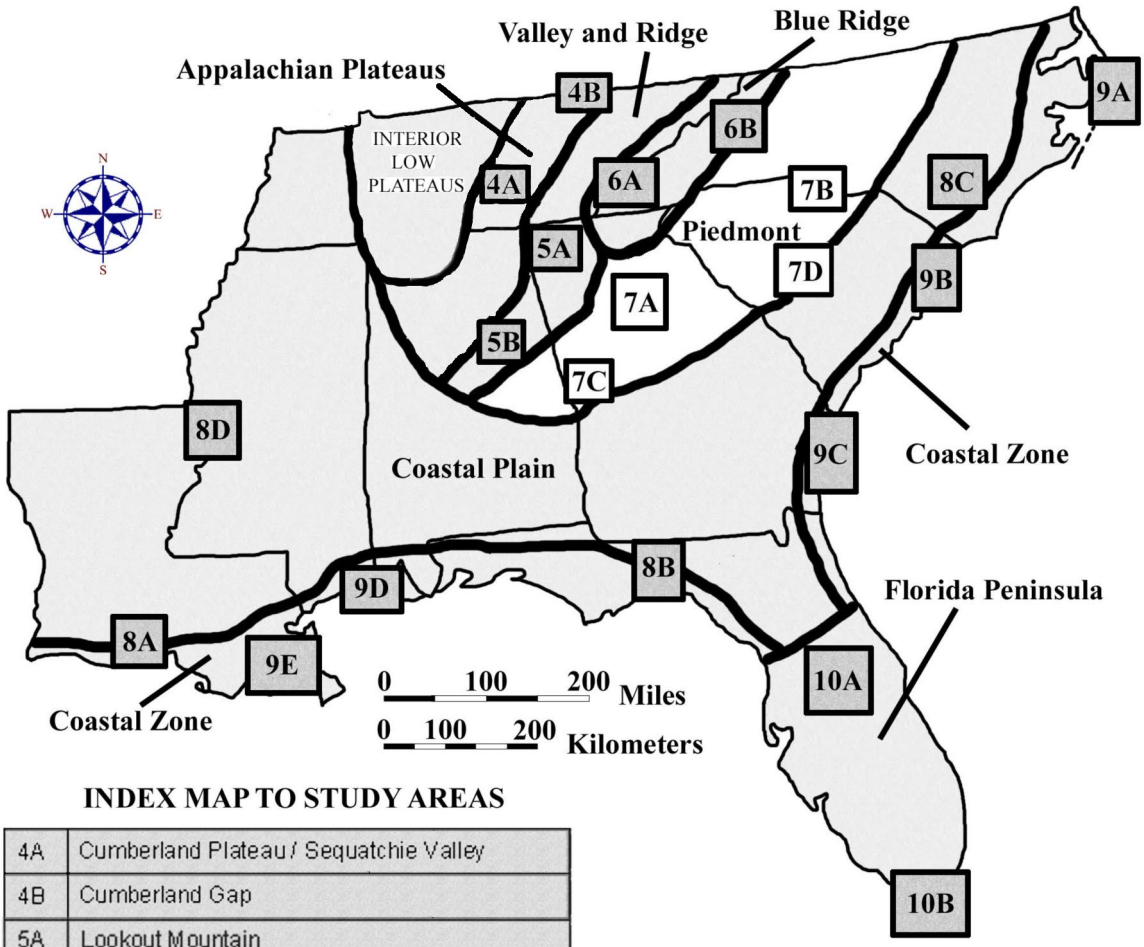
CHAPTER 7

PIEDMONT REGION



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BACKGROUND INFORMATION

Description of Landforms, Drainage Patterns, and Geological Processes

Characteristic Landforms of the Piedmont

The word **Piedmont** is derived from a French word meaning 'Foot of the Mountains'. Although the portion of the Piedmont that borders the Appalachian Mountains certainly qualifies, it is only this northwestern portion that is technically at the foot of the mountains. The rest of the region stretches for over 100 miles (161 km) towards the southeast in a gradually sloping, mostly flat plain. The southeastern boundary of the Piedmont is usually associated with the Fall Line Zone where the more resistant metamorphic and igneous rocks of the Piedmont dip underneath the sedimentary rocks of the Atlantic Coastal Plain. Because of the differences in resistance to erosion of the underlying rocks, streams flowing from the Piedmont into the Coastal Plain often exhibit rapids or small waterfalls at this boundary. A variety of wells drilled through Coastal Plain sediments have confirmed that Piedmont rocks lie underneath, in some places extending in the subsurface as far as the Atlantic Ocean shoreline. As a general rule, the farther from the Fall Line Zone, the deeper the Piedmont rocks lie.

The land surface of the Piedmont can be quite hilly in the higher elevations towards the northwest, but the land becomes flatter and more gently rolling at the lower elevations farther away from the mountains. Piedmont rivers are usually wider and flow more gently than mountain streams, but still have enough energy to actively erode into the landscape creating steep-walled valleys with locally high **relief**. Most Piedmont rivers have **dendritic** (branching) drainage patterns unless they flow over more resistant rocks that have been broken and weakened by fractures and faults. In this latter case, **rectangular** drainage patterns are more common (recognizable by multiple right-angle bends along the stream channel). Because of the great variety of rock types found in the Piedmont, occasionally streams will flow across a particularly resistant rock layer. Such locations are usually marked by rocky shoals, rapids, and occasionally even small waterfalls. Particularly after heavy rainfalls, Piedmont rivers are full of suspended sediment transported from the mountains. Occasionally, this suspended sediment is temporarily deposited in wide flood plains which provide rich and very productive soil for agriculture. Between river valleys, the broad upland areas are essentially flat.

Occasionally, the relatively flat rolling **topography** of the Piedmont is interrupted by a few isolated mountains, called **monadnocks**. These can be either single peaks or elongated ridges, left comparatively undisturbed by erosion. Monadnocks are usually surrounded by relatively flat ground and can therefore be seen from many miles away. Sometimes these hills are composed of more resistant rock which accounts for their greater resistance to erosion. In other cases, it seems to have been pure chance which has allowed these mountains to survive. Some monadnocks located near the boundary with the Blue

Ridge are considered by geologists to actually belong to the Blue Ridge region. Many geologists place the boundary between the Piedmont and Blue Ridge at the Brevard Fault Zone, while most soil scientists and geographers prefer to place the boundary along the Blue Ridge Escarpment, a major topographic lineament that marks a sudden elevation change of up to 2,000 feet (610 meters). In North and South Carolina, the Brevard Fault Zone and the Blue Ridge Escarpment are closely aligned, but in much of Georgia, the Brevard Fault is completely contained within the Piedmont region.

