

# UNIT 3

## What Is Geography?

The term *geography* comes from the Greek word *geographia* and means “Earth’s description.” **Geography** is the science of studying Earth as the home of humans. Geography helps us understand ourselves, the places we live, our relationships with the natural environment, and our interdependence with other places and people in the United States and throughout the world. People interact with the natural world in culturally distinct ways that change over time.

In the past, people learned about the world from what they saw in photographs, read in books, or heard from others. New technologies have changed all that! Today, people can tour countries and communicate personally with those who live in foreign places without leaving home. The Internet has made the world a much smaller and less uncertain place.

As you study the two chapters in this unit, you will

- examine varying ways in which people interact with their environment and gain an appreciation of the diversity and similarities of cultures and places.
- use geographic perspectives and technology to interpret the interaction between people and their environment.
- collaborate with one another or work individually using geographic skills to ask questions based on the five themes of geography (location, place, human/environmental interaction, movement, and regions).
- acquire, organize, and analyze information to respond to geographic questions.

As you study the next two chapters, more specific objectives will provide you with opportunities to develop and practice these geographic concepts.



**Background:** This NASA satellite view of Earth shows the landforms of North America on a summer day.

# CHAPTER 5

# The Geography of West Virginia

## CHAPTER PREVIEW

### TERMS

geography, relative location, absolute location, equator, latitude, prime meridian, longitude, panhandle, climate, weather, elevation, precipitation, drought, topography, erosion, tributary, extinct, surface mining

### PLACES

Fairfax Stone, Mason-Dixon Line, Canaan Valley, Teays Valley, Ice Mountain, Hawks Nest, Blackwater Falls, Cathedral Falls, Smoke Hole Caverns





Geography is present in every aspect of our lives. Its five basic themes—location, place, human and environmental interaction, movement, and regions—provide a greater understanding and appreciation for the importance of geography in our past as well as in our future.

In this chapter, you will examine West Virginia in terms of the first four themes of geography. Because maps play an important role in studying geography, you will also have an opportunity to read and analyze a number of special purpose maps.



**Top:** West Virginia's beautiful landscapes attract visitors to the state. **Bottom:** The New River as seen from Hawks Nest Overlook in Fayette County.



# SIGNS of the TIMES

## VITAL STATISTICS

**Area of West Virginia:** 24,231 square miles

**Land area:** 24,119 square miles

**Inland water area:** 112 square miles

**Number of bordering states:** 5

**Number of counties:** 55

**Forested land:** 75 percent

**Population 2018:** 1,800,000 (38th in the nation)

**Boundary length:** 1,180 miles

## LOCATION

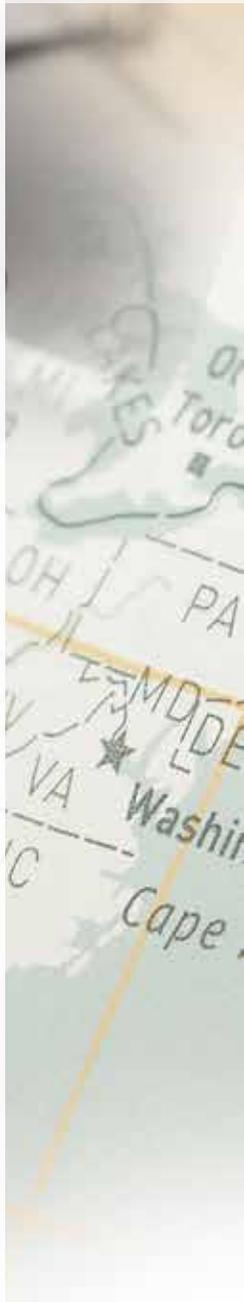
**Latitude and longitude:** Between 37°12' and 40°38' north latitude and between 77°38' and 82°55' west longitude

**Location within United States:** East, South Atlantic Region

**Geographic center of state:** Elk River Public Hunting Area in Braxton County

**Miles from westernmost point to easternmost point:**  
265 miles

**Miles from northernmost point to southernmost point:**  
237 miles



# SQ3R

## DEFINING THE SKILL

The reading material in social studies textbooks is usually structured and includes detailed information. Because of the amount of reading required, it is helpful to skim or read the material quickly in order to recall prior knowledge, locate specific information, and predict the content of the reading. SQ3R, which stands for survey, question, read, recite, and review, is a reading strategy that will help you do this.

## PRACTICING THE SKILL

Practice the SQ3R strategy by skimming Section 1 of Chapter 5.

**Survey:** Before you read, survey the section to determine its title as well as the main idea found in the first paragraph.

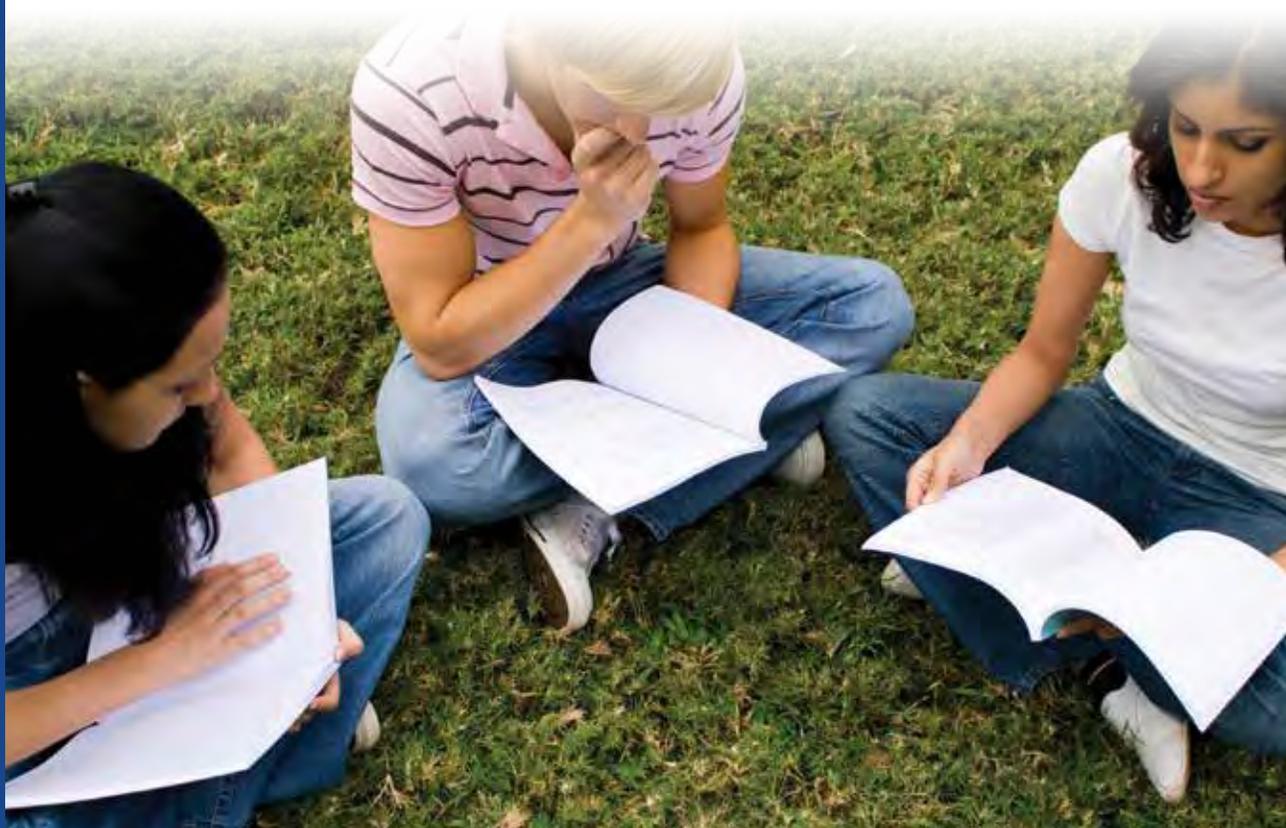
**Question:** After your survey, make a list of questions you think will be answered in the section.

**Read:** Read the section, noting any unfamiliar vocabulary words.

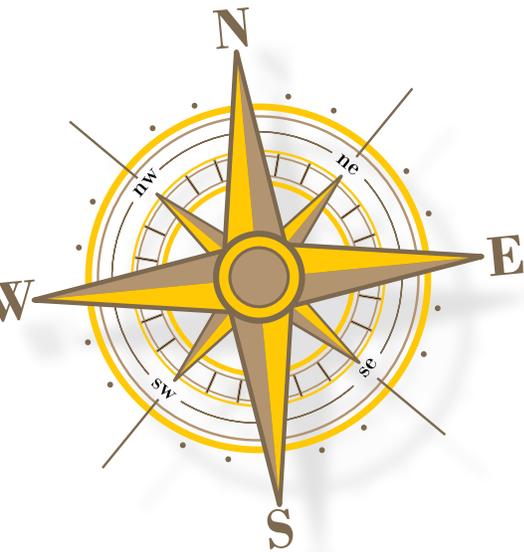
**Recite:** Write the answers to any of the questions you posed in your survey. On a separate sheet of paper, write down the main ideas in the section and then summarize the section in your own words.

**Review:** Finally, on a separate sheet of paper, rephrase your notes into questions. Then, answer your questions from memory.

Note: Continue to use the SQ3R reading skill before you read each of the other three sections in the chapter.



# Location



## As you read, look for

- the difference between absolute and relative location;
- the difference between latitude and longitude;
- the boundaries of West Virginia;
- the size of West Virginia;
- the population of West Virginia;
- terms: **relative location**, **absolute location**, **equator**, **latitude**, **prime meridian**, **longitude**, **panhandle**.

**One basic geographic skill is the ability to describe** where a place is *located*. Location can be either relative or absolute. **Relative location** describes where a place is compared to other places. For example, Fairmont is located near Morgantown; Huntington is located about 50 miles west of Charleston; Martinsburg is northeast of Moorefield. You might tell someone where your school is located by saying that it is near a particular landmark or business.

**Absolute location** identifies a precise position on Earth's surface. For example, the Governor's Mansion is located at 1716 Kanawha Boulevard in Charleston. Your street address designates a local location and defines the absolute location of your home. We use maps and globes with special lines more precise than street addresses to find the absolute location of states or countries.

## something extra!

One degree of latitude covers about 69 miles (111 kilometers).

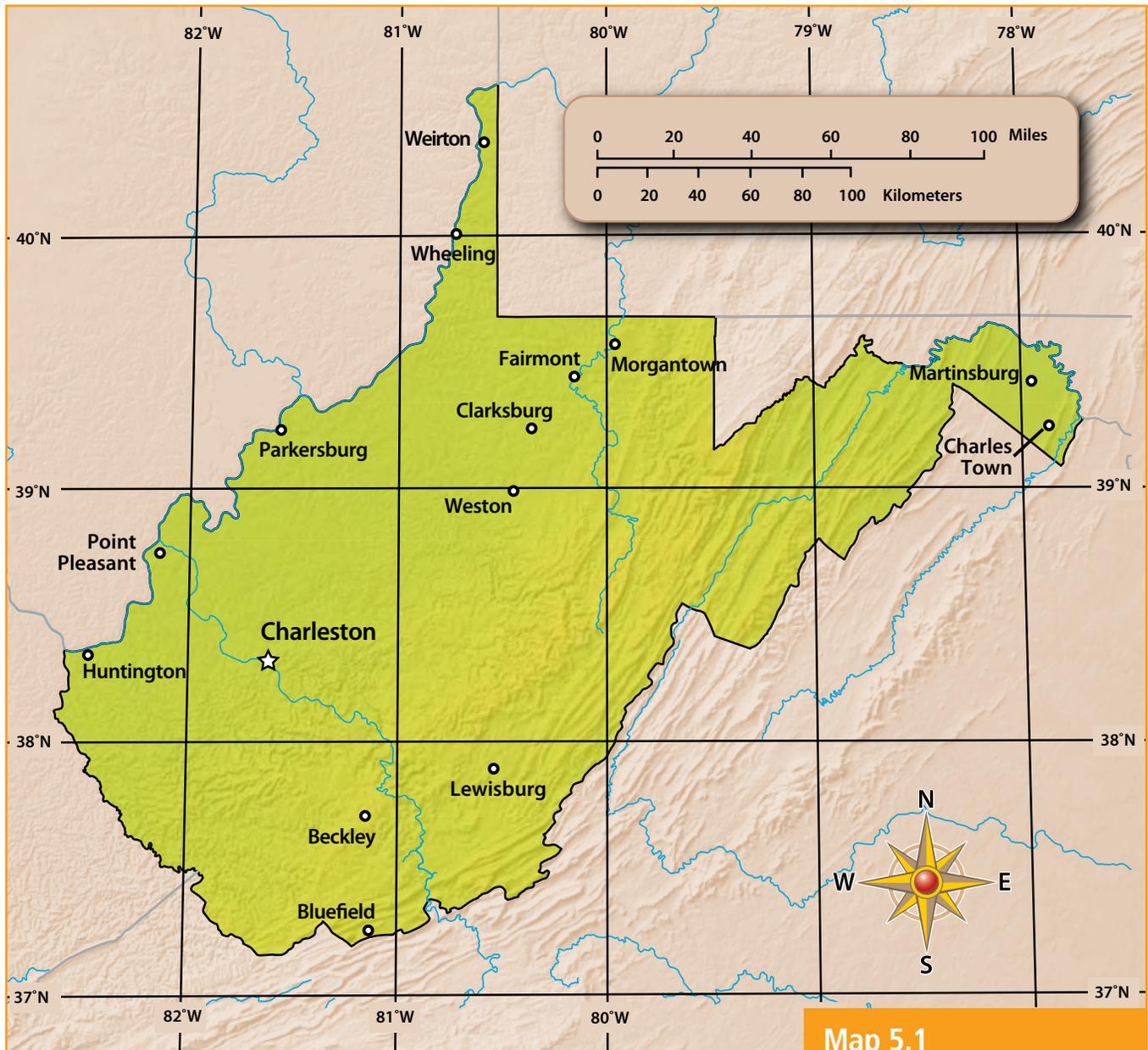


**Top:** Compass rose. **Above:** Located on the Kanawha River, Charleston is about 55 miles from Point Pleasant, where the Kanawha empties into the Ohio River. This describes its relative location.

## Latitude and Longitude

When you examine globes and some maps, you find lines that run east and west, side by side with the equator. (The **equator** is a line that goes around the globe halfway between the North Pole and the South Pole.) These lines, called *parallels*, are used to describe **latitude** (the distance north (N) or south (S) of the equator).

The distances are measured in units called *degrees*. Degrees are identified by the symbol  $^{\circ}$ . Since there is only one equator, there is only one line or parallel that is  $0^{\circ}$  latitude. The latitude of every other point must be some degree north or south of the equator, from  $0^{\circ}$  to  $90^{\circ}$ . The North Pole is located at  $90^{\circ}$ N latitude, and the South Pole is found at  $90^{\circ}$ S latitude.



**Map 5.1**

## West Virginia's Latitude and Longitude

**Map Skill:** What West Virginia city is located at  $38^{\circ} 35' N$  latitude and  $81^{\circ} 63' W$  longitude?

Each degree can be divided into smaller measurements called *minutes*. Each degree contains 60 minutes. Minutes are identified by the symbol  $'$ . West Virginia is located between  $37^{\circ} 12'$  and  $40^{\circ} 38'$  N latitude.

On the globe or map, you will also find lines that run from one pole to the other. These lines running north and south are called *meridians*. The starting point for the meridians is the **prime meridian** (a line running from the North Pole through Greenwich, England, and part of Africa to the South Pole). Meridians measure **longitude**, which tells how far east (E) or west (W) of the prime meridian a place is located. The prime meridian is located at  $0^{\circ}$  longitude. One-half of the world is measured in degrees of east longitude up to  $180^{\circ}$ , and the other half in degrees of west longitude up to  $180^{\circ}$ . West Virginia is located between  $77^{\circ} 38'$  and  $82^{\circ} 55'$  W longitude.

# Katherine Johnson: A Human Computer

Katherine Johnson was born in White Sulphur Springs in 1918. Always a curious child with a brilliant mind for mathematics, she attended high school on the campus of historically black West Virginia State College (now West Virginia State University) when she was thirteen years old. At eighteen years of age, she was enrolled as a college student and graduated with highest honors in 1937.

Katherine began her career as a teacher at a black public school in Virginia. However, within two years, when West Virginia quietly integrated its graduate schools, she and two black males became the first black students to attend West Virginia University. She enrolled in the graduate math program but decided to leave after a semester to start a family with her husband.

During World War II, the National Advisory Committee for Aeronautics (NACA) began recruiting African American women with college degrees to work as computers at its Langley (Virginia) lab. Because of segregation, these women had to work in a separate section called the West Area Computers. In 1953, Katherine reentered the workforce as a West Area Computer. She began her career working with data from flight tests. This work lasted for four years.

The 1957 launch of the Soviet satellite Sputnik changed history—and Katherine Johnson's life. It was during this time that she provided some of the math for a 1958 document, *Notes on Space Technology*. The document focused on lectures given by engineers in the Flight Research Division and the Pilotless Aircraft Research Division. A number of these engineers later formed the Space Task Group, which guided the United States' first steps into space travel. Over time, Katherine became an engineer (electronic computer programmer) herself. When NACA became NASA, a number of engineers, including Katherine Johnson, came along with the program.

Katherine did trajectory analysis for Alan Shepard's Freedom 7 mission in 1961; and, at John Glenn's request, did the same job for his orbital mission in 1962. Despite Glenn's trajectory being planned from blastoff to splashdown by computers, he reportedly wanted Katherine herself to run through the equations to make sure they were safe!

Katherine calls her work on the Apollo Lunar Lander with the moon-orbiting Command and Service Module and her work on the Space Shuttle her greatest contributions to the space program. In 2017, when she was 97 years old, President Barack Obama awarded her the Presidential Medal of Freedom, America's highest civilian award. In 2017, she and two other women were the subjects of an award-winning movie, *Hidden Figures*. The movie portrayed the women as silent computers who played an important role in the success of the nation's space program, but who received little or no public recognition for their work. The night the Academy Awards were broadcast around the world, many heard of Katherine Johnson for the first time. But after she was introduced to the audience as millions of people watched, she was no longer a hidden figure!





**Map 5.2**  
**West Virginia's Panhandles and Borders**  
**Map Skill:** Which state lies to the northwest of West Virginia?

### West Virginia's Boundaries

West Virginia's relative location is in the eastern United States, in the South Atlantic region. The state is bordered by five states—Virginia, Kentucky, Ohio, Pennsylvania, and Maryland. Its natural borders make it the most irregularly shaped, noncoastal state in the United States. The shape of the state is basically oval, but two panhandles add variety. A **panhandle** is a long, narrow strip of a larger territory. The eastern panhandle is bordered by Maryland on the north and Virginia on the south. The northern panhandle lies between Pennsylvania on the east and Ohio on the west.

Often called the “most northern of the southern states,” West Virginia's northern panhandle extends further north than Pittsburgh, Pennsylvania, while its southern boundary is south of Richmond, Virginia.



**Bottom:** Boundaries are typically identified by signage.



**Map 5.3**

## West Virginia and Major Metropolitan Areas

**Map Skill:** How many major cities are shown on the map?

West Virginia has a number of natural boundaries, but some of its borders were the result of disputes with its neighbors. West Virginia's eastern and southern borders follow the Allegheny Mountains, while its western border is made up of rivers, including the Ohio, Big Sandy, and Tug Fork. Part of the border with Maryland follows the natural flow of the Potomac River. The U.S. Supreme Court settled the rest of that border in 1912 when it ruled that the Fairfax Stone was the starting point of the boundary between the two states. The *Fairfax Stone*, located at the headwaters of the North Branch of the Potomac River, marked the westernmost edge of the land granted to Lord Fairfax by English King Charles II. From the Fairfax Stone, the boundary runs due north to the Mason-Dixon Line, which marks part of West Virginia's northern border with Pennsylvania. The line that created the eastern boundary of the northern panhandle runs due north from the Mason-Dixon Line to the Ohio River.

## West Virginia's Statistics

In all, West Virginia is a rather small state containing 24,231 square miles. The state ranks 41st of the 50 states in size. Almost 75 percent of its land is forested, while less than 1 percent of its area is covered with water. From east to west, its greatest width is 265 miles. Its greatest length from north to south is 237 miles. The state is conveniently located within 500 miles of a number of major population centers including Washington, DC; Pittsburgh, Pennsylvania; New York, New York; Chicago, Illinois; and Atlanta, Georgia.

In 2018, West Virginia had a projected population of 1,800,000 and ranked 38th in the nation in population. Between 2010 and 2018, the state's population decreased by 50,000 while the population of the United States increased by around 18 million.

### Reviewing the Section

#### Reviewing the Content

1. How could you describe West Virginia's relative location to a friend?
2. What states border West Virginia?
3. What are the natural boundaries of West Virginia?

#### Using the Content

1. Write a brief paragraph describing the relative location of your home to your school.
2. Use Map 5.1 on page 197 to locate the latitude and longitude of other cities in West Virginia.

#### Extending the Literacy Skill

List and define the five parts of the SQ3R reading skill. Which part best helped you understand the material in the section?

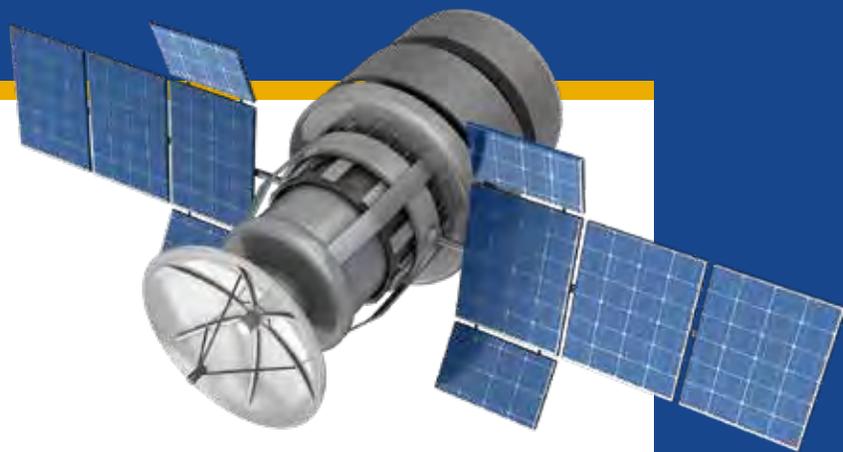


something  
**extra!**

A small portion of Virginia is actually further west than the entire state of West Virginia.

**Above:** West Virginia is the third most forested state in the nation.

# Global Positioning System



Have you ever traveled by automobile to a place you have not visited previously? If you had not been there before, how did you find the place? In planning such a trip thirty years ago, you would probably have relied on printed maps to guide you to your destination. While these maps took you in the right direction, they did not take you to your specific location. For example, if you lived in West Virginia and you were going to attend a sporting event at Pittsburgh's Heinz Field, your map would have taken you to Pittsburgh, but not specifically to Heinz Field. Once you were in Pittsburgh, you would have had to follow signs or ask someone for more specific directions. Have you ever tried to find a location by following signs, only to discover some were hard to read or confusing, resulting in your getting lost?

Fortunately, in today's world there is a device that lets you drive directly to your destination without the hassle of using paper maps or signs along the way! A global positioning system (GPS) allows you to have a navigation system in your car, on your smartphone, or even on a wristwatch. This system will take you wherever you want to go. It will instantly show you the shortest or fastest route to follow. After you select a route, the GPS will guide you with turn-by-turn directions. The system is so precise, it will alert you a couple of miles before you must make a turn, even telling or showing you which lane to be in. It can even warn you if there is a traffic problem and recommend an alternate route that will allow you to avoid any stoppage or slowdown.

Have you wondered how the navigation system can guide your car with such precision? Does it seem a little strange that your navigation system always knows where you are? The GPS is a network of orbiting satellites. Scientists discovered as early as 1957, when the Russians launched the Sputnik satellite, that satellites could be tracked from the ground by measuring the frequency of the radio signals they sent out.

Today, several operational satellites, along with a few extra ones, orbit some 12,000 miles above Earth. They travel approximately 7,000 miles per hour and take about 12 hours to circle Earth. Satellites are positioned where a GPS receiver can receive signals from at least six of them at any one time at any location. If a satellite stops working, a spare is activated or a new one is sent into space to replace the old one. New satellites enable the GPS system to be upgraded with hardware that contains new features. Five unmanned ground stations around Earth monitor the satellites. A GPS receiver calculates its speed and direction by using its change in position and time. It can calculate its position many times in as little as one second.



# Place

## As you read, look for

- characteristics of West Virginia’s climate;
- examples of erratic weather in West Virginia;
- the natural wonders of West Virginia;
- major rivers in West Virginia;
- terms: **climate, weather, elevation, precipitation, drought, topography, erosion, tributary.**

**Events occur in a particular place.** Usually, there are reasons why events happen where they do. To understand human events, you must first understand the physical characteristics of the places where the events occurred. Physical characteristics of a place include its climate, natural wonders, and bodies of water.

## Climate

People sometimes confuse “climate” and “weather.” **Climate** refers to the average weather of a region over a long period of time. **Weather** refers to the day-to-day conditions and changes in the atmosphere. Weather extremes can produce devastating results—the destruction of property and the environment, injuries, and even deaths. While weather varies constantly, the climate of an area remains much the same. The climate of a region influences the types of homes built, the types of industries that develop, the clothing styles, and even what crops are grown.



**Above:** People walk, hike, and ride bikes along the Chesapeake and Ohio Canal Towpath, which runs along the Potomac River.

**Bottom:** In winter, tourists ride lifts and then ski down West Virginia’s mountain slopes.

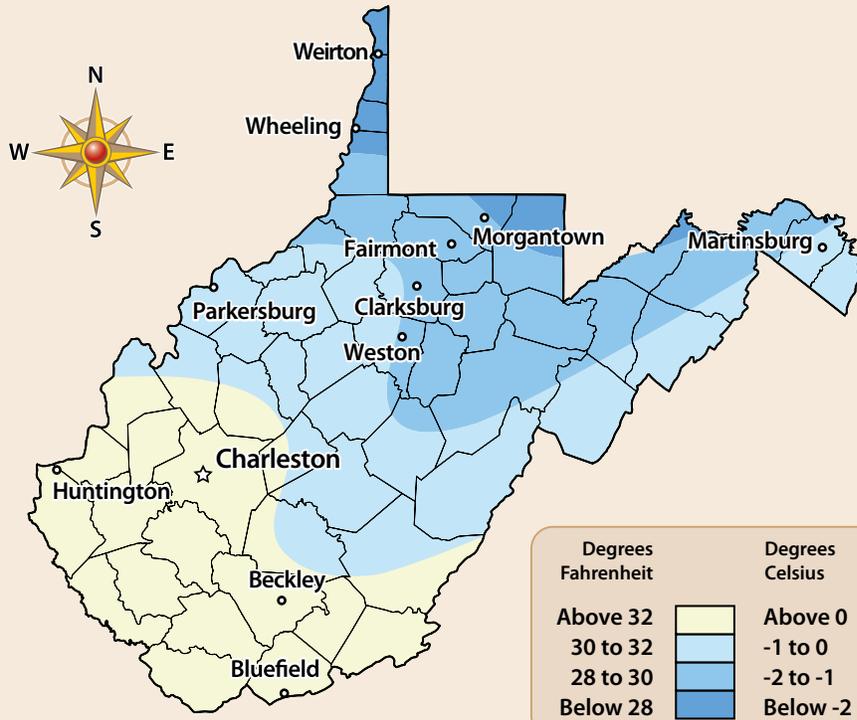


West Virginia's climate is *humid continental*. This means that state residents experience four distinct seasons: spring, summer, autumn, and winter. Winters on the average are cold, while summers are hot. The lowest temperature ever recorded in West Virginia was  $-37^{\circ}\text{F}$  (Fahrenheit) on December 30, 1917, at Lewisburg. The highest temperature was  $112^{\circ}\text{F}$  on July 10, 1936, at Martinsburg. The average January temperature is about  $33^{\circ}\text{F}$ , while the thermometer rises to an average  $74^{\circ}\text{F}$  in July. Annually, the average temperature is around  $54^{\circ}\text{F}$ .

The mountains of the state also influence temperatures. That is because the higher the **elevation** (the height of the land above sea level), the colder the temperature. This phenomenon, sometimes called *vertical climate*, explains why some areas of southern West Virginia are actually colder than areas farther north. The average  $55^{\circ}\text{F}$  temperature in Charleston is warmer than the average  $50.9^{\circ}\text{F}$  in Beckley, which is farther south. Beckley, however, is located in the mountains, while Charleston is in a valley. Morgantown averages warmer temperatures than Green Bank mainly because Green Bank has an elevation of 2,000 feet, while Morgantown's elevation is only 1,000 feet.

Most of the winds that carry water into the state come from the south and west. As water vapor rises and cools, it forms clouds. Once the clouds become saturated, **precipitation** falls in the form of rain, snow, sleet,

**Top:** The Trough runs through Hardy County. **Bottom:** Bluestone Gorge at Pipestem State Park.



Map 5.4

### West Virginia Average January Temperatures

**Map Skill:** What is the average January temperature of Huntington?

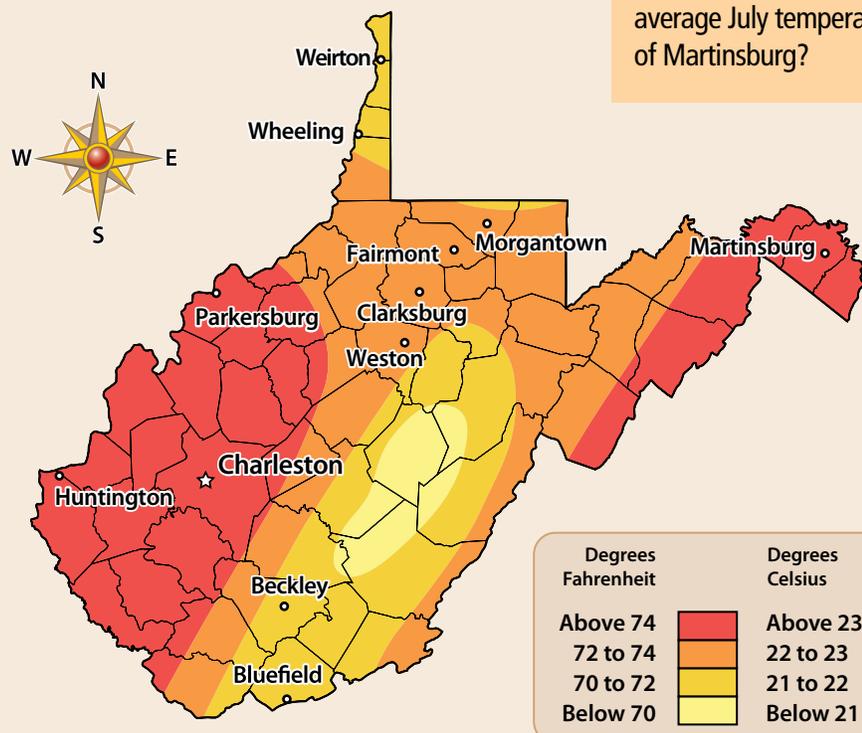
or hail. The clouds lose most of their moisture while traveling over the eastern mountains. As a result, there is less precipitation in the eastern panhandle. However, rainfall is plentiful throughout the state, ranging from a low average of 32 inches a year in Hardy County to a high average of 60 inches in the mountains of Randolph County.

Every area of the state gets snow, but the heaviest snowfalls occur in the higher, cooler elevations. Lesser amounts of snow are found in the southwest. Average snowfalls in the state measure 32.2 inches in Charleston, 25.7 inches in Huntington, 75 inches in Elkins, and 60.1 inches in Beckley.

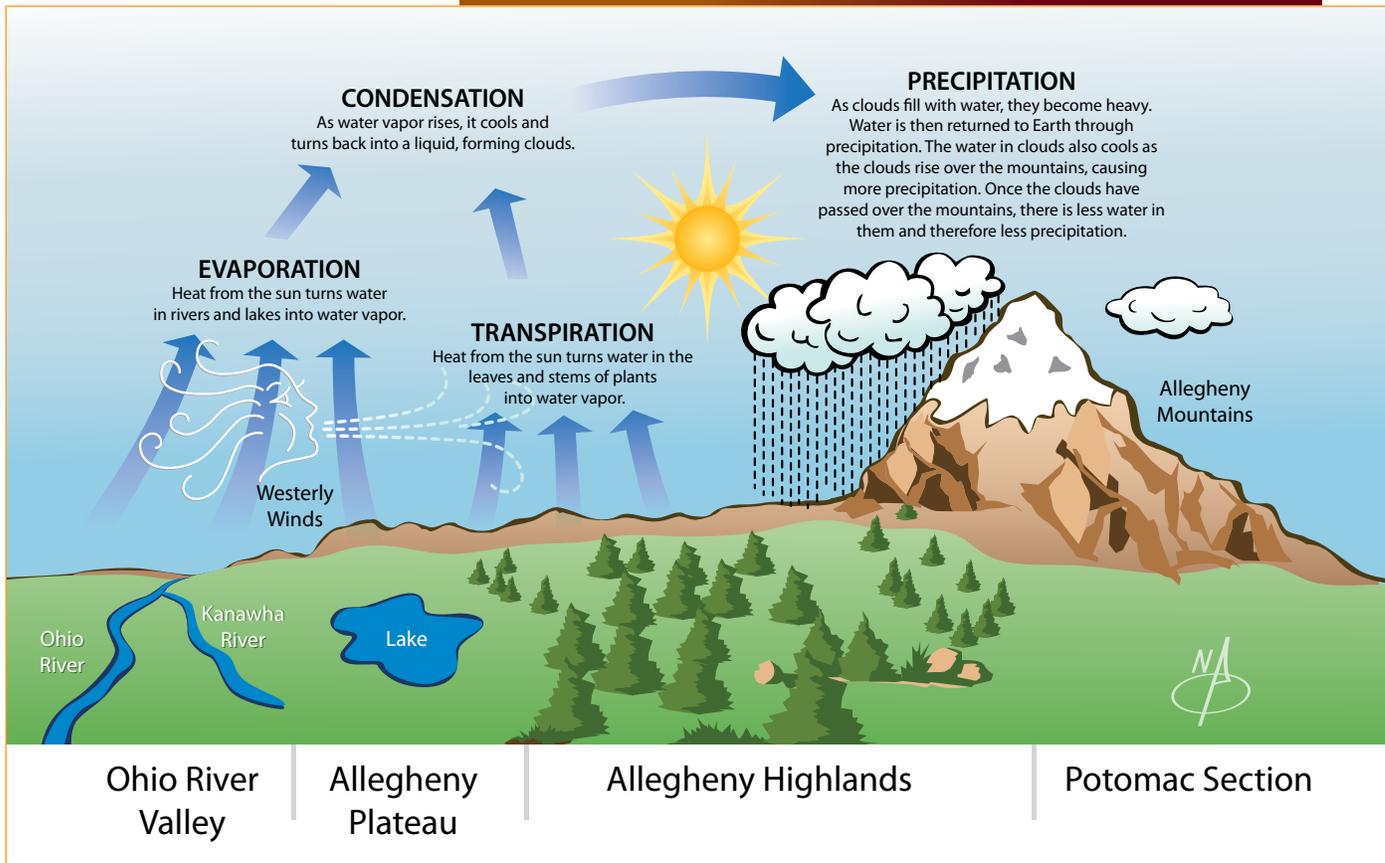
Map 5.5

### West Virginia Average July Temperatures

**Map Skill:** What is the average July temperature of Martinsburg?



**Figure 5.1 Precipitation in West Virginia**



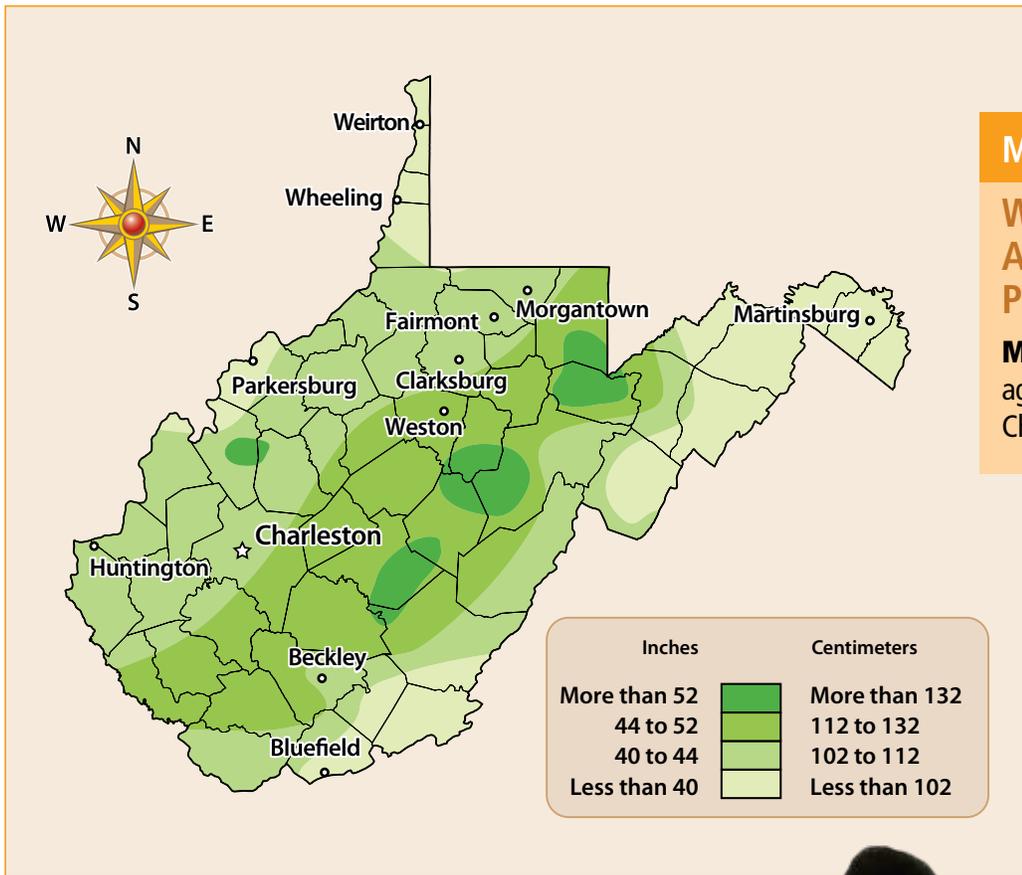
During the winter of 1995-1996, Elkins actually had 136.6 inches of snow. On January 27-28, 1996, Flat Top, in Mercer County, had a snowfall of 35 inches. Greater amounts are recorded in the ski-resort areas. Snowfall in Canaan Valley, for example, averages 150 inches.

West Virginia has experienced some very erratic weather in the last several years. Unprecedented rainfall has caused severe flooding and mudslides, leaving thousands of people homeless. On the other hand, the state experienced a **drought** (a prolonged period of dry weather) in 2007. August 2006 was the state's 11th-hottest month during the 112-year period of record-keeping. During that time, the temperature averaged more than 4 degrees above normal in Charleston and Huntington.

Several explanations have been given to explain the unusual weather patterns. One involves *El Niño* (warmer-than-usual Pacific Ocean temperatures) and *La Niña* (colder-than-usual Pacific Ocean temperatures), which disrupt weather patterns throughout the world. West Virginia is no exception. According to the West Virginia State Climate Center, most of the state has a 15-30 percent decrease in total precipitation from January to March during an *El Niño* year. The state also experiences a 1.7-2.2 degree increase in normal temperature for November and December during an *El Niño* year.

**something extra!**

With an average elevation of 1,500 feet, West Virginia is the "highest" state east of the Mississippi River.



**Map 5.6**  
**West Virginia Average Annual Precipitation**  
**Map Skill:** What is the average annual precipitation of Charleston?

## Natural Wonders

Climate has also affected the natural features of West Virginia. Winds and water have eroded and shaped the state's **topography**, including physical features such as mountains or plateaus. Wind-driven rivers have cut through the Allegheny Plateau. In other places, topsoil has eroded so that only an outcropping of rock remains.

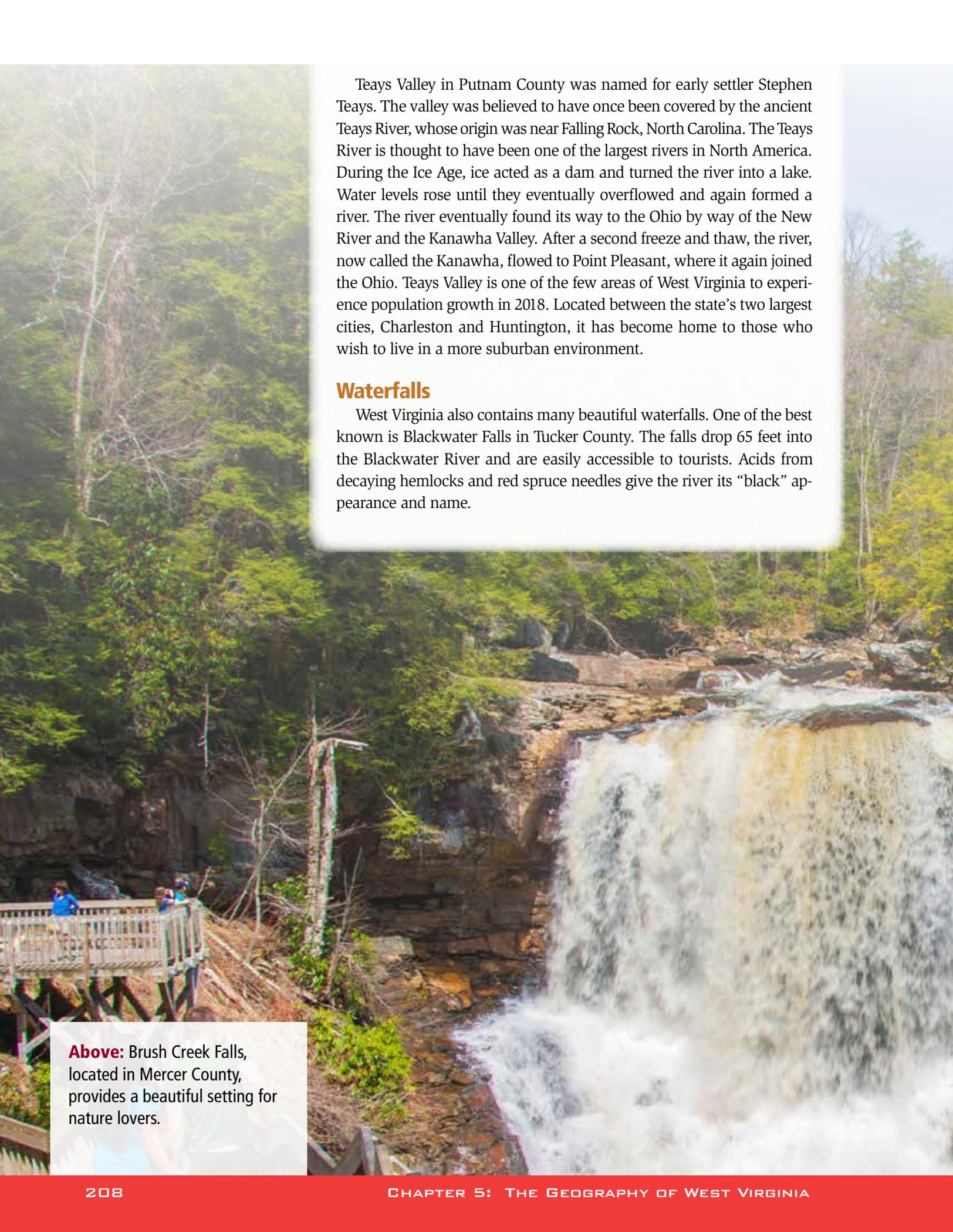
## Valleys

West Virginia has a number of breathtakingly beautiful valleys that are also unique geographic areas. Canaan Valley in Tucker County was first explored by Europeans in the mid-1700s. Because of the area's natural beauty, those early explorers reportedly declared that it surely must be the Biblical land of Canaan. That name has been used ever since. Today, the area is home to the second-largest inland wetlands in the United States. A variety of wildlife, including deer, coyote, black bear, fox, beaver, wild turkey, and a large number of geese, ducks, and other birds can be seen here in their natural habitat.



**something extra!**  
 Canaan Valley is believed to have been a lake at one time.

**Above:** The black bear is the state animal.

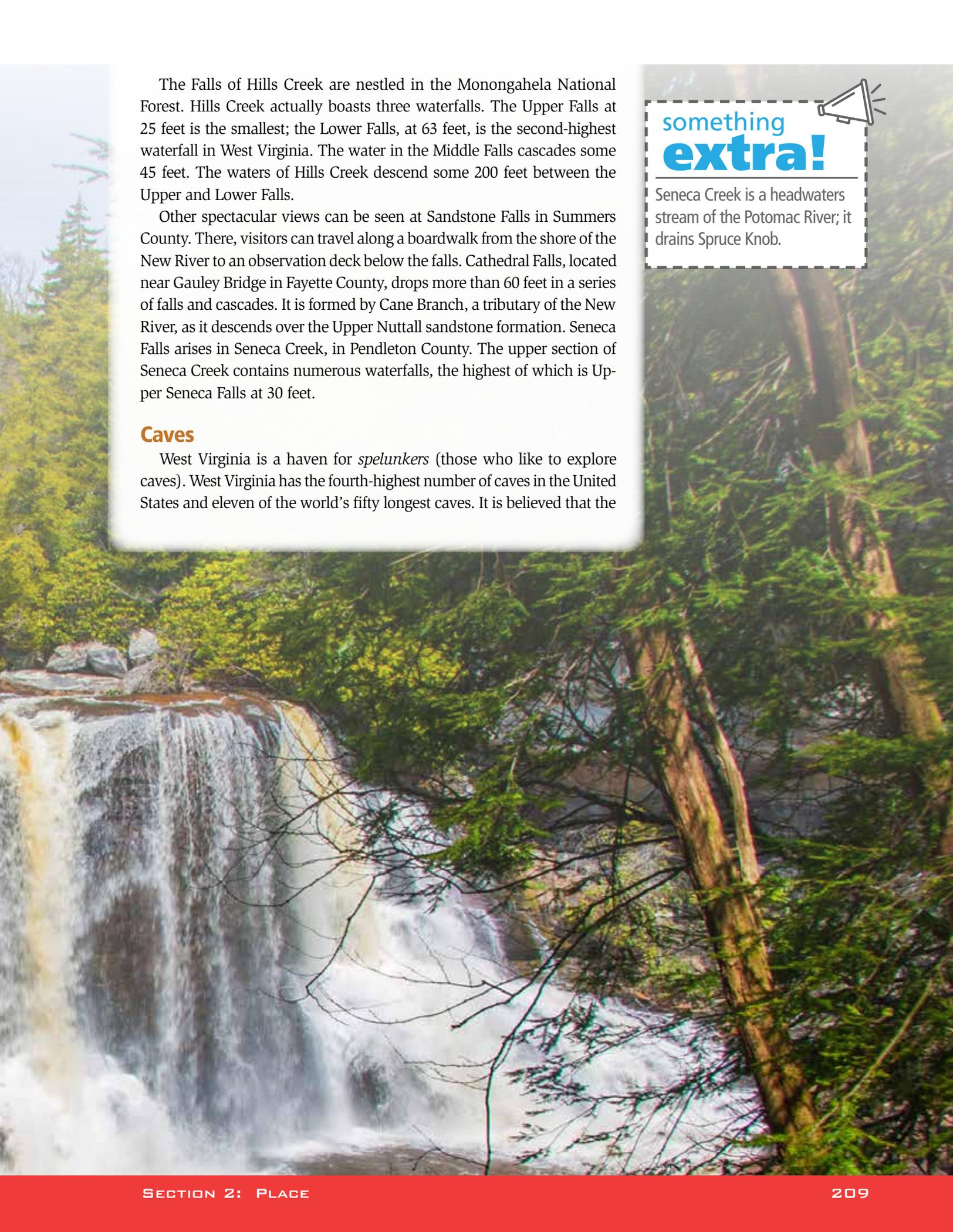


Teays Valley in Putnam County was named for early settler Stephen Teays. The valley was believed to have once been covered by the ancient Teays River, whose origin was near Falling Rock, North Carolina. The Teays River is thought to have been one of the largest rivers in North America. During the Ice Age, ice acted as a dam and turned the river into a lake. Water levels rose until they eventually overflowed and again formed a river. The river eventually found its way to the Ohio by way of the New River and the Kanawha Valley. After a second freeze and thaw, the river, now called the Kanawha, flowed to Point Pleasant, where it again joined the Ohio. Teays Valley is one of the few areas of West Virginia to experience population growth in 2018. Located between the state's two largest cities, Charleston and Huntington, it has become home to those who wish to live in a more suburban environment.

### Waterfalls

West Virginia also contains many beautiful waterfalls. One of the best known is Blackwater Falls in Tucker County. The falls drop 65 feet into the Blackwater River and are easily accessible to tourists. Acids from decaying hemlocks and red spruce needles give the river its “black” appearance and name.

**Above:** Brush Creek Falls, located in Mercer County, provides a beautiful setting for nature lovers.



The Falls of Hills Creek are nestled in the Monongahela National Forest. Hills Creek actually boasts three waterfalls. The Upper Falls at 25 feet is the smallest; the Lower Falls, at 63 feet, is the second-highest waterfall in West Virginia. The water in the Middle Falls cascades some 45 feet. The waters of Hills Creek descend some 200 feet between the Upper and Lower Falls.

Other spectacular views can be seen at Sandstone Falls in Summers County. There, visitors can travel along a boardwalk from the shore of the New River to an observation deck below the falls. Cathedral Falls, located near Gauley Bridge in Fayette County, drops more than 60 feet in a series of falls and cascades. It is formed by Cane Branch, a tributary of the New River, as it descends over the Upper Nuttall sandstone formation. Seneca Falls arises in Seneca Creek, in Pendleton County. The upper section of Seneca Creek contains numerous waterfalls, the highest of which is Upper Seneca Falls at 30 feet.

### Caves

West Virginia is a haven for *spelunkers* (those who like to explore caves). West Virginia has the fourth-highest number of caves in the United States and eleven of the world's fifty longest caves. It is believed that the



something  
**extra!**

Seneca Creek is a headwaters stream of the Potomac River; it drains Spruce Knob.



state's many limestone caves were formed hundreds of millions of years ago by the flow of underground water. The caves were then pushed above sea level during the Ice Age, possibly the result of an ancient earthquake. The stalactites and stalagmites in the caves evolved over millions of years as water drops slowly deposited calcium carbonate. *Stalactites* hang like icicles from the roof of a cave, and *stalagmites* are like pillars rising from the cave floor.

Native Americans and early pioneers used the caves for shelter and natural refrigeration. In the twentieth century, they became tourist attractions. One such site is Organ Cave in Greenbrier County, which was discovered in 1704. In 1796, Vice President Thomas Jefferson, who had an interest in paleontology, received some fossil bones from a man named John Stuart. Because Stuart theorized that the bones might be the remains of a lion, Jefferson named the discovery *Megalonyx*. It was later discovered that the bones came from a giant ground sloth that at one time lived in southern West Virginia. In 2008, the *Megalonyx Jeffersonii* was named West Virginia's state fossil. The cave may be best known for the part it played in the Civil War. Besides serving as a safe haven for Confederate soldiers, 1,100 of General Robert E. Lee's soldiers were known to have gathered there for religious services.

More importantly, however, the cave was a source of saltpeter, a substance (potassium nitrate) used in the production of gunpowder. Visitors can examine a number of the original saltpeter hoppers that have been preserved.



### something extra!

Commercial tours of Seneca Caverns began in 1928. Electric lights were added as a safety precaution in 1930.

**Top:** The Ice Cream Wall at Lost World Caverns is named for its creamy white coloring.

**Bottom:** The War Club, a 28-foot stalagmite at Lost World Caverns, is estimated to be 500,000 years old.





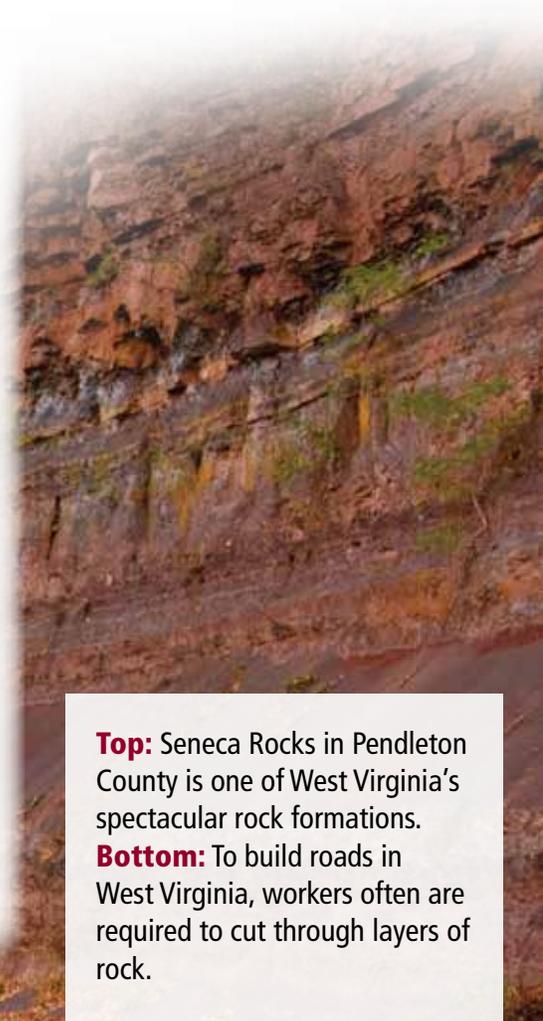
In Pendleton County are Seneca Caverns, the largest of West Virginia's commercial caves. Seneca Caverns are almost 3 1/2 miles long and extend 165 feet below Earth's surface at their deepest point. The Seneca Indians sought shelter in the caverns, which maintain a constant temperature of 54°F.

Before there was refrigeration, meat was smoked to keep it from spoiling. Legend has it that the Seneca Indians used caverns to store meat. Smoke venting from one such cave in Grant County caused it to be named Smoke Hole Caverns. The caverns there have been open to the public since 1942. Visitors have marveled at the "world's longest ribbon stalactite," a limestone formation of overlapping ribbons weighing 2 1/2 tons.

Lost World Caverns, in Greenbrier County, was discovered in 1942 by explorers from Virginia Polytechnic Institute in Blacksburg, Virginia. Originally called Grapevine Cave because of the many grapevines that covered its opening, it received its present name when it opened to the public in 1970. Visitors to the cave can travel up to 120 feet below Earth's surface.

### Rock Formations

West Virginia also contains a number of natural rock formations. The oldest rock formations are found in the eastern part of the state. One of the oldest is the Trough, which is near Romney and got its name from the overhanging rocks found there. The South Branch of the Potomac River cuts through Hardy and Hampshire Counties and flows seven miles through the Trough.



**Top:** Seneca Rocks in Pendleton County is one of West Virginia's spectacular rock formations.

**Bottom:** To build roads in West Virginia, workers often are required to cut through layers of rock.

# Focus on Technology

## LEARNING SKILL: COLLABORATION

Work with a partner to access a given website and use information to perform a task.

## TECHNOLOGY TOOL: SATELLITE MAPPING

Use the features of a global mapping site to find specific information.

Go to <https://geonames.usgs.gov/pls/gnispublic> and enter the name of your school in the Feature Name field. Click West Virginia and your county. Then, click "Send Query."

Once the school is located, click its name. You will receive additional information about your school's location. This will help make sure you clicked the right thing!

Click the ACME Mapper link on the right. A map will open showing your school's relative and absolute locations. Record that information. (Latitude and longitude are shown in degrees, minutes, and seconds: 32°40'2"N.)

Finally, look at the images under each tab (Map, Satellite, Topo) and write a description of what you see in each.



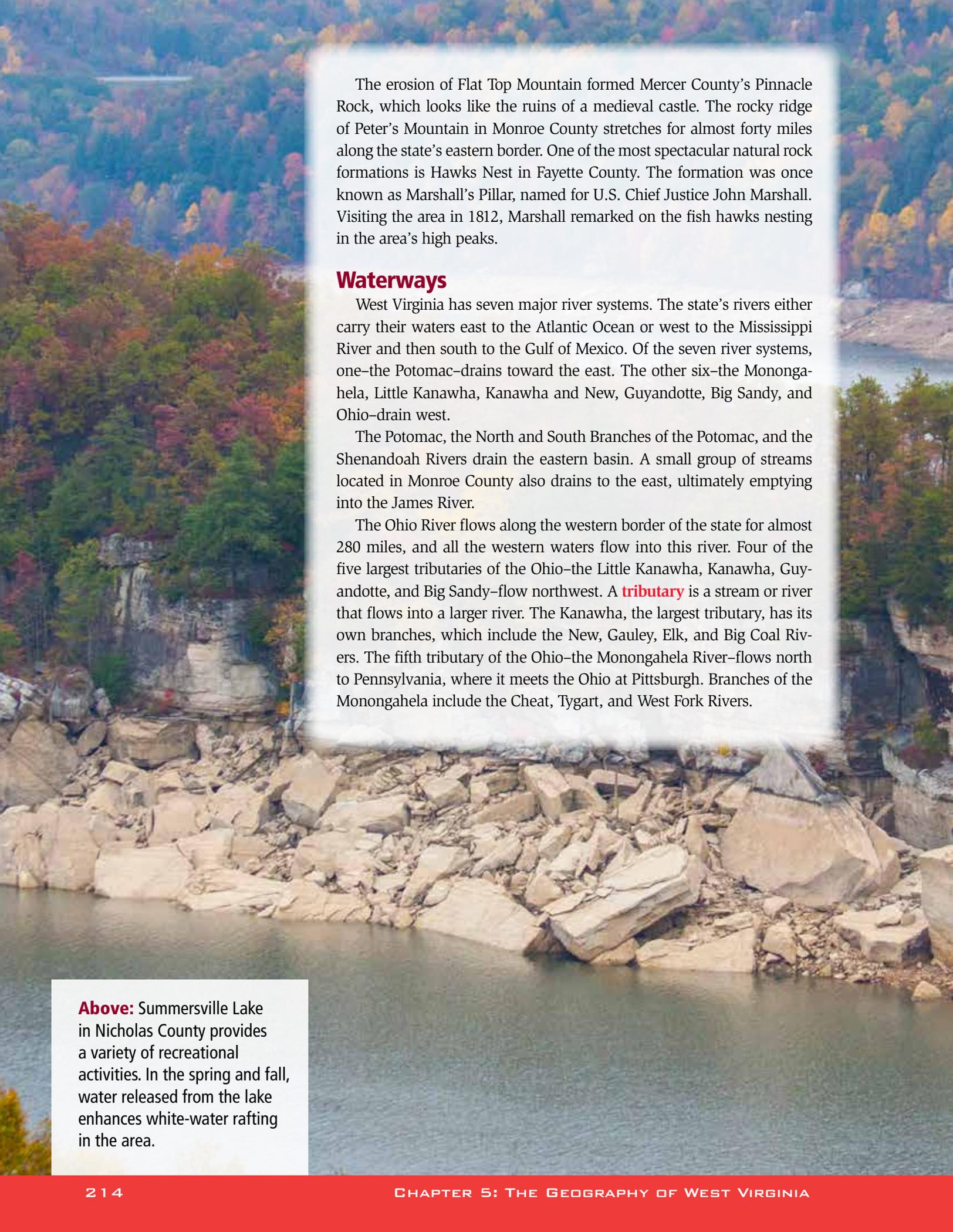
Another rock formation, Caudy's Castle (Castle Rock), towers 1,070 feet above sea level over the Cacapon River. It is named for James Caudy, an early Hampshire County pioneer and Indian fighter. In the 1730s, Caudy took refuge from a group of Indians on this mass of rocks overlooking the Cacapon River.

Ice Mountain is a unique structure located in Hampshire County between Slanesville and Capon Bridge. Its 1,250-foot summit offers a panoramic view of the eastern panhandle. At one time, people thought that the mountain held an underground glacier. In reality, Ice Mountain has what geologists call a cold-producing slope. Water seeps into the mountain and freezes, and the sandstone insulates the ice so it does not thaw. The air that filters out from the 60 small holes at the mountain's base remains a constant 38 degrees all year. Because of the temperature, plants that normally live at an elevation of 3,000-4,000 feet grow at the mountain's base elevation of 700 feet. Some of the plants around Ice Mountain include the Appalachian wood fern, nannyberry, skunk currant, starflower, and Canada mayflower. The area around Ice Mountain is such a fragile environment that rock climbing and rappelling are forbidden. In the past, ice could be seen on Ice Mountain into late May. Today, however, warming temperatures have caused the ice to disappear earlier. If this warming continues, the area's unique plants could be endangered.

West Virginia's rock formations are actually the result of erosion as well as freezing and thawing. **Erosion** is the gradual wearing down of the land or rock by wind and water. Seneca Rocks rise almost 1,000 feet above the confluence (the coming together) of Seneca Creek and the North Fork of the South Branch of the Potomac River in Pendleton County. They were formed by the erosion of topsoil.

**Below:** Pinnacle Rock in Mercer County. **Bottom:** Hanging Rocks rises nearly 300 feet above the South Branch of the Potomac River in Hampshire County.





The erosion of Flat Top Mountain formed Mercer County's Pinnacle Rock, which looks like the ruins of a medieval castle. The rocky ridge of Peter's Mountain in Monroe County stretches for almost forty miles along the state's eastern border. One of the most spectacular natural rock formations is Hawks Nest in Fayette County. The formation was once known as Marshall's Pillar, named for U.S. Chief Justice John Marshall. Visiting the area in 1812, Marshall remarked on the fish hawks nesting in the area's high peaks.

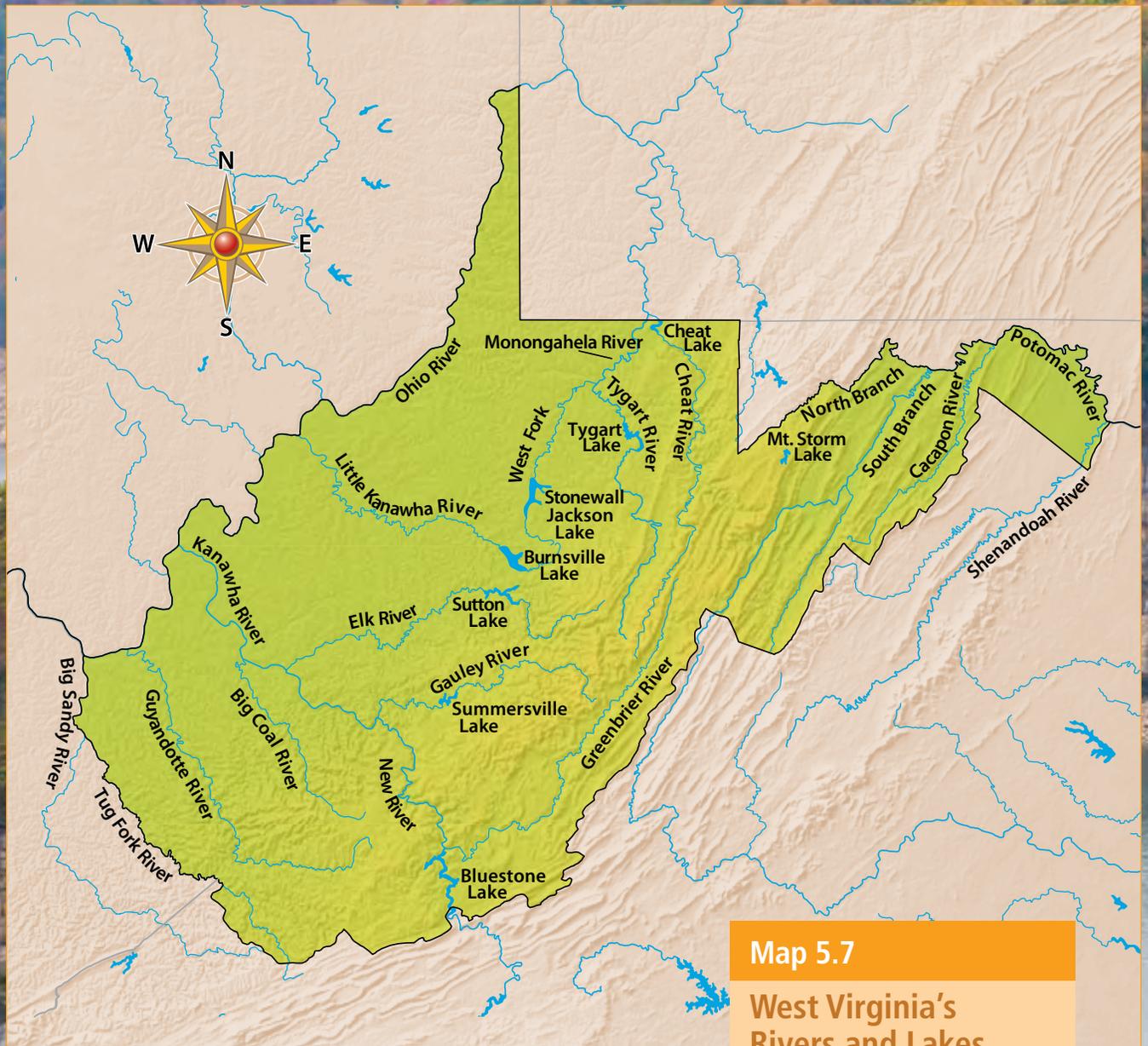
## Waterways

West Virginia has seven major river systems. The state's rivers either carry their waters east to the Atlantic Ocean or west to the Mississippi River and then south to the Gulf of Mexico. Of the seven river systems, one—the Potomac—drains toward the east. The other six—the Monongahela, Little Kanawha, Kanawha and New, Guyandotte, Big Sandy, and Ohio—drain west.

The Potomac, the North and South Branches of the Potomac, and the Shenandoah Rivers drain the eastern basin. A small group of streams located in Monroe County also drains to the east, ultimately emptying into the James River.

The Ohio River flows along the western border of the state for almost 280 miles, and all the western waters flow into this river. Four of the five largest tributaries of the Ohio—the Little Kanawha, Kanawha, Guyandotte, and Big Sandy—flow northwest. A **tributary** is a stream or river that flows into a larger river. The Kanawha, the largest tributary, has its own branches, which include the New, Gauley, Elk, and Big Coal Rivers. The fifth tributary of the Ohio—the Monongahela River—flows north to Pennsylvania, where it meets the Ohio at Pittsburgh. Branches of the Monongahela include the Cheat, Tygart, and West Fork Rivers.

**Above:** Summersville Lake in Nicholas County provides a variety of recreational activities. In the spring and fall, water released from the lake enhances white-water rafting in the area.



**Map 5.7**

**West Virginia's Rivers and Lakes**

**Map Skill:** Which river forms Stonewall Jackson Lake?

Three streams in West Virginia have headwaters (sources) that are within one-half mile of one another, near the intersection of Pendleton, Pocahontas, and Randolph Counties. These streams begin about 4,000 feet above sea level. Melting winter snow and rainfall propel these three streams along a journey that can take snowflakes that fall within inches of one another on the same mountain to destinations separated by 1,500 miles. The source of the three streams is on the Allegheny Front, a steep mountain ridge that marks the dividing line between eastern and western West Virginia. East of the Front, the streams and rivers empty into the Atlantic Ocean; west of the Front, the waters eventually flow into the Gulf of Mexico.

One of the streams begins on the Grassy Mountain side of the Front; the other two begin on the Allegheny Mountain side. The stream on the Grassy Mountain side—Elk Run—begins near 38°40' N latitude and 79°37' W longitude. Elk Run flows into Big Run, which flows into the North Fork of the South Branch of the Potomac River. From there, the water runs into the South Branch and the Potomac Rivers, and then passes through the nation's capital. Then, it reaches the Chesapeake Bay and finally the Atlantic Ocean.

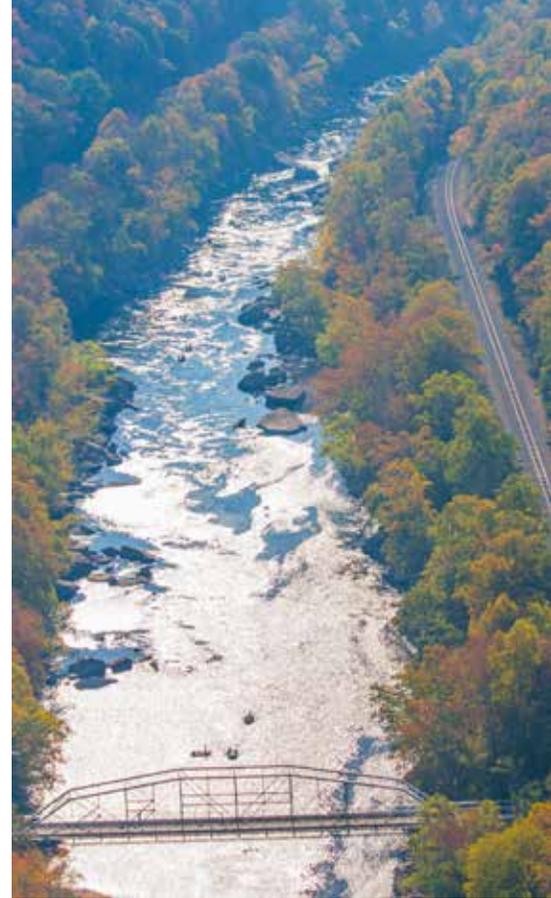


**Above:** The Ohio River is an important transportation route for West Virginia, in addition to being one of its borders.

A ridge separates the two streams on the Allegheny Mountain side of the front. As a result, one stream flows north, the other south. The north-flowing stream begins at about 38°39' N latitude and 79°38' W longitude. Its water flows into Gandy Creek and continues down the mountain to Dry Fork, where it enters the Blackwater River. Still flowing northward, the water enters the Cheat and Monongahela Rivers. When it reaches Pittsburgh, the Monongahela joins with the Allegheny River to form the Ohio, which flows southwest to the Mississippi River and ultimately to the Gulf of Mexico.

The stream on the south side of the ridge also begins near 38°39' N latitude and 79°38' W longitude. Its water flows to Bennett Run, a tributary of the East Fork of the Greenbrier River. The Greenbrier River is a tributary of the New River, which flows northwest to Gauley Bridge. There it joins other rivers to form the Kanawha. The Kanawha continues south through Charleston, the capital of West Virginia. When it finally reaches Point Pleasant, the Kanawha flows into the Ohio. It is ironic that the two neighboring streams, which might have begun as snow high in the Alleghenies, go their separate ways only to be reunited in the Ohio River. Once they are rejoined, they travel together down the Mississippi River to the Gulf of Mexico.

With so many rivers, it is difficult to believe that West Virginia has only one natural lake, Trout Pond in Hardy County. One explanation for this is that West Virginia escaped the Ice Age glacial period that carved lakes in other states. The state also lacks watershed basins, which cause lakes to form. Many lakes have been created, however, behind flood-control dams. These large man-made lakes provide many opportunities for recreation. Some of the larger lakes are Cheat Lake in Monongalia County, Stonewall Jackson Lake in Lewis County, Bluestone Lake in Summers County, and Summersville Lake in Nicholas County.



## Reviewing the Section

### Reviewing the Content

1. What type climate does West Virginia have?
2. What were early caves used for?
3. Name the seven river systems found in West Virginia.

### Using the Content

Write a description of the place where you live (a town, street, rural area) using examples of the physical characteristics (climate, rock formations, rivers, waterfalls, caves) that are found there.

### Extending the Literacy Skill

When you used the SQ3R strategy in Section 2, what did you list in your survey that helped you understand the information found there?

something  
**extra!**



Trout Pond was created by a sinkhole that filled with water from the streams coming from Long Mountain.

**Above:** The Potomac River also serves as one of West Virginia's borders.

# Human/ Environmental Interaction

## As you read, look for

- the definition of human/environmental interaction;
- how geography affects industrial growth;
- results of human/environmental interaction;
- terms: **extinct**, **surface mining**.

**The geographic theme of *human/environmental interaction*** describes how humans use, affect, and are affected by their environment. For example, animals like the American bison, wolf, and elk once thrived in West Virginia. Then, men began hunting the animals for food and hides. Some time later, the Virginia government began paying a bounty (a reward or payment) for dead wolves. Because of these human interventions, these animals are now **extinct** (do not exist) in the state.

## The Environment and Industrial Growth

Over the years, geography has dictated where people live as well as how they make a living. Three major industries in West Virginia were created because unique geographic conditions exist in the state. The industrial growth and success of these industries, however, have also been responsible for changing the very environment that supported their creation.

The central and southern regions of West Virginia contain valuable supplies of coal. Geographic conditions caused the coal to develop where it did. Humans, however, had to alter the natural surroundings somewhat in order to make mining the mineral profitable. Although there were some settlements in the area before coal became important, the lack of roads and navigable streams delayed the region's development. It was not until the coming of the railroad in the mid- to late 1800s that the area began to grow and become economically successful. Building the roads and railroads changed the look of the region. What was once fertile, unspoiled land was soon covered with houses, churches, schools, and stores to meet the needs of the many people who came to work in the mines or on the railroad.

**Above:** This coal-processing plant is at Elk Run.



As mining became more and more profitable, some companies began to look for an easier way to extract the coal that was near Earth's surface. The result was **surface mining**, or "strip mining" as it is commonly called. This type of mining actually strips the land, uproots trees, destroys land, and pollutes streams, increasing the potential for erosion and flooding. Today, companies engaged in surface mining must restore the land when they are finished. In some instances, the area is actually left in better condition than before it was mined.

West Virginia's geographic conditions also made it a natural site for the expansion of the chemical industry. The state contained almost limitless quantities of five of the six elements needed for the production of chemicals. Five of these elements are carbon from coal, hydrogen from water, oxygen and nitrogen from the air, and chlorine from salt brines. Sulphur, the sixth element, was easily obtained from surrounding states. The availability of these elements as well as an abundance of natural gas were major factors in Union Carbide's decision to locate in the state. Other chemical companies followed Union Carbide's lead, and soon the Kanawha Valley became known as "the Chemical Valley of the World."

The development of the chemical industry caused changes in the state's natural environment. Sometimes chemical waste was accidentally or deliberately poured into the state's rivers and streams, killing wild-life and making some waterways unfit for human use. Sometimes the chemical waste was dumped or buried, causing soil pollution that has left some land unusable. Sometimes chemical leaks and the machinery used to make the chemicals polluted the air, endangering the lives of those nearby. Although the chemical industry has brought economic growth and prosperity to the state, it has, like the coal industry, endangered the environment at times.

**something extra!**  
Coal is sometimes referred to as "black gold."

**Top:** These early 1900s miners changed the natural environment to remove the coal.



something  
**extra!**

The most popular hardwood tree in West Virginia is the red oak.

Besides the effect industry has had on the environment, other factors have impacted it as well. Shifting population has resulted in changes in land use in particular places.

Population growth or decline can bring change. For example, the eastern panhandle was once primarily farmlands. As new transportation systems connected the region with Washington, DC, people who wanted to live outside the city began to relocate, primarily in Jefferson and Berkeley Counties. As the once rural area continued to grow, farmland soon became housing developments, retail shops, restaurants, hotels, and business centers.

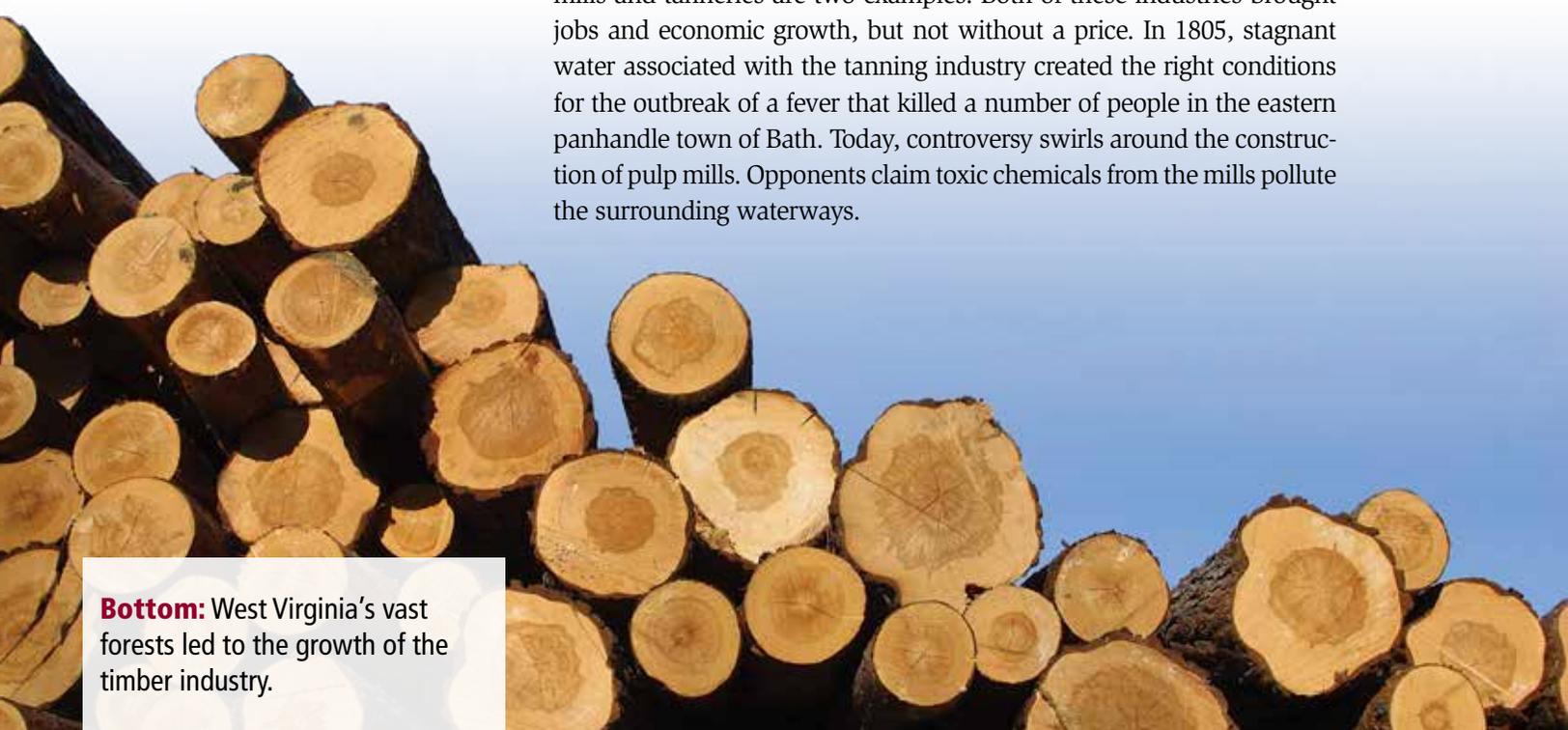
Although population growth almost always results in a decline in farmland, advancements in technology have kept production up. The eastern panhandle is still a leading producer of beef products and fruit.

Population decline, which is often associated with job loss, can have a very different effect on a region. Population loss often results in closed buildings and reduced services. This has been a trend, especially in southern West Virginia where some small towns are now almost ghost towns.

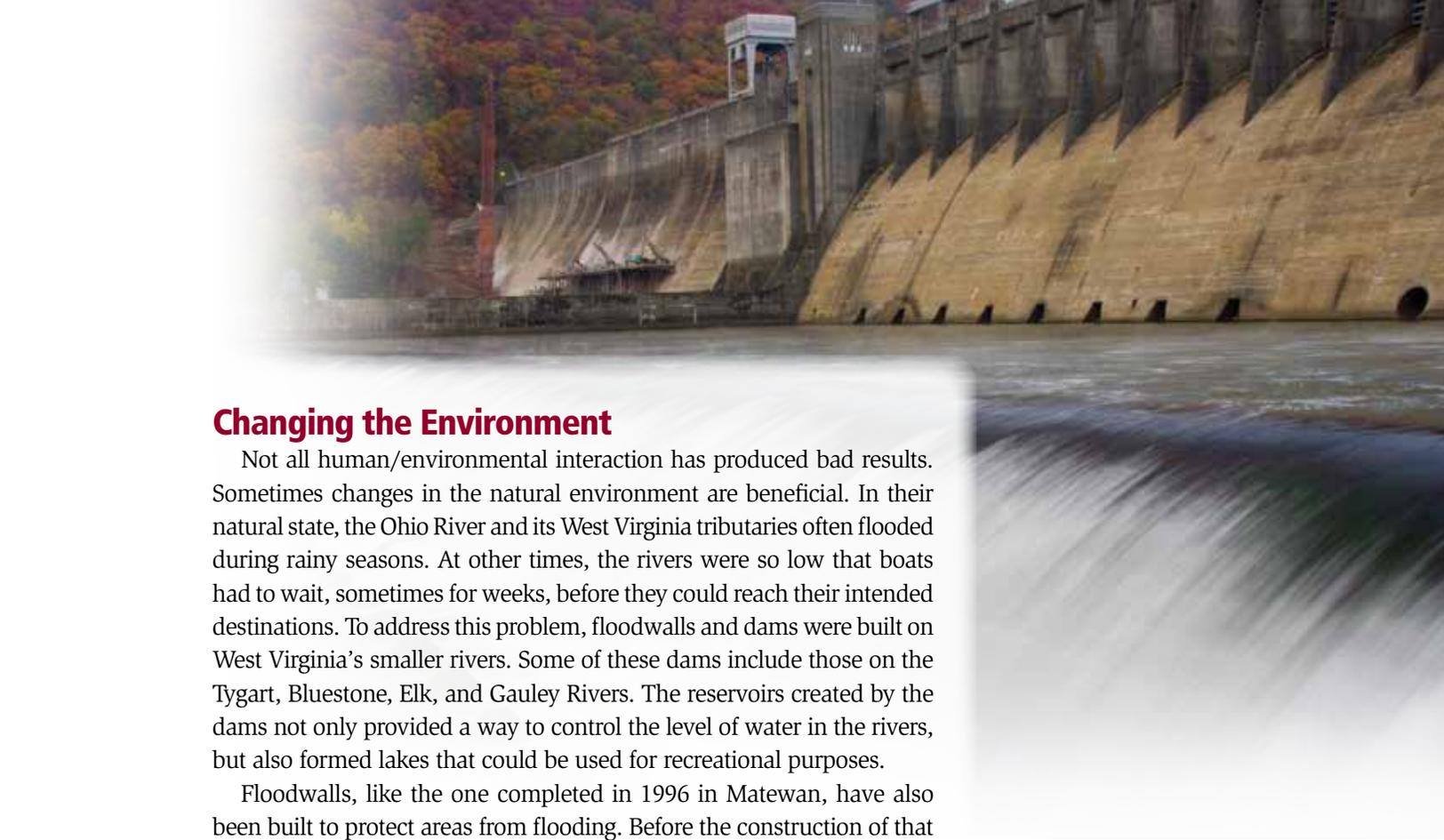
The lumber industry provides a final example of human/environmental interaction. Because West Virginia is heavily forested, it was only a matter of time before someone recognized the economic potential of its rich timberlands. When the first white men came into the area, the entire state was covered with natural forests containing some of the finest hardwoods in the eastern United States.

The first trees were cut to provide building material for houses and wood for fuel. As settlers began to produce food for sale or trade, they needed wood to make the boats to carry those products to market. The growth of the lumber industry continued as railroads made their way into the state in the mid-1800s.

The increased demand for lumber brought about the need for more and better mills. Lumbering brought other industries to the state; pulp mills and tanneries are two examples. Both of these industries brought jobs and economic growth, but not without a price. In 1805, stagnant water associated with the tanning industry created the right conditions for the outbreak of a fever that killed a number of people in the eastern panhandle town of Bath. Today, controversy swirls around the construction of pulp mills. Opponents claim toxic chemicals from the mills pollute the surrounding waterways.



**Bottom:** West Virginia's vast forests led to the growth of the timber industry.



## Changing the Environment

Not all human/environmental interaction has produced bad results. Sometimes changes in the natural environment are beneficial. In their natural state, the Ohio River and its West Virginia tributaries often flooded during rainy seasons. At other times, the rivers were so low that boats had to wait, sometimes for weeks, before they could reach their intended destinations. To address this problem, floodwalls and dams were built on West Virginia's smaller rivers. Some of these dams include those on the Tygart, Bluestone, Elk, and Gauley Rivers. The reservoirs created by the dams not only provided a way to control the level of water in the rivers, but also formed lakes that could be used for recreational purposes.

Floodwalls, like the one completed in 1996 in Matewan, have also been built to protect areas from flooding. Before the construction of that floodwall, Matewan experienced four floods in a one-month period in 1953, as well as major floods in 1977 and 1984. The floodwall, which is 2,350 feet long and between 6 and 29 feet high, should protect the town from future flooding. The floodwall, which contains murals depicting the history of Matewan, also serves as a tourist attraction.

### Reviewing the Section

#### Reviewing the Content

1. What is meant by human/environmental interaction?
2. Name three industries that grew up in West Virginia because of geographic conditions that existed in the state.
3. How has human intervention changed the natural environment of West Virginia?

#### Using the Content

Write a letter to one of your state legislators about an environmental concern and offer a possible solution.

#### Extending the Literacy Skill

When you used the SQ3R strategy before reading Section 3, what questions did you write? How did your questions compare with the questions in your textbook at the end of the section?

**Top:** Dams control the water level in rivers and create lakes that can be used for recreation.

# Sharing as Well as Preserving Culture

When the first immigrants, the Germans, settled in the Shenandoah Valley, they mostly settled on the available rich farmland. When the Scots-Irish came a few years later, they found most of the good farmland in the eastern region of western Virginia taken, so they traveled farther west into the Greenbrier Valley. Both immigrant groups remained relatively isolated on farms, but they eventually formed small towns made up of people of the same or similar ethnic or cultural backgrounds. It was in these early settlements that a blended Appalachian culture was born.

These settlers developed a unique language that was mostly influenced by the Scots. Many of the phrases used today had their origin in the early mountain settlements. Because doctors were not readily available on the frontier, these settlers developed their own cures, using a combination of herbs and roots. They also created recreational opportunities. Some of these activities grew out of everyday necessities. For example, when someone needed a cabin, families would organize a house raising, an event that combined work with picnics and games.



When the second large group of immigrants came to West Virginia in the early 1900s, they settled mostly in towns near coal mines, salt mines, iron furnaces, and other industrial sites. These immigrants, many of whom were single men who married local residents, made little attempt to preserve their native culture. Rather, they assimilated (adopted the practices of another culture, thereby becoming a member of that culture). These groups of immigrants, e.g., Italians, Russians, Spaniards, and Hungarians, celebrate their native cultures today through the various fairs and festivals held throughout West Virginia. These celebrations focus on the music, food, dance, dress, and customs of the countries from which these immigrants came.



The newest immigrants, who came to West Virginia in the late 20th century from countries like India, China, Iran, and Pakistan, settled in neighborhoods surrounded by people of different ethnicities. They immediately accepted some elements of their neighbors—including language, food, and music—while maintaining elements of their own culture. Immigrants from India and the Middle East have established cultural centers and places of worship to offer opportunities to keep their native culture alive and to promote understanding and closer ties with their neighbors.

Immigrants from India have constructed the India Center in South Charleston and the Hindu Religious and Cultural Center in Morgantown. These centers are open to the public and host special events, such as Bollywood, to showcase their culture through dance performances, worship opportunities, and recognition of special days. Immigrants from the Middle East have established mosques in South Charleston, Morgantown, Beckley, and Huntington to provide places to practice Islam. The mosques also provide places to host celebrations. Both groups welcome people outside their culture to worship and attend cultural events.



## SECTION 4

# Movement

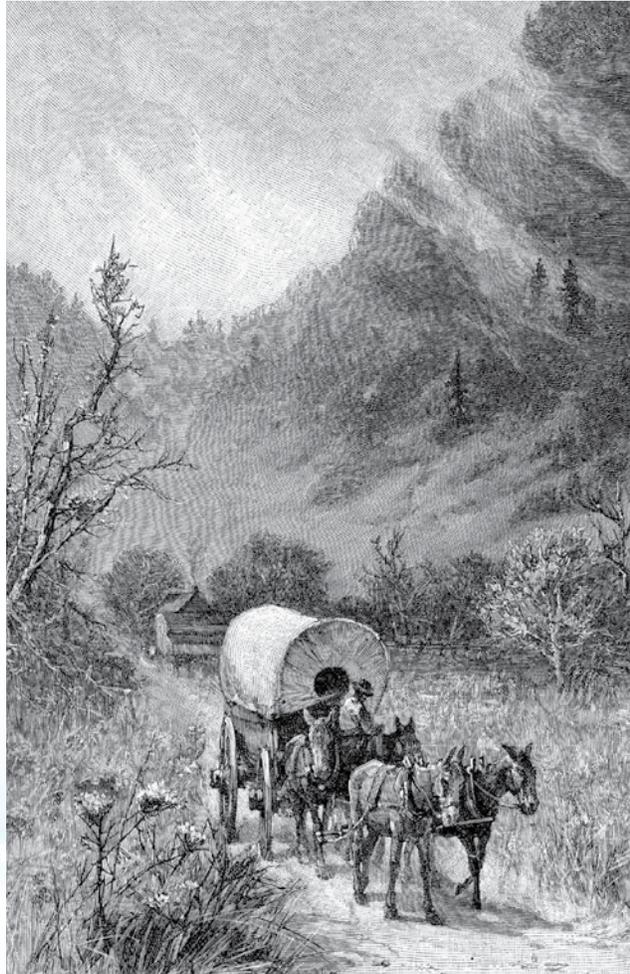
### As you read, look for

- reasons people move from place to place.

**The geographic theme of *movement*** focuses on the ways people are linked with regions, cultures, and other people beyond their immediate environment. These linkages may be the result of travel, trade, communication, or even immigration. Patterns of movement can be seen in exploration, trade routes, settlement, migration, and invasion.

Geographic conditions greatly affected where people traveled as well as where they settled. Early humans migrated from place to place in search of food, water, and security. Explorers were sent out to look for gold and silver and for a shorter route to the Far East.

Because the mountains were a tremendous obstacle, the first European explorers investigated the easiest routes. River valleys and gaps through the mountains provided access to the interior, influencing what areas were actually explored and charted. The first white settlers in western Virginia came to the eastern panhandle, where an extension of the Valley of Virginia made their movement into the area easier.



**Above:** Settlers crossed the eastern mountains in wagons to move into western Virginia.

**Bottom:** This photograph of the Valley of the Potomac illustrates why it was a popular route for settlers moving west.

Later, as people came to the area to make their homes, they followed many of the same paths that the explorers did. The need to find fertile land and sources of food also influenced their movement. As more and more settlers came, the later arrivals found the best farmland already taken by those who had preceded them. As a result, they had to push farther into unexplored territory.

By the time humans learned how to control geographic conditions, economic opportunities affected movement. Some people moved to be near jobs, while others moved to get away from heavily populated centers. In modern society, transportation and communication networks provide for the continued movement of goods, people, and ideas. Movement promotes the spread of ideas and technological innovations as well as goods.

## Reviewing the Section

### Reviewing the Content

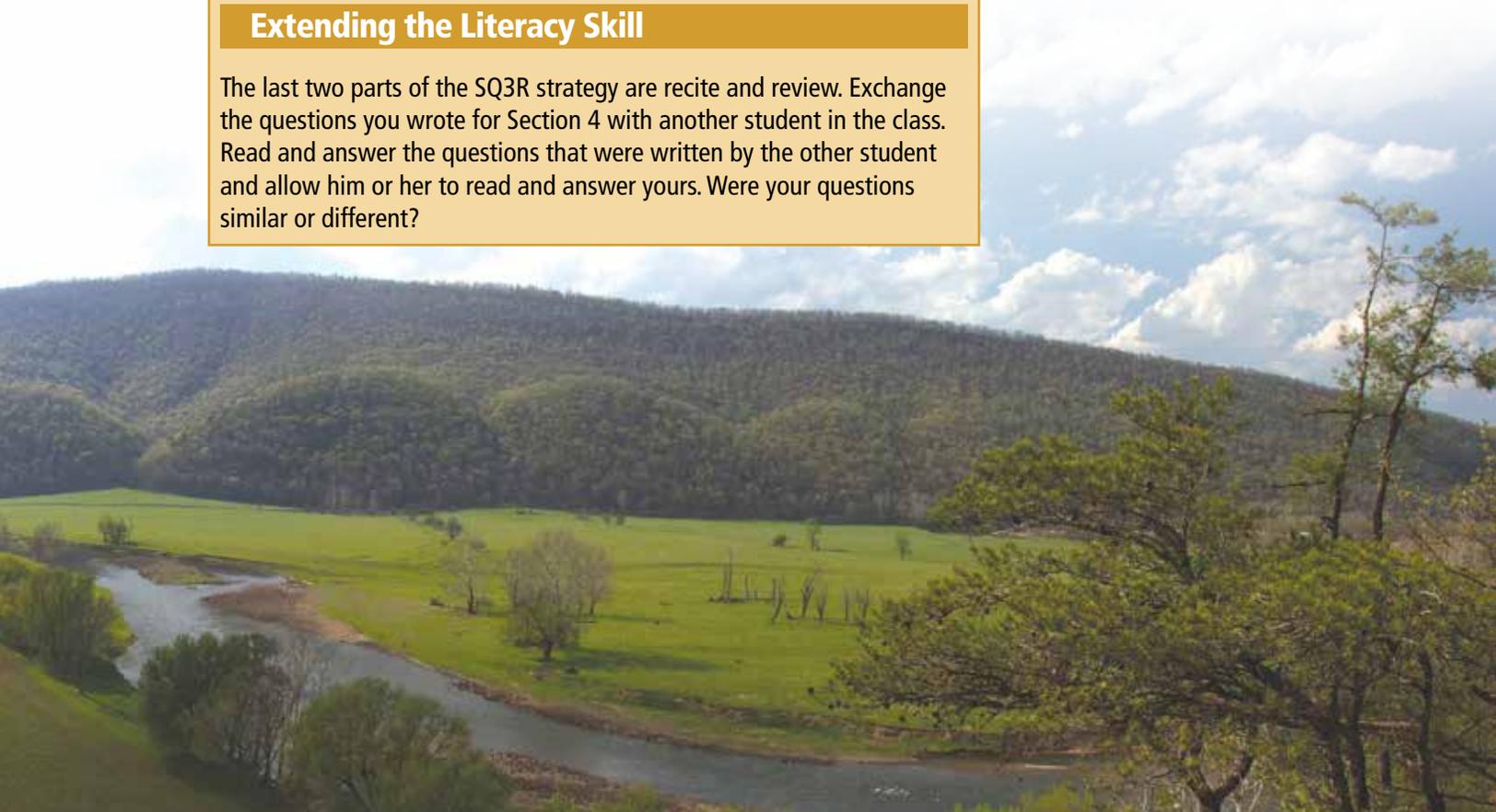
1. Describe several geographic conditions that affect movement.
2. How do economic activities affect movement?

### Using the Content

Pretend you have just moved to your current house. Write a letter to a fictional friend from the fictional town where you lived previously describing how the move has been good for you and your family. Include information on living in a different house, making new friends, attending a new school, seeing new sights, and so on.

### Extending the Literacy Skill

The last two parts of the SQ3R strategy are recite and review. Exchange the questions you wrote for Section 4 with another student in the class. Read and answer the questions that were written by the other student and allow him or her to read and answer yours. Were your questions similar or different?



# Chapter Summary

## Section 1: Location

- West Virginia's location can be described in terms of absolute location and relative location.
- Latitude and longitude are used to describe absolute location.
- West Virginia is bordered by five states: Virginia, Kentucky, Ohio, Pennsylvania, and Maryland.
- West Virginia's natural boundaries include the Allegheny Mountains and the Potomac, Ohio, Big Sandy, and Tug Fork Rivers.
- West Virginia's man-made borders include the Fairfax Stone and Mason-Dixon Line.

## Section 2: Place

- West Virginia's climate is humid continental.
- The mountainous regions have colder temperatures than the valleys.
- Most of the state's precipitation comes from the south and west.
- West Virginia has experienced erratic weather, including flooding and droughts.
- Climate has influenced the natural features of West Virginia.
- West Virginia's valleys include Canaan Valley and Teays Valley.
- Waterfalls in West Virginia include Blackwater Falls, Falls of Hills Creek, Sandstone Falls, Cathedral Falls, and Seneca Falls.
- Early pioneers used caves for shelter and natural refrigeration. West Virginia's caves include Organ Cave, Smoke Hole Caverns, Seneca Caverns, and Lost World Caverns.
- Rock formations in West Virginia include Caudy's Castle, Ice Mountain, Seneca Rocks, Pinnacle Mountain, Peter's Mountain, and Hawks Nest.

- West Virginia has seven major river systems. One—the Potomac—drains east, while the other six—Monongahela, Little Kanawha, Kanawha and New, Guyandotte, Big Sandy, and Ohio—drain west.
- The Ohio River flows along the western border of the state for almost 280 miles. The Kanawha is the largest tributary of the Ohio River.
- West Virginia has only one natural lake. Major man-made lakes in West Virginia include Cheat Lake, Stonewall Jackson Lake, Bluestone Lake, and Summersville Lake.

## Section 3: Human/Environmental Interaction

- Humans have altered the natural environment.
- Hunting has caused the extinction of some animals in West Virginia.
- Geographic conditions supported coal mining, lumbering, and chemical industries in West Virginia.
- Surface mining has changed the face of the Mountain State.
- Beneficial results of human/environmental interaction include building dams to reduce the threat of flooding and create recreational activities.

## Section 4: Movement

- Movement results from travel, trade, communication, and immigration and from the search for food, water, jobs, and security.
- Good transportation routes make movement easier.
- Early settlers followed transportation routes that had been used by early explorers.
- Today, movement includes the spread of ideas and technological innovations as well as goods.

## The Geography of West Virginia

### Recalling the Facts

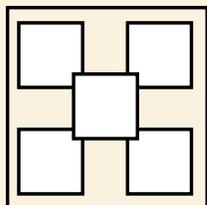


1. What are four of the five themes of geography?
2. What part of West Virginia's border with Maryland was established by the U.S. Supreme Court?
3. What are some characteristics of West Virginia's climate?
4. How does elevation affect temperature and precipitation?
5. What has caused most of the rock formations in West Virginia?
6. How many natural lakes does West Virginia have?
7. Give an example of a human/environmental interaction that resulted in an improved condition.
8. Why was the eastern panhandle the first area of West Virginia to be settled?
9. What are some reasons people move?

### Learning Skill



1. Is West Virginia's location an advantage or a disadvantage? Give reasons for your answer.
2. Use a Venn diagram to compare and contrast longitude and latitude.
3. How can prolonged droughts negatively impact the state's economy and its individual citizens?
4. Copy the following graphic organizer on a plain piece of paper. Draw a picture of West Virginia in the center box. Write one fact about West Virginia's location that you did not know in each of the boxes located in the four corners.



# Chapter Review

5. Do you think human/environmental interaction has been good or bad for West Virginia? Why?
6. Why do you think environmental issues are discussed more openly today than in the past?

### Community Connection



1. Find a picture of a "place" near where you live. Mount the picture on a piece of construction paper, and identify natural wonders found there that help to define the place.
2. Interview someone who has recently moved—to a different house, a different state—to find the reason(s) for the move. Then, with the rest of the class, make a graph from all the interviews.

### Literacy Skill



Choose one of the natural wonders—valleys, waterfalls, caves, rock formations, waterways—mentioned in the chapter. Write a descriptive essay using your five senses (seeing, hearing, smelling, touching, and tasting) to describe the place.

### Technology Tool



1. There are all sorts of long-held folklore about the weather. Use your favorite search engine and the words "weather folklore" to locate three or four interesting beliefs about weather that are part of folklore. Then, determine through observations, interviews, or additional web searches if any of these beliefs are actually true.
2. Use a search engine to find and read the words of the four official West Virginia state songs. Then, use a Venn diagram to list similarities and differences between two of them.