. An evaluation chart is a powerful tool used to organize large amounts of information. According to the chart, which resources will the U.S. be using less and less of in the future? Which resources will be used more as time goes by? Can you explain why?

Using the evaluation chart
 This evaluation chart was adapted from several similar charts, and some of the high, medium, and low ratings are open to debate; the information is not meant to represent specific scientific research data—it is meant to stimulate discussion.

Resource		What is the chance that this source can be used 50 years from now?	What level of cost is involved with using this system?	What level of <i>impact</i> does using this resource have on the environment?
Nonrenewable resources	Petroleum	Low	High	Medium
	Natural gas	Medium	High	Low
	Coal	High	Medium	Very high
	Nuclear	Medium	Very high	Very high
Renewable resources	Hydroelectric (dams)	Low	Medium	Low
	Solar	High	High	Low
	Wind	High	Medium	Low
	Geothermal (using Earth's energy)	Medium	Medium	Medium
	Biomass (burning wood and agricultural waste)	Medium	Medium	Medium

Transportation and energy sources

Gasoline use If you were asked to estimate how many automobiles there are in the United States, what number would you guess? According to the U.S. Department of Transportation, there were *over 132 million automobiles* in the United States in 1997. What is the main energy source used for operating automobiles? If you guessed petroleum, you are correct. Gasoline is made from petroleum. Americans use about 375 million gallons of gasoline *every day*. It is important to know that the U.S. does not produce enough crude oil to make all of the gasoline used by American motorists. The United States produces only about 40 percent of the crude oil it uses. Where does the rest come from? It is imported from other countries.

Efficiency What does it mean to say that a machine or a process is efficient? If a machine is *efficient*, the machine is able to use most of its energy source to do a job. For efficient machines, very little of the energy source is converted to unusable energy like heat. Efficiency is a very important idea to understand when you are learning about how we use different energy sources. A bicycle is a very efficient machine (Figure 14.3). When you ride a bicycle, almost 80 percent of the energy you put into pedaling the bike is converted to motion. Automobiles, however, have a low efficiency. Only about 20 percent of the gasoline energy is converted to motion. Most of the energy is lost as unusable heat.

Usefulness and trade-offs If bicycles are so efficient, why don't we use them more, instead of automobiles, when we travel? You know the answer to that question! Cars can take us where we want to go much faster and more conveniently than bicycles can. Bicycles aren't as useful to us as cars are. Useful energy sources are sources that meet our needs *and* have the right balance of cost and efficiency.

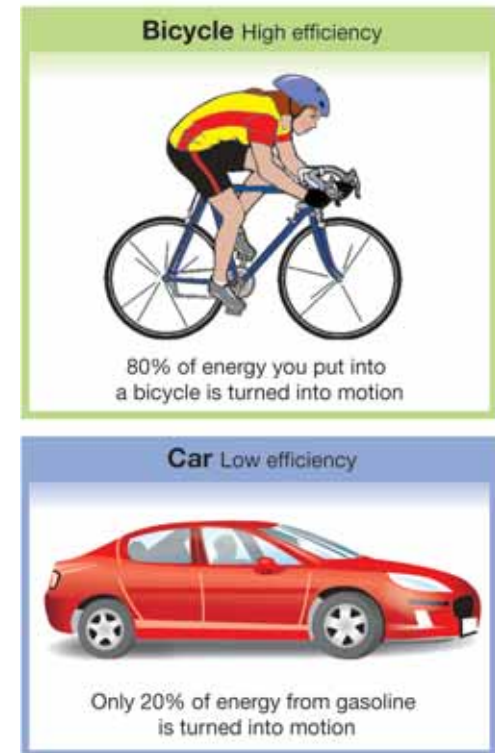


Figure 14.3: *Bicycles are efficient but they are not useful for most transportation needs!*



Comparing notes

For discussion Compare gasoline-powered cars to cars of the future. What will cars of the future use for energy sources? What type of car will you drive some day?

Current
Gasoline-powered cars

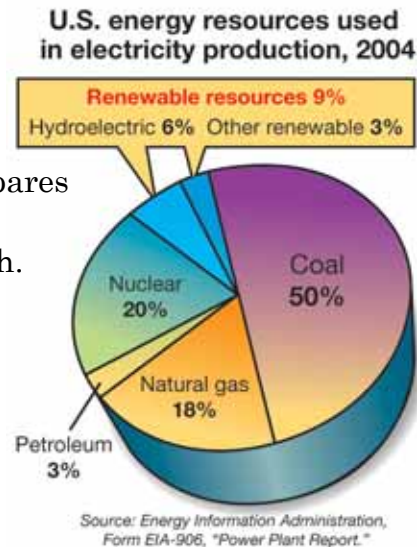
- Efficiency:**
Low
- Resource:**
Nonrenewable
- Technology:**
Current
- Pollution level:**
High
- Cost to user:**
Lowest
- Biggest problem:**
Pollution and using up world supply of oil
- Best feature:**
Lowest cost to user

Future
Hybrid cars, electric cars,
solar cars, fuel cell cars, biofuel cars

- Efficiency:**
Higher than gasoline
- Resource:**
Mostly renewable
- Technology:**
Most future (hybrid cars current)
- Pollution level:**
Medium to low
- Cost to user:**
Higher than gasoline
- Biggest problem:**
Too costly for most users, technology is still being developed
- Best feature:**
Doesn't depend so much (if at all) on oil and reduces air pollution

14.2 Section Review

1. Some of the energy that comes from burning a fossil fuel can be turned into electricity, but most of the energy is lost. Explain why this is a true statement and identify the unusable or lost energy.
2. Define *nonrenewable resources* and list three used for making electricity.
3. Define *renewable resources* and list three that can be used for making electricity.
4. List one major advantage and one disadvantage of making electricity in a nuclear power plant.
5. List two advantages and disadvantages of using solar energy to make electricity.
6. List two advantages and disadvantages of using wind energy to make electricity.
7. Study the pie chart below. Redraw your own version of this pie chart as it will most likely look *fifty years from now*. Use the evaluation table in this section that compares energy resources to help you decide how to draw your graph.



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Hybrid Cars

The entire world, not just the United States, depends on oil—mostly for transportation energy. What are scientists doing to prepare for the time when there is not enough oil to meet the world's needs? One new type of car that will help reduce our need for oil is a hybrid car. Do some research and find out how hybrid cars might help reduce our need for oil. Write an essay on what you learn.



14.3 Resources and Conservation

In this chapter you have been learning about Earth's material and energy resources. Natural resources benefit people, and it is important to think about how we can take care of Earth's resources. **Resource conservation** happens when people protect, preserve, and manage Earth's natural resources.

Air—an important resource

Air is everywhere Air is a very important natural resource, even though you may forget that it is all around you. Air is a mixture of nitrogen, oxygen, carbon dioxide, water vapor, and other gases. We do not need to worry that the air will get “used up,” because there are natural cycles that keep the supply steady. However, these natural cycles can't always keep the air clean.

Air pollution **Pollution** is a change to the environment (air, water, or soil) that is harmful to humans or other living things. Some changes to the air can have harmful effects on humans and other living organisms. Air pollution (Figure 14.4) is caused by tiny particles and gases called **emissions** that are released into the air. What produces emissions that pollute the air?

- power plants that use fossil fuels to make electricity
- motor vehicles (trucks, cars, airplanes, etc.)
- factories
- erupting volcanoes

Reducing pollution The United States government has passed laws to control the levels of emissions from power plants, factories, and motor vehicles. If you use less electricity, you can help keep the air clean too.

VOCABULARY

resource conservation - protecting, preserving, and managing Earth's natural resources.

pollution - a change to the environment that is harmful to humans or other living things.

emissions - tiny particles and gases released into the air.



Figure 14.4: Air pollution is caused by emissions from some factories, power plants, and motor vehicles.

The water supply

Earth is a watery planet The amount of water on Earth today is about the same as it was during the age of dinosaurs, 65 to 220 million years ago. About 70 percent of Earth's surface is covered by water. That's a lot of water! However, only a small amount of this water is useful to humans. Why can't humans use more than a small part of Earth's water supply? About 97 percent of Earth's water is salt water. That leaves only 3% as fresh water. About 70 percent of this fresh water is frozen, and the rest is found in rivers, streams, lakes, ponds, and even below the ground in layers of soil and rock. If this is true, and Earth has been around for such a long time, why haven't we run out of water? Earth's water is recycled by natural processes.

Water pollution Earth's water supply will stay steady, but the water that humans can actually use is a precious resource which we must use with care. Water can be polluted by changes that are harmful to people or other living things. How does water get polluted?

- towns and cities can pollute the fresh water supply with wastes that are washed down sinks, toilets, and showers
- industries like factories and power plants produce wastes that can pollute water
- pesticides and fertilizers from farms can end up in the water supply
- oil spills from large ships that transport oil across the oceans can cause serious pollution problems

What can you do? Using less water at home and at school can certainly help by putting less demand on the water supply. Also, never pour things like paint, paint thinner, motor oil, or garden chemicals on the ground or down the drain. Your town or city has probably has a special collection area for these hazardous substances.

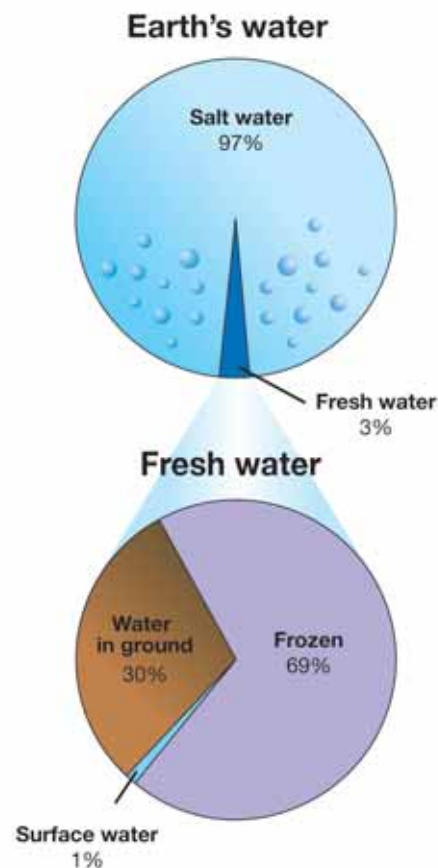


Figure 14.5: The top pie chart shows how much of Earth's total water is salt water, and how much is fresh. The bottom pie chart shows how much of the fresh water is frozen, and how much is in the ground and on the surface.



Land, forests, and wildlife resources

Land and soil Earth's land and soil are used to benefit people in many ways, and everyone must share these nonrenewable resources. How is land used to benefit people?

- **Mining minerals:** a *mineral* is a nonliving substance found in Earth's crust. Gold, iron, and tin are minerals that are called metals. Coal, oil, sand, and salt are also examples of minerals.
- **Development:** people use land to build houses, schools, and industries.
- **Agriculture:** growing crops and raising animals for food are important land uses.

Forests and fisheries Think of all the products we use that come from forests. Maple syrup, rubber, fruits, and nuts come from living trees. Lumber for constructing buildings and furniture comes from trees that have been cut down. Paper is another important forest product. Don't forget that trees and other plants produce oxygen that humans and other organisms need to survive. Fish are also valuable resources. Both trees and fish are renewable resources, but we cannot use them up faster than they are replenished, or the supply will decrease quickly.

What can you do? Do you recycle paper, metal, and plastic in your home and school? Recycling programs all over the country have been put in place to help reduce the solid waste that takes up so much of our land space.



What minerals are mined from Earth in the United States? Do some research and make a list of these minerals. Which ones are mined in your state?



A resource conservation issue: global warming

Global warming Have you ever heard the phrase “global warming”? This is an important concern that has received a lot of attention in recent years. *Global warming* refers to our ability to increase the temperature of Earth’s climate by increasing the amount of certain gases in the atmosphere—mostly carbon dioxide.

Carbon dioxide and global warming There is very little carbon dioxide in the atmosphere, compared to the amounts of nitrogen and oxygen (Figure 14.6). Does this surprise you? The amount of carbon dioxide in Earth’s atmosphere is just enough to trap heat from the Sun to make Earth warm and comfortable. Earth would be too warm with too much carbon dioxide, and too cold if the carbon dioxide level was too low. When we use fossil fuels, we add more carbon dioxide to the atmosphere. Increased levels of carbon dioxide can contribute to global warming. Using public transportation, using less electricity (turn out the lights!), and driving hybrid vehicles can all help reduce carbon dioxide levels.

Consequences The amount of carbon dioxide in the atmosphere has increased by about 30 percent since the 1800s. Also, Earth’s average surface temperature has increased 0.6 to 1.2 degrees Fahrenheit over that same time period. These increases are not huge, but they are enough to have warmed the North Pole and caused the sea level to rise 4 to 10 inches. Have you heard about any other consequences of global warming?

Trees and air quality One acre of trees can provide oxygen for about 20 people each day. This same acre of trees can also absorb emissions, including carbon dioxide. Trees are not the solution to the problem of increased carbon dioxide levels, but they can certainly help!

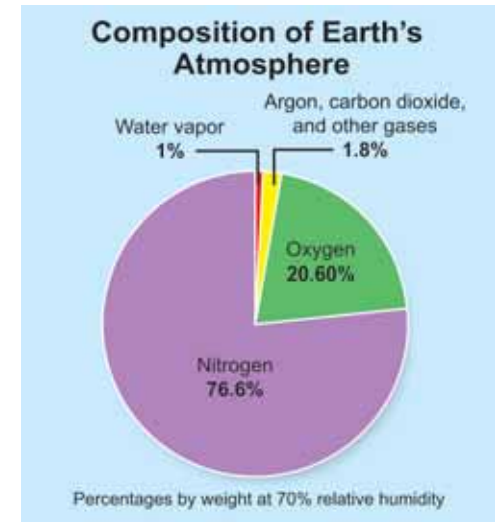


Figure 14.6: *There is very little carbon dioxide in Earth’s atmosphere, compared to the amount of nitrogen and oxygen.*



Figure 14.7: *Trees can improve Earth’s air quality.*



14.3 Section Review

1. What does it mean to conserve Earth's natural resources?
2. Why is air an important natural resource?
3. List four possible causes of air pollution.
4. Why can humans only use a small part of Earth's water supply for drinking, cleaning, and other daily needs?
5. Why is water an important natural resource?
6. List four possible causes of water pollution.
7. Describe two things you can do to help conserve Earth's water resources.
8. Study the fresh water pie chart in Figure 14.5. What percentage of fresh water can readily be used for drinking water and other needs? Why?
9. Make your own illustration of natural resources provided by trees. Draw a living tree and show on your diagram all of the different products that can come from different kinds of living trees. Draw a tree that has been cut down and show on your diagram all the different products that can come from trees that have been harvested. Be creative!
10. Why are fish considered a natural resource? Is this a nonrenewable or a renewable resource? Explain your answer.
11. Land is a natural resource. List at least three ways that land and soil are used to benefit humans.
12. How can global warming cause the ocean levels to rise? What problems could increased ocean levels cause?
13. Do some research to find at least two consequences of global warming, in addition to rising ocean levels.



SOLVE IT!



What percent of *your* state do you think is covered by water? What state do you think has the greatest area covered by water? Write down your predictions, then do some research to find the answers to these questions. (Hint: <http://ga.water.usgs.gov/edu/wetstates.html> is a website maintained by the United States Geological Survey that will give you information on this topic.)



The Roads to the Mighty Redwoods

Have you ever gone over the river and through the woods to Grandmother's house? If she lived near one of the redwood groves in Northern California, you just might have crossed a river or creek on the way—and seen the tallest and biggest trees in the world among these mighty redwoods.

Over 65 million years ago a dozen species of redwoods existed on Earth. Today, only three species remain. What could have happened to cause the loss of so many tree species? Scientists believe that changes in the Earth's climate caused the trees' extinction. Millions of years ago Earth was warmer and wetter. Over time the climate became colder and drier. The three species that survived had to adapt to this new environment.

Different roads lead to different woods

The dawn redwood was thought to be extinct up until its “discovery” in 1944. You must travel to remote valleys in China to see this redwood, the smallest of the three species. Dawn redwoods grow to about 70 feet and are only a few feet in diameter. These redwoods grow well in a colder climate.

A different road leads to the Sierra redwood, also known as the giant sequoia. This species is found on the western side of the Sierra Nevada, the “snowy range” that lies mostly in eastern California. Sierra redwoods have adapted to the snow and freezing temperatures of the area. They are not the tallest variety of redwoods, but they have the largest trunk size. They are the most massive living organism known. The largest is located in Sequoia National Park, in the southern



Photo courtesy National Park Service

Sierra Nevada. Can you imagine a tree 275 feet tall and 26.5 feet in diameter? Can you believe that it may reach 2,500 years of age? This mighty tree goes by the name of General Sherman. In the park are several sequoias that are named after United States presidents.

The road to the third species of redwood stretches along a 450-mile coastal strip from southern Oregon to south of Monterey, California. Here you find the tallest trees in the world, the coast redwoods. They have adapted to a climate of heavy fog, which helps to protect them in the dry summers and cold winters.

The tallest living coast redwood is 367 feet 5 inches. That's taller than a 30-story building—and, in fact, taller than the Statue of Liberty, which is 305 feet from the ground to the tip of the torch. This mighty redwood goes by the name

Mendocino. It is growing in one of the remotest parts of California's Montgomery Woods State Reserve, in the heart of the Coast Range. Its age is estimated at between 600-800 years. Its diameter has been measured at 10 feet 4 inches, which is wider than the average car.

Forests and redwoods as resources

Less than 200 years ago, the redwood forest spread over nearly 2 million acres. While all but 100,000 of those acres are still covered in redwood forest today, only about 68,000 remain that have never been logged.

What are the pressures on this great natural resource? First, lumber was in demand as more settlers made their way to

Northern California in the 1840s and '50s. The Gold Rush increased that demand. The logging industry, settlers, and individuals began cutting down forests. This lumber was used for buildings, railroad ties, barns, and fences. Large sections of forest were removed in a process called clear-cutting, in which a large portion of the trees were removed at one time. Early clear-cutting methods sometimes damaged the ecosystems. Efforts continue today to balance the social, economic, and environmental concerns to conserve this natural resource. Organizations such as Save-the-Redwoods League buy land and donate it to government park services.



Saving the redwoods

In 1902, in the Santa Cruz Mountains south of San Francisco, Big Basin Redwoods State Park was established. California's oldest state park is home to the largest stand of coast redwoods south of San Francisco. The original park started with 3,800 acres of protected redwoods. Today, the park covers 18,000 acres.

State park employees perform many important duties. For example, visitors to Big Basin may cross paths with Park Ranger Gary Brennan. His responsibilities include law enforcement, visitor information, and protection of the park. He patrols roads blanketed in the same fog that reaches across the forest and protects and preserves the magnificent and mighty redwoods.



Questions:

1. Why do scientists think there are so few redwood species alive today?
2. What are the names of the three species of redwoods that are alive today?
3. Write a couple of sentences about why you think redwood forests are a "great natural resource."



CHAPTER ACTIVITY **Conserving Resources**

There are two types of natural resources, nonrenewable and renewable. A nonrenewable natural resource cannot be replaced, and a renewable natural resource is in constant supply. You have studied these different types of natural resources in this chapter. Nonrenewable natural resources are often used more than renewable natural resources, despite the fact that they will eventually run out.

In this activity you will form an action plan for one type of natural resource used in your school. First, identify the different ways natural resources are used in your school. Then, choose to study the use of one of these resources. Finally, you and your peers will devise an action plan to decrease the waste, and conserve more of this natural resource!



What you will do

1. In your group list all of the ways natural resources are used in your school.
2. Now, choose to analyze the use of one of these natural resources in your school. Check your choice with your teacher, so all of the groups are not doing the same thing.
3. In your analysis you need to collect data. This may be in the form of a survey, interview, reading a meter, or some other way. It is important to not only record the amount of the resource that is used, but also how it is used. This way, when it comes time to design an action plan you will be able to analyze ways that resources have been wasted. For instance, if windows are left open often, energy is wasted and if students don't print paper double-sided, paper is wasted!
4. Design a way that your group will collect data, and record data. Again, check over your data collection and recording method with your teacher before continuing.
5. Once your data collection method has been approved, and you have designed an appropriate method of collection, collect your data. Divide the responsibilities for data collection.
6. After collecting data, write a report about your findings.
7. As a group, design an action plan and make a poster that explains the problem (overuse of natural resources) and the solution (action plan to conserve natural resources).

Applying your knowledge

- a. What natural resource did your group decide to study?
- b. Summarize your group's findings from collecting data.
- c. After your action plan has been in effect for a month, write a paragraph explaining whether or not your message to conserve natural resources is working. If something does not seem to be working, decide on new strategies to communicate with people.

Chapter 14 Assessment

Vocabulary

Select the correct term to complete the sentences.

solar energy	nonrenewable resource	resource conservation
emissions	renewable resource	fossil fuels
natural resources	pollution	petroleum

Section 14.1

1. Another name for the natural resource called oil is _____.
2. Earth's _____ are features that benefit people — like air, fresh water, soil, minerals, trees, and petroleum.

Section 14.2

3. _____ are substances made from things that were once alive.
4. A _____ is a natural resource like uranium or coal that is not replaced as it is used.
5. The Sun's energy is often called _____.
6. A _____ is a natural resource like the Sun, wind, or trees that can be replaced in a relatively short period of time.

Section 14.3

7. Tiny particles and gases released into the air are called _____.
8. If you practice _____, you are protecting, preserving, and managing Earth's natural resources.
9. _____ is a change to the environment that is harmful to humans or other living things.

Concepts

Section 14.1

1. Generate a list of anything that can be considered a natural resource.

2. Look around you right now and name five objects that would not exist if there was no petroleum.

Section 14.2

3. Describe the three fossil fuels and where they can be found.
4. Sort the list of energy resources into *renewable* and *nonrenewable* resources.

nuclear, natural gas, hydroelectric, solar, biomass, wind, oil, coal, geothermal

5. Refer to the chart “Evaluating resources used to produce electricity in the U.S.” to answer the following questions:
 - a. Name a resource that has a high chance of being used 50 years from now, has a medium level of cost, and a low impact on the environment.
 - b. Is this source of energy being used to produce electricity in your state? Write down where you got your information from to answer this question.
 - c. Study the chart and choose the resource that you think will be used to make the most electricity 50 years from now. Justify your answer with information from the chart.

6. Look at the “Comparing notes” illustration that shows a notebook comparison between current cars and future cars. Choose one of the following future cars. Research and find information on your chosen future car to write a notebook list like the one in the illustration.

Future cars to choose from: electric car, solar car, fuel cell car, biofuel car, hybrid car

Section 14.3

7. Why is air an important natural resource?
8. Describe two things *you* can do to help reduce air pollution.
9. How does water become polluted?

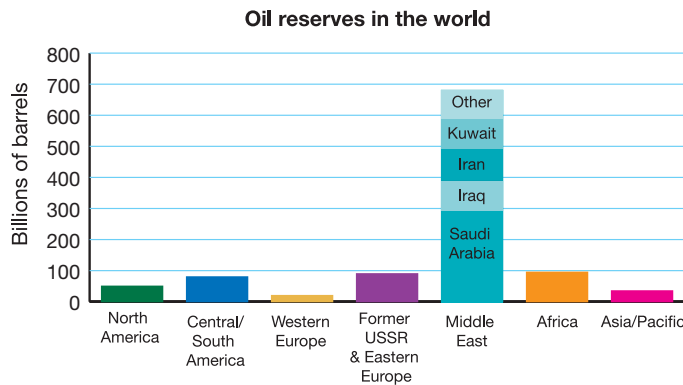
Math and Writing Skills

Section 14.1

- Study the bar graph “Transportation energy use in the United States”, found on the 14.1 section review page. Write a paragraph that tells in words what information this bar graph gives about daily life in the United States.

Section 14.2

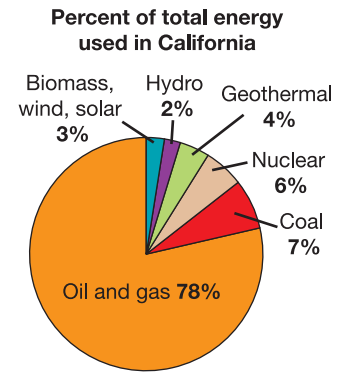
- Use the graph to answer the questions:



- Which area of the world has the most oil in reserves? How many billions of barrels does this area have?
- Which specific country has the most oil in reserves? How many billions of barrels does this country have?
- Which area of the world has the least oil in reserves? How many billions of barrels does this area have?
- What percentage of total world oil does North America have in reserves?
- EXTENSION: Research the following question—what percentage of total world oil does North America use?

- Use the graph to answer the questions:

- What percent of total energy used in California is from oil and gas?
- What type of energy is used least in California?
- What is the total percent of nonrenewable energy use in California?
- What is the total percent of renewable energy use in California?
- Based on your analysis of the graph above, how successfully do you think California is conserving natural resources for energy use?



Section 14.3

- Find out about recycling plastics in your community. Prepare a brochure that provides information on how to recycle plastics.

Chapter Project—Can You Conserve?

Keep a journal for 1 week of the different ways you use natural resources. Don't forget to include electricity use! Keep track of heat used, lights turned on, oven use, shower use, paper used, plastic bottles, etc. Give as much detail as you can about the amount of resources used and the time of day they are used.

After you have kept detailed notes for one week of how you use natural resources, identify two areas that you can practice better resource conservation. Create a poster of an action plan that shows how you will conserve these resources. Be creative and practical!