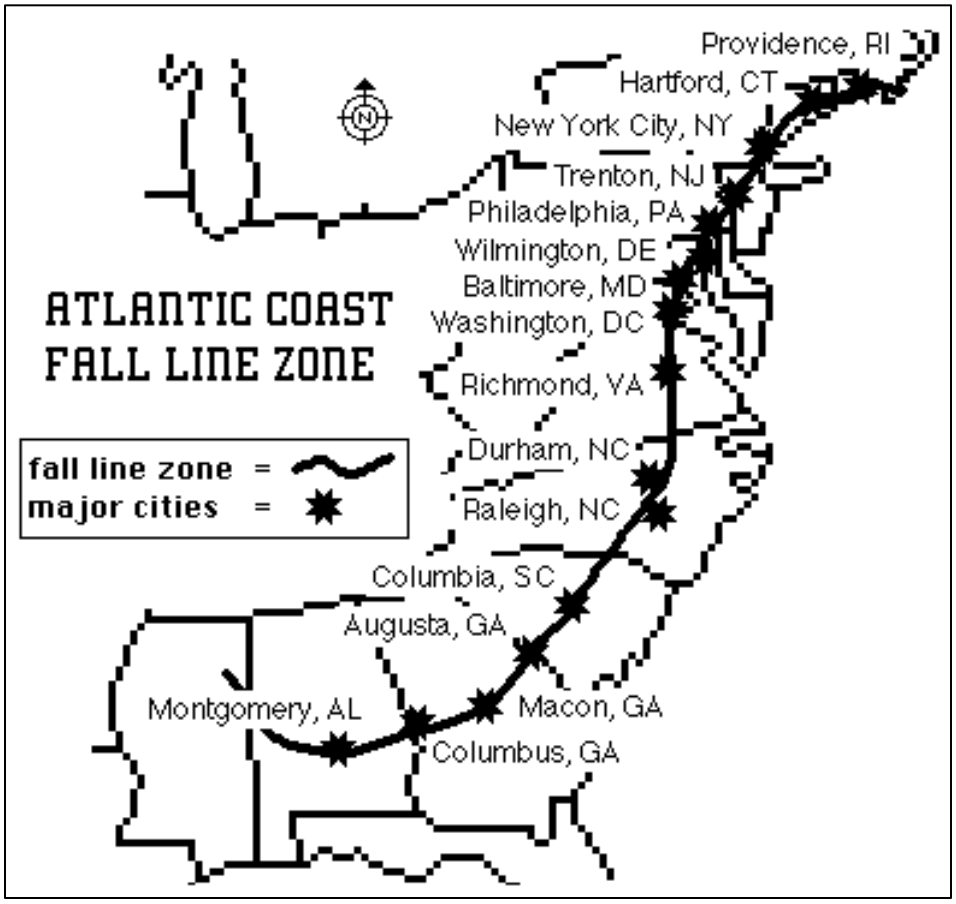
Geographic Features and Localities of Special Interest

Because of their elevation high above surrounding areas, monadnocks are perfect locations for TV, radio, and microwave broadcasting towers. Some well-known examples include Pine Mountain, near Columbus, GA, Stone Mountain, near Atlanta, GA, Paris Mountain, near Greenville, SC, and Kings Mountain, west of Gaffney, NC. In addition, many large non-mountainous bodies of exposed granite rock occur throughout the Piedmont. These features show up as bald rock exposures scattered around the landscape. In reality, the total granite rock mass underground is much greater than the small amount visible at the land surface. The largest and most famous of these exposures is called "Forty Acre Rock" (although only about fourteen acres are actually visible at the surface), located near Taxahaw in Lancaster County, SC. Another famous outcropping, called "Ten Acre Rock," located near Rion in Fairfield County, SC, is the site of a large quarry operation which mines the prized "Winnsboro Blue Granite."

The Fall Line Zone is easily located along river valleys by documenting the first occurrence of **rapids** upstream from the ocean, preventing boats from traveling further inland. The more resistant rocks of the Piedmont and the less resistant rocks of the Coastal Plain Region do not erode at equal rates. As a result, the river channel in the Coastal Plain Region is always slightly lower in elevation than the channel in the Piedmont, allowing the telltale rapids to form. The importance to commerce of the Fall Line Zone is confirmed by the large number of major cities located along the roughly defined boundary, including state capitals Providence, RI; Hartford, CT; Trenton, NJ; Richmond, VA; Raleigh, NC; Columbia, SC; and Montgomery, AL. Many of these cities started out as mill towns taking advantage of the water power available and also were sites of canals originally intended to by-pass the rapids, but later used more for hydroelectric power production.

It can be very difficult to trace the actual Fall Line Zone boundary between river valleys because of the locally extensive and elevated Sandhills Region stretching across Georgia, South Carolina, and extending partially into North Carolina. Throughout much of the region, the Sandhills act as a drainage divide preventing Piedmont streams from crossing into the Coastal Plain. The only exceptions are large, powerful rivers such as the Chattahoochee, Flint, Ocmulgee, and Oconee in Georgia; the Savannah, Congaree, Wateree, and Pee Dee in South Carolina; and the Cape Fear in North Carolina. These major rivers have had enough energy to cut through the Sandhills and maintain their course as uplift occurred; and in certain cases have even managed to erode through the Sandhills rocks completely.

Figure 7-1: Map of Fall Line Zone



In addition to the rapids at the Fall Line Zone, the Piedmont also features many examples of shallow **shoals**, sections of typically flat, resistant rock exposed in streams or rivers. These were favored as places where horse-drawn wagons could cross the stream safely during times of low stream flow. They also provided excellent sites for damming up rivers to provide water power for early mills. Two well-known examples are the Barnett Shoals mill village on the Oconee River near Athens, GA and Ware Shoals on the Saluda River near Greenwood, SC. Many mill towns even incorporated the word 'shoals' into their name. Great Falls, on the Catawba River, also in South Carolina, used to be one of the largest waterfalls in the state before the river was dammed to form several small **reservoirs**. Old-time residents claim that the roar of the falls could be heard for miles around whenever the river level was high. Almost every Piedmont river, stream, creek, and branch has at least one dam and reservoir combination somewhere along its reach. Several of these original mill towns grew into the current major metropolitan areas of the Piedmont, such as Atlanta, GA; Greenville, SC; and Charlotte, NC.

Rock Types and Geologic History

Rock types of the Piedmont are remarkably similar to those of the Blue Ridge Region, differing only in specific mineral content and in regional distribution, and to a certain extent, geologic age. Both **igneous** and **metamorphic** rocks are present in great

variety in the Piedmont. Large igneous **intrusions** (plutons) are exposed in many areas of the Piedmont and range in composition from rocks rich in iron and magnesium silicate minerals, such as gabbro in Abbeville County, SC, to rocks rich in aluminum, potassium, or sodium silicates, such as the blue granites in Elbert County, GA. All such intrusions represent previously molten rock formed deep within the earth's crust during episodes of **tectonic** activity, primarily due to continental collisions, during the Paleozoic Era.

Smaller but still significant outcroppings of Mesozoic age sedimentary rocks occurs in the Raleigh-Durham area of North Carolina and in northern Chesterfield County, South Carolina. These rocks, identified mostly as sandstone and shale, were deposited in **downfaulted basins** (usually called Triassic Basins) associated with **rift zones** which became active at the time the Atlantic Ocean first opened. At about the same time, a series of narrow igneous basaltic **dikes** intruded the older Piedmont rocks and the overlying sedimentary deposits. While the sedimentary deposits have been eroded almost completely away, the more resistant intrusive dikes remain as evidence of the robust geologic activity which accompanied the continental separation. Many geologists believe that this igneous activity was responsible for the opening of the Atlantic Ocean. Such dikes can be found today in several areas of the Piedmont in North and South Carolina and also in the subsurface beneath Coastal Plain deposits in South Carolina and Georgia.

Metamorphic rocks exposed in the Piedmont are primarily gneiss and schist, but local deposits of marble exist in Cherokee County, SC and other less common types of rock occur locally in other areas. Major amphibolite bodies contain remnants of severely deformed pillow lavas, or mounds of lava that are indicative of submarine extrusions. All of these rocks vary considerably in their mineral content throughout the Piedmont, but more importantly, they differ in the extent of their **metamorphism**. Piedmont metamorphic rocks are broadly grouped into several parallel bands crossing the Southeastern states from southwest to northeast, a trend mirroring the original pattern of late Paleozoic Era continental collisions. At one time, the metamorphic rocks of the Piedmont may have formed the substructure of a volcanic island arc, which has been compared to the present-day Indonesian arc in the Pacific Ocean.

The Inner Piedmont Belt consists of strongly folded and fractured metamorphic rock that forms the northwesternmost major tectonic division of the region. The rocks range from 500 to 750 million years in age (Precambrian and Early Paleozoic Eras), and include gneiss and schist that have been intruded by younger granitic rocks. Once comprising a thick sequence of volcanic and marine sediments, these rocks were near the center of the continental collision zone and were the most severely deformed, folded, and recrystallized during the period of regional metamorphism.

The Kings Mountain Belt, and the closely related Pine Mountain Belt in Georgia, represent a shear zone marking the suture of the Inner Piedmont terrane with the rest of the Piedmont. The Kings Mountain Belt outcrops in the Carolinas from Lincolnton, NC to Gaffney, SC, while the Pine Mountain Belt extends from central Georgia to near Auburn, Alabama. These belts consist of moderately deformed and metamorphosed volcanic and sedimentary rocks that are about 400-500 million years old (Early Paleozoic Era). They

are more highly mineralized than the other Piedmont belts and exhibit a lower grade of metamorphism. The mountainous topography of these areas results from the lesser degree of metamorphism that produces minerals and rocks that are more stable at earth-surface conditions, and therefore more resistant to erosion.

The third zone is the Charlotte Belt (sometimes referred to as the 'Carolina Terrane' or the 'Avalon Terrane'). This moderately metamorphosed belt is thought to be the core of the island arc that collided with North America in the Ordovician Period of the Paleozoic Era. It contains more igneous intrusive rocks, especially granite, diorite, and gabbro, than any other Piedmont belt. These igneous intrusions date from 735 to 235 million years old. The volcanic island arc also generated many types of extrusive igneous rocks, including volcanic ash, that were later altered into many of the schists and phyllites exposed at the surface today.

The next major terrane to the southeast is the Carolina Slate Belt. Rocks in this region have been only slightly metamorphosed and can contain some original sedimentary structures and even some occasional fossils. The original site is thought to have been a series of volcanic islands that were active from 550 to 650 million years ago (Late Precambrian to Early Paleozoic Eras). The major rock types are sandstone, mudstone, and volcanic sediments, formed originally as marine sediments generated by tectonic activity along the island arc zone. A few large granite bodies occur in this zone, but they are much shallower and younger than igneous intrusions found in the other belts. The youngest granites here have been dated at 286 million years. Much of the gold mining in the Carolinas occurred in the Carolina Slate Belt in volcanic deposits and other sediments which were metamorphosed by hot fluids released from localized igneous intrusions. Graves Mountain, Georgia features mineral deposits that are thought to be exhalative (caused by submarine hot water vents) in origin.

The last metamorphic terrane of the Piedmont is the Kiokee Belt stretching from west-central South Carolina to central Georgia. Rocks in this belt formed at a higher metamorphic grade than the Slate Belt and are thought to represent a tectonic subduction zone. The Modoc Fault, which forms the northern boundary, is considered by some geologists to represent the suture zone where the African continent impacted North America during the formation of the Appalachian Mountains in the late Paleozoic Era.

The final Piedmont terrane consists of sedimentary rocks and related shallow igneous dikes thought to be associated with the rifting of the North American plate and the opening of the Atlantic Ocean during the Triassic and Jurassic Periods of the Mesozoic Era. The Crowburg Basin in Chesterfield County, South Carolina and the Durham Basin in North Carolina display the largest surface exposures of these downfaulted basins, but other such basins occur in the subsurface, beneath Coastal Plain rocks, throughout South Carolina and into Georgia.

Figure 7-2: Major Piedmont Metamorphic Belts

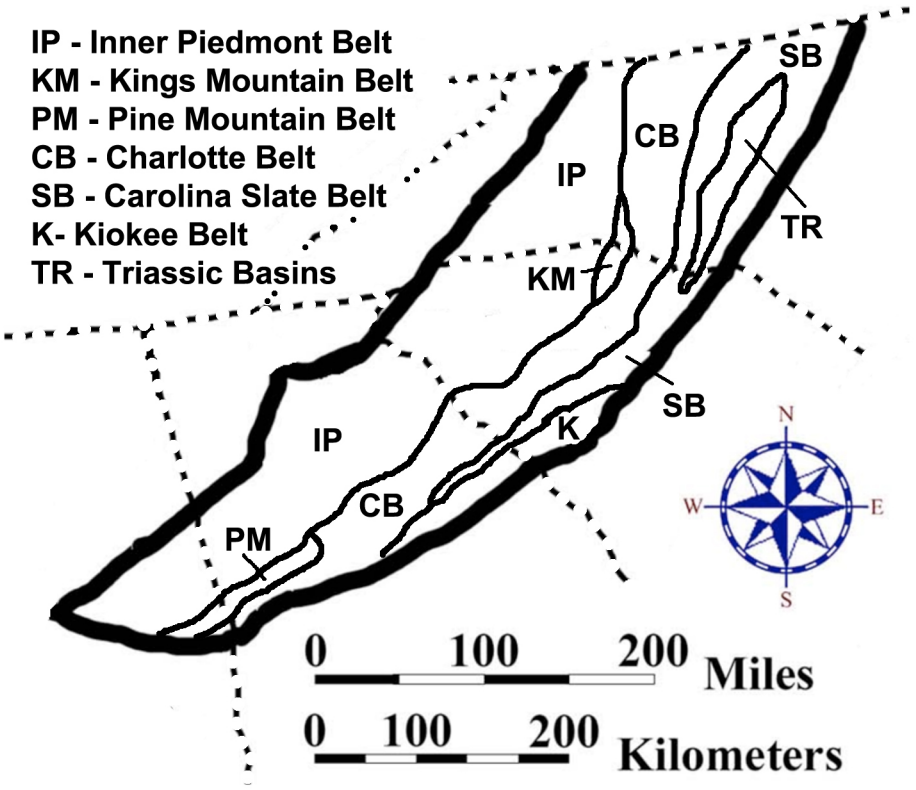
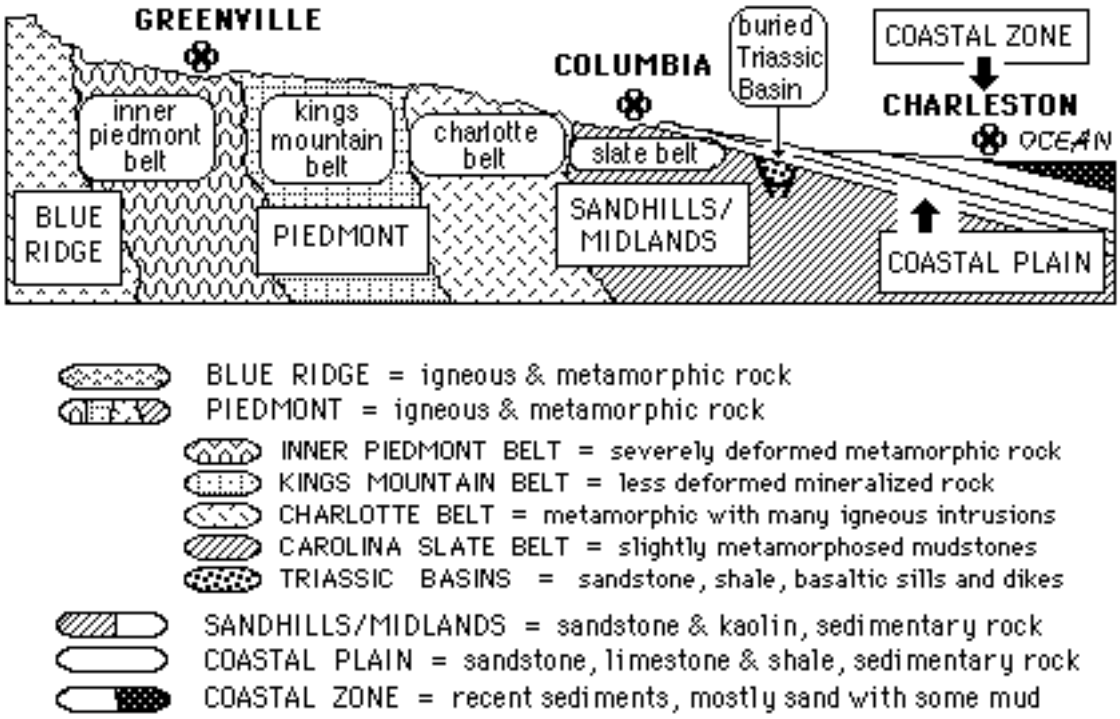


Figure 7-3: Cross-Section Through South Carolina Piedmont

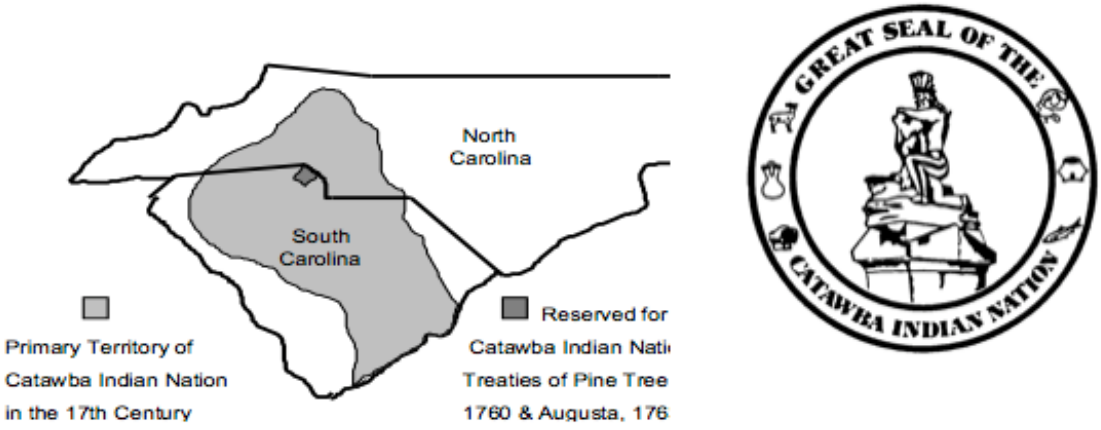


Folklore

From the beginning of European colonization of the region, all of the Atlantic Coastal states soon developed a marked difference in culture between the low-country coastal cities, like Savannah, GA, Charleston, SC, and Wilmington, NC, and the up-country frontier towns located in the Piedmont. This is partly due to the different ethnic groups that migrated to each region, but even more so because of the different origin points and modes of transport. Coastal cities were populated primarily by immigrants who arrived from Europe by boat, or on slave ships from Africa or the Caribbean colonies. Piedmont settlers were primarily farmers who arrived by land, usually on horse-drawn wagons from northern colonies such as Virginia and Pennsylvania. Both groups confronted Native American cultures that were already well established, but frontier towns soon grew into major cities and the Native Americans were gradually pushed westward, assimilated, or defeated in a series of bloody battles.

Although many different Native American peoples and sub-groups inhabited the Piedmont areas of the Southeast, one group, the Catawba Nation, which originally inhabited portions of North and South Carolina, stands out as having a particularly interesting history and culture. They are one of the few groups that have managed to keep some of their Piedmont land holdings and have an official "Indian Reservation" located near Rock Hill, South Carolina. Little is known about the origin of this ancient people. From stories recorded by Spanish chroniclers we know that the Catawba people called themselves "ye iswa" (nea eswa) meaning "river people." Much of the history and culture has long been forgotten. Some of the remnants, though, such as the pottery tradition and folk stories told in their native Siouan language, as well as historical sketches recorded by the first Europeans to make contact, are still with us today.

Figure 7-4: Great Seal and Map of Catawba Nation



Ye Iswa (People of the River)

[Collected stories retold by Bob Ward from interviews at the Catawba Reservation]

The old chief stirred before the fire and murmured a moment in the tongue of his fathers. Then he turned again to his tale. "I think the Catawba have always been here on the river. And why not? Are we not People of the River?" The flames crackled and I did not dispute him...

Thus goes the story of the chief of the mighty Catawba who called themselves Ye Iswa, People of the River. The Catawba Nation originated from tribesmen who were members of a Canadian community driven from their homes by the Connewango Nation. From Canada they wandered and settled at times in Kentucky and Virginia. Finally, they reached a river where they fought with the Cherokee, each side losing more than 1,000 men. The site of this bloody battle was said to be Nations Ford. These two tribes at last reached a settlement. The Cherokee would live on the territory west of the Broad River while the Catawba would live along the east banks of what would be known as the Catawba River. The land between was to be neutral territory--they could hunt on the nightfall. The Catawba River was named for this great aboriginal tribe probably from the Choctaw word "katapa," meaning "separated." The last of the Catawba soon will pass to the happy hunting ground--the "humbari," the "where-you-never-die" --of their fathers. And with them will die a thousand tales of a vanished people.

The wind whispered and sighed; and the wind and the night were part of the tales. With the firelight etching the wrinkles deep on his dark Indian face and warming his copper hands, the chief spoke the tales softly to the flames across the pines and red gullies to the banks of the Catawba River, now slow and muddy in the eye of his minds. He recalled the days when King Hagler and his children walked in the shade of their ancestors, the masters of the forests.

Old Bob Harris said it was understood by the Catawba of generations past that storytelling was intended to develop the mind and to teach children the ways of life. Tales or stories should never be told at night according to the wise warriors of the Catawba. Such tellings cause trouble from snakes. Once a mighty warrior left his home knowing that he would be away until late at night; however, he never said aloud the time he meant to leave or return. Instead, he told his family that he was leaving on the following day--this might sound a bit confusing and that's good. Hopefully the snakes couldn't figure it out either!

The Legend of the Comet

Traditional

Once a woman's son was stolen by another woman. The mother searched and searched. Finally she found her son and together they escaped from the earth and rose high up into the sky. The thief who had stolen the boy caught hold of a rope the mother and her son had let down to the earth. Ungi, for that was her name, lost her hold and fell down through the sky leaving behind her a brilliant streak like a tailed star. She became a comet. Delighted to never fear Ungi again, the mother and son soon went to humbari (heaven) and the son became a cloud.

Through often changing and conflicting state and federal policies regarding Native Americans, the Catawbas struggled to maintain their cultural identity. Their pottery serves as a historic link with their past. Their pottery continues to be made using ancient traditional pottery techniques. It is made from a special clay taken from the banks of the Catawba River (at a secret location). This special clay is filled with bits of mica and contains a relatively high percentage of iron oxide. Throughout a long, drawn out struggle, the Catawba nation has managed to maintain a large portion of its cultural identity in an ever-changing world.

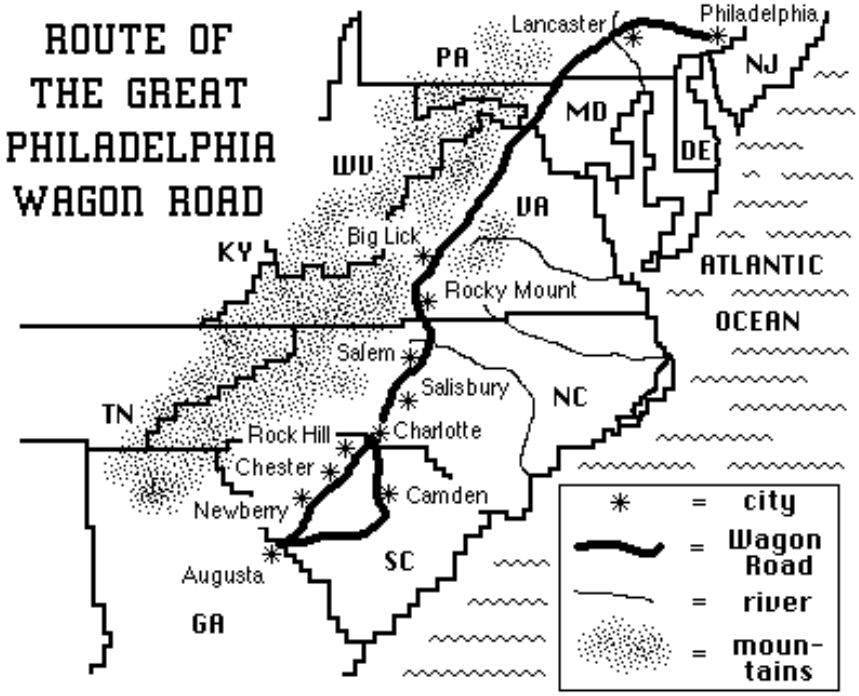
Historical Events

Far removed from the coast and the easily navigable rivers of the **Coastal Plain**, the Piedmont was the second frontier in the European settlement of the Southeast. Urged on by several colonial governments, which granted incentives of food, tools, and land to European settlers of the Piedmont, and facilitated by improved transportation routes into the area, colonists began to arrive in ever-greater numbers during the second half of the 1700's. The influx of white settlers produced inevitable conflicts with the over 100 Native American nations that already called the Piedmont home. While many of these nations were small, two of the largest were the Cherokee and the Catawbas who spoke a Siouan language. Like most Native Americans in the east, they hunted, fished, and cultivated crops like corn, beans, squash, and pumpkins. They lived in bark-covered houses within villages surrounded by stockades. Although trade with European settlers brought prosperity to some groups, the introduction of whiskey and diseases such as smallpox did much to weaken their ability to resist the white settlers encroaching upon their ancestral lands. Many treaties reserving some land for Native American groups were signed and then quickly broken as more and more settlers moved into the disputed territory.

One typical example is the Treaty of Nation Ford, signed in 1840), in which South Carolina agreed to purchase the remaining Catawba lands in that state but also promised to purchase a new homeland for them in North Carolina. However, North Carolina refused to agree to this arrangement and the Catawbas were left homeless. The fact that South Carolina had not obtained federal approval of the treaty (as required by the federal 1790 Non-Intercourse Act) meant that the treaty was legally questionable. In 1842, the state did purchase some 600 acres as a reservation for the Catawbas.

The Great Philadelphia Wagon Road was a major immigration route for German and Scotch-Irish settlers who moved into the Piedmont region from the north. The wagon road stretched seven hundred miles from Philadelphia, extended through the Carolina Piedmont, and ended at Augusta, Georgia. German settlers living in Pennsylvania developed a covered wagon, known as the Conestoga, which was used extensively on this road. This heavy wagon was constructed of hardwoods and required six horses to pull it. It was covered by a canopied top that was called a "poke bonnet" due to its similarity to a women's bonnet. When fully loaded these wagons could travel approximately thirty miles a day. During the last years of the colonial period, the Great Philadelphia Wagon Road became one of the most heavily traveled roads in America.

Figure 7-5: Map of the Great Philadelphia Wagon Road



The Piedmont played an important role in the American Revolutionary War. The first military action in the area between American patriots and British loyalists that resulted in bloodshed occurred in South Carolina at the town of Ninety Six. Loyalist forces attacked Major Andrew Williamson's patriot force at the fort that the patriots had constructed. In response to the loyalist threat, Colonel William Richardson marched a group of patriots across the Back Country crushing loyalist resistance in what became known as the Great Snow Campaign in December of 1775. The critical Battles of Cowpens and Kings Mountain were fought in South Carolina in 1780.

Toward the close of the Civil War, Union General William T. Sherman made his infamous march through the South. After burning Atlanta, Sherman and his troops marched through Georgia to Savannah, pillaging and destroying mansions, homes, barns, fields, and forests. Huge columns of smoke and burnt chimneys marked his sixty mile wide path. When Sherman left Savannah, GA, most South Carolinians thought he would strike Charleston. Consequently, many citizens left Charleston for Columbia or sent their goods there for security reasons. Not until Sherman left Orangeburg, SC in partial ruins and turned his 20,000 troops and 250 wagons toward Columbia did most citizens realize that this city was his next target. By then all of the railway lines had been destroyed and there was no communication possible except by word of mouth. As he approached Columbia, the Congaree River Bridge was burned to prevent access to the city.

During the Great Depression, many New Deal projects impacted the Piedmont, including the Pine Mountain Valley Community Resettlement Project, located near President Roosevelt's 'Little White House' in Warm Springs, Georgia. Many Soil Conservation Service (SCS) projects were also sited in the heavily eroded Piedmont soils.

Influence of Topography on Commerce, Culture, and Tourism

The earliest inhabitants of the Piedmont traveled mostly along rivers, which led from the Blue Ridge Mountains to the coast. Most Native American trade routes therefore ran from northwest to southeast. Very little commerce took place in an east-west direction until the first roads were constructed. The few mountains that existed in the Piedmont either were monadnocks that could be easily by-passed or east-west ridges like Kings Mountain NC and Pine Mountain, GA. Otherwise, there were very few topographic impediments to increased settlement and the Piedmont soon became well populated. This population shift forced many southern states to relocate their capitols from the coast to a more centralized location near the middle of the state. The move of the capitols in South Carolina from Charleston to Columbia and in Georgia from Savannah to Atlanta are prime examples of the increasing influence of the Piedmont in political and cultural affairs.

The railroads were responsible for freeing Piedmont cities from reliance on navigable rivers and markets located on the coast. The main railroad line from Atlanta, GA to Charlotte, NC was completed in the early 1800s and for the first time provided farmers with access to markets from Virginia to Alabama. Several vibrant cities grew up along that route and have become major industrial and commercial centers. Major U.S. Highways soon paralleled the railroad routes as the automobile became a factor in 20th century culture and changed the way citizens travel, shop, and do business. Prior to 1940, every small town had its commercial center where local residents could do their shopping. Industries selected their locations based on the availability of power (either water power or electrical power), and access to a railroad line. Almost all shipping was done by rail. As a result, small industries became widespread across the Piedmont Region, and the textile industry mills were freed from the necessity of being situated along river sites.

Once the Interstate Highway System was built, lifestyles changed dramatically. Where interstates bypassed cities, shopping malls, commercial facilities, and industrial parks followed, until an entire suburban culture sprang up like a series of satellites around the town center. Most people preferred to shop in large suburban stores forcing commercial districts in town or city centers, to either close completely or make drastic changes in their operations. As a result, many people in both rural and urban areas had to travel a lot farther to do their shopping, an inconvenience for both poor people and those who do not drive or own a car. Although these developments have brought a newfound prosperity to the communities along the Interstate corridors, they have also siphoned off business from other towns and cities which are not located near an interstate highway.

Tourism in the Piedmont has traditionally been limited mostly to historical sites and battlefields, but several parks and other recreation facilities were constructed by the Civilian Conservation Corps (CCC) during the Great Depression, and the demand for electrical power led to the damming up of most Piedmont rivers to form a series of reservoirs that could be used for hydroelectric power generation. Those reservoirs today have provided a booming recreational economy benefitting both locals and tourists. As cities grew, museums and exhibition halls were built to meet the increasing demand for the types of refined cultural events typically found in the more established northern cities.

Climate and Water Resources

The Piedmont Region receives annual rainfall amounts ranging from 45 inches to 60 inches and has a 200 to 240 day growing season. In contrast to the Blue Ridge, Piedmont streams flow more gently and have numerous tributaries. Most stream waters are colored to some extent by suspended sediments composed of silt and clay-sized soil particles. This brownish coloration is especially noticeable during heavy rainstorms, when runoff from farmland brings great amounts of eroded soil into the adjacent stream systems. All but the smallest streams are **perennial**, and rainfall is usually equally sufficient for most agricultural needs. Groundwater resources are highly variable because of the complex geologic structures underlying the Piedmont landscape. Fracture zones serve as conduits for groundwater and are the best sites for locating wells.

For years the settlers of the Piedmont were almost single-mindedly concerned with growing cotton, but the region was still able to become an early industrial location because of the wide availability of water power. Almost every stream, at every falls or shoals, was dammed to provide power for water wheels to run cotton mills. Small mill towns flourished for years, even after cotton was no longer a profitable crop. Until recently, textile mills were the Piedmont's most important industry. However, with the textile mills came a variety of pollution problems, such as the dyes that were poured in the rivers from various plants. Former agricultural misuse of the land created severe erosion problems but the transition from an agricultural to an industrial society has helped to encourage conservation and more effective land use planning.

Since 1900, large reservoirs have been constructed for purposes of hydroelectric power generation and recreation along most of the major rivers that flow through the Piedmont. Many of these lakes have also become preferred locations for retirement communities and have become sites for major fishing tournaments. Environmental issues include the loss of forest and agricultural bottomland, increase in thermal pollution in waterways, and controlled stream flow.

Soils and Agriculture

Soils in the Piedmont are generally found on gentle to moderate slopes, although some slopes are occasionally steep. These soils are usually thick and formed in rock that has weathered in place for many years, producing extensive exposures of the crumbly rock and soil mixture called **saprolite**. For many millions of years, the Piedmont has been primarily an erosional region. Only in a few stream valleys and **floodplains**, and in the Triassic Basins, can any thick depositional sequences be found. Soils along such river and stream valleys are usually formed in alluvial material transported and deposited by streams.

Most Piedmont soils are moderately deep, well drained, and have clayey to **loamy** surface layers and clayey subsoil layers. Most are also residual, having formed directly from the underlying chemical **weathering** of crystalline rocks, and as a result, soil types are strongly related to the rock type in which it formed. These soils are well known to farmers and homeowners for having a layer (or horizon) of reddish clay beneath the surface. Insoluble iron and aluminum oxides cause the red to reddish-yellow color often seen in the subsoil. The red color is one indication of the soil's extreme age. The Piedmont soils are, in fact, some of the oldest found anywhere on the earth. The high clay content contributes to the compact nature of most Piedmont soils, a feature that prevents them from easily absorbing rainfall. As a result, most heavy precipitation runs off the land creating a high risk of serious soil erosion. Due to poor farming practices and the clearcutting of timber, extensive sections of the Piedmont have been severely eroded over the past several hundred years, resulting in the presence of only very thin topsoil layers or no topsoil at all; just subsoil layers exposed at the ground surface.

During the colonial period, it was mostly farmers who settled in the Piedmont Region. They arrived with a pair of horses or yoke of oxen, a small wagonload of household goods and farm tools, and a few cattle, hogs, and chickens. Many received land grants for small farms of about 175 acres. They preferred hillside locations near creeks rather than along the large rivers due to flooding concerns. Smaller creeks could easily be crossed providing more mobility to the settlers and many natural springs in the hillsides provided a reliable source of water. The early settlers arrived in the winter months so that a shelter could be built and a few acres of land cleared in time to plant a spring crop of corn and other food. As time went on, apple and peach trees were planted to provide cider and brandy. The soil was very rich at first, but with continuous planting of crops and the subsequent soil erosion, it soon became depleted. Later when cotton was introduced in the region, it was planted extensively and caused increased erosion and even more depletion of soil nutrients.

Travelers and naturalists passing through the Piedmont in the 18th century described seeing mature forests of hardwoods and shortleaf pines. Beginning in the 19th century, large areas were cleared for cotton production to the extent that little of the natural vegetation remained undisturbed. Because soil conservation was not an issue at that time, much of the Piedmont Region of South Carolina became a victim of extensive soil erosion with the rolling hills cut by gullies and the soil nearly exhausted. When land became too gullied to work productively, farmers simply picked up and moved westward to find new land. By the early 1900's, much of the upstate consisted of abandoned farmland or subsistence farms that could barely support the families living on that land.

Approximately two-thirds of the Piedmont land area is now covered by forest and about 30 percent is devoted to farming, with corn, soybeans, cotton, and small grains being the major crops. Orchards, pastures, and forests are found on land more susceptible to erosion. Only about 20 percent of the area is considered to be prime farmland. By the late 1900s, soybeans had replaced cotton as the primary crop grown in the Piedmont. The lower Piedmont provides some of the best deer and turkey hunting and outdoor recreation in the state. Many of the land tracts of the Piedmont are managed

for multiple use, a term used to describe the practice of land management that provides for timber production and harvest, while also encouraging wildlife management, recreational use, and other benefits to the landowner.

Mining and Resource Extraction

The Kings Mountain Mineral Belt, in North and South Carolina, has been mined for iron, lithium, tin, kyanite, and barite, as well as more common resources such as limestone (marble) and granite (pegmatite). The mineral wealth in Kings Mountain played a big part in the historical development of the region. When the Native American residents first agreed to let settlers live in the Kings Mountain area, a floodgate was opened for people with iron mining knowledge, particularly from the southeastern section of Pennsylvania. They applied what they knew to the local iron deposits that run the length of the Kings Mountain Belt. Mining operations began even before the Revolutionary War, and Bessemer City and Lincolnton in North Carolina soon became the top iron manufacturers in the region. By the time the Civil War started, the iron supply was large enough to contribute significantly to the Confederate war effort. After the war, but before the turn of the century, the iron industry in the area collapsed due to the shallowness of the local deposits and tremendous competition from richer iron mines in the Lake Superior region.

Other localized areas in the Piedmont, such as Soapstone Ridge near Atlanta, GA, and Graves Mountain, GA, have produced commercial quantities of various specialized minerals, but the single largest mining operations in the region have been for granite and other igneous rocks. Several kinds of these rocks are mined for monuments, memorials, tombstones, and foundation stone, but the largest use is as crushed stone. Both North and South Carolina have named granite as their official state rock, and Georgia claims the town of Elberton as the "Granite Capital of the world." An interesting use of an underground granite mass is the storage of propane fuel in the York County community in South Carolina called Tirzah. Two caverns dug out of solid granite 450 feet (137 meters) below the earth's surface are used as storage for millions of gallons of propane. Trucks and trains arrive daily and are loaded with propane to service a large region of the southeast. A six-inch pipeline is also used to transport the fuel.

North and South Carolina were the sites of an early gold rush that began when a 17 pound (7.7 kg) gold nugget was found in the Piedmont section of North Carolinas in 1799. This was fifty years before the gold rush in California. Most of the gold mining operations have been centered in South Carolina. Gold from the Haile Mine in Lancaster County was used by the Confederate Army to finance the war effort. As a result, Sherman made a special effort to destroy the buildings and equipment during his historic march through South Carolina. It was not until the 1970's when the price of gold skyrocketed and new mining and extracting processes were designed, that the gold mining industry in this area was revitalized. The new process uses a chemical dissolving process to extract the gold, but is quite expensive, as it takes about 20 to 30 tons (18 to 27 metric tons) of rock to produce one ounce of gold.

Pottery clay is also found in several regions of the Piedmont. Although not mined commercially, a special type of clay is used by artists from the Catawba Nation to make their pottery. This clay is typically found in deep gullies along the Catawba River, five to six feet under the topsoil. The clays are cleaned and mixed to remove all foreign substances and then strained until workable. This part of the process can take weeks. Finally, the potter takes the prepared clay and, using a coiling method, begins to make a pot or bowl. Potters use their hands, sticks, shells, knives, spoons and rocks to form the clay in the desired shape. The unusual finish found on Catawba pottery is applied with a rubbing rock. A good pot will have a finish like velvet. The last step in the process is the firing. They burn the pottery in a bonfire fueled with seasoned oak wood. Most potters burn three fires to produce a finished pot. The entire process is slow, but the results are some of the finest Native American pottery you can find. This pottery, regarded as "a pure aboriginal art form," sells for as much as $500 a piece to museums and collectors around the country.

PLACES TO VISIT

Atlanta History Center. 130 West Paces Ferry Road, NW, Atlanta, GA 30305. For more information call 404-814-4000 or search online at https://www.atlantahistorycenter.com/

Catawba Cultural Center. 1536 Tom Steven Rd, Rock Hill, SC 29730. For more information call 803-328-2427 or search online at https://www.catawbaindiancrafts.com/

Columbia Canal / Riverfront Park. 1010 Lincoln Street, Columbia, SC 29201. For more information call 803-545-0000 or search online at https://www.experiencecolumbiasc.com/listing/riverfront-park/15732/

Cowpens National Battlefield. 4001 Chesnee Highway, Gaffney, SC 29341 . For more information call 864-461-2828 or search online at http://www.nps.gov/cowp/index.htm

Flat Creek Natural Area and Forty-Acre Rock Heritage Preserve Site, Kershaw, SC. For more information call 843-661-4768 or search online at https://www2.dnr.sc.gov/ManagedLands/ManagedLand/Contactus/42

F.D. Roosevelt State Park. 2970 Georgia Highway 190, Pine Mountain, Georgia 31822. For more information call (706) 663-4858 or search online at https://gastateparks.org/FDRoosevelt

Historic Scull Shoals Mill Village. Forest Service Road. 1234, Greensboro, GA 30642. For more information call 706-453-0380 or search online at https://www.exploregeorgia.org/greensboro/general/historic-sites-trails-tours/historic-scull-shoals-mill-village

Kennesaw Mountain National Battlefield Park. 900 Kennesaw Mountain Dr., Kennesaw, GA 30152 . For more information call 770-427-4686 or search online at https://www.nps.gov/kemo/index.htm

Kings Mountain National Military Park. 2625 Park Road, Blacksburg, SC 29702. For more information call 864-936-7921 or search online at http://www.nps.gov/kimo/index.htm

Reed Gold Mine. 9621 Reed Mine Rd, Midland, NC 28107. For more information call 704-721-4653 or search online at https://historicsites.nc.gov/all-sites/reed-gold-mine

Roosevelt's Little White House Historic Site. 401 Little White House Rd, Warm Springs, Georgia 31830. For more information call (706) 655-5870 or search online at https://www.nps.gov/nr/travel/presidents/roosevelts_little_white_house.html

Stone Mountain Park. 1000 Robert E. Lee Drive, Stone Mountain, GA 30083. For more information call 800-401-2407 or search online at http://www.stonemountainpark.com/default.aspx

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Smith, Jean Edward (2008). FDR. Random House Trade Paperbacks.

SELECTED INTERNET RESOURCES (all sites were functional and accessible in 2020)

http://www.priweb.org/ed/TFGuide/SE/se_main.htm
The Teacher Friendly Guide to the Geology of the Southeast contains information about geologic history, rocks, fossils, resources, and environmental issues and virtual field trips.

http://www.cwc.lsu.edu/cwc/links/links12.htm
It provides links to various agriculture-based topics dealing with the South around the time of the Civil War. Some of the links include: When Rice was King, Cotton Culture.

http://www.nass.usda.gov/census/census92/atlas92/html/m215.htm
This site allows maps of various census and agricultural statistics to be viewed.

http://digital.lib.uiowa.edu/cdm4/results.php?CISOOP1=any&CISOFIELD1=CISOSEARCHALL&CISOROOT=/geoscience&CISOBOX1=domes
The Iowa Digital Library at the University of Iowa Libraries site exhibits pictures of several examples of exfoliation domes in the U.S. for use in class presentations.

http://www.faculty.fairfield.edu/faculty/hodgson/Courses/so11/population/urbanization.htm
This site from a course offered at Fairfield University offers a definition of "urbanization" and approaches the topic from a historical point of view by examining first world societies and following their evolution into villages and to cities.

https://www.georgiaencyclopedia.org/articles/history-archaeology/civil-war-georgia-overview
This site gives detailed accounts of events, battles, etc. of the Civil War in Georgia.

http://www.scencyclopedia.org/sce/entries/civil-war/
This site gives detailed accounts of events, battles, etc. of the Civil War in South Carolina

http://home.att.net/~cochrans/soapst01.htm
This site gives a brief description of the geologic processes that formed the Soapstone Ridge rock formation in southeast Atlanta, Georgia. Sources of information are offered.

http://www.co.dekalb.ga.us/planning/pdf/hp/soapStnFcts.pdf
This pdf from the Dekalb County Historic Preservation Commission describes the Soapstone Ridge formation and defines its importance.

https://www.history.com/topics/great-depression/new-deal
This site summarizes several of the 'New Deal' programs and projects instituted during the Great Depression by President Franklin D. Roosevelt.

http://www.fs.fed.us/geology/aml-index.htm
The Forest Service Minerals & Geology Management (MGM) Program provides for the sustainable use and enjoyment of mineral and geologic resources in National Forests. An important part of that mission is the restoration of land disturbed by mining activities.

ATLANTA JOURNAL CONSTITUTION

August 11, 2001

Atlanta Pays Price for Unchecked Growth

Atlanta, GA
by Dahleen Glanton

For more than a decade, Atlanta has been the epicenter of a population explosion, luring more than 1.3 million new residents to the area since 1990 with the hope of affordable housing, a pleasant climate, and jobs.

While the influx fueled a flourishing economy, land developers have been allowed to gulp up property in every direction, with suburban Atlanta spilling over small communities that once took pride in their independence from the big city. Residents pay for this unrestrained growth through diminished green space, air pollution, and the longest commutes in the country.

"By most indicators, Atlanta is the most sprawled major metro area in the country," said George Galster, an urban affairs professor at Wayne State University. "Atlanta is a model for a metro area that has a booming population relatively unconstrained by topographical factors, a lack of growth controls and has developed primarily in an era when the auto was king."

As a result, the Atlanta area is among the most polluted in the country. "The attitude for two decades has been 'Let us go ahead and build this batch of roads, and we will deal with air pollution and access to jobs for people without cars later.' There's been a lot of broken promises," said David Farren, an attorney for the Southern Environmental Law Center.

Many suburbs have fought vigorously against public transportation. But in a city that is almost entirely automobile-dependent, the lack of public transportation creates huge issues about how people get to the suburbs where the new jobs are," Farren said. According to the Fannie Mae sprawl report, houses are spread out more in the Atlanta area than in any of the 13 cities studied. Because the area's public transit system only serves two counties, more than 3 million vehicles pack the roads, traveling over a million miles a year.

RATIONALE

Atlanta is one of the largest cities in the Southeast, with a population over 500,000, but the total metropolitan area is home to more than 6 million people and is the ninth-largest metropolitan area in the nation. Its airport is considered to be the world's busiest. In many ways, this city has become the cultural and economic hub of the New South. Founded initially as a railroad town, it was burned to the ground during the Civil War, but rebounded quickly to become a center for commerce and became a focal point for the Civil Rights movement during the 1950's and 1960's. Two major topographic features in the metropolitan area deserve special note. Stone Mountain is considered the largest mass of exposed granite rock in the world and is an excellent example of a geologic exfoliation dome. Carved into its massive north face are the likenesses of three heroes of the Confederacy that reach nearly nine stories tall. Soapstone Ridge is an unusual geological formation that is also an important archeological site that was used by Native Americans to carve and shape large stone bowls.

PERFORMANCE OBJECTIVES

1. Use topographic map information to locate features on aerial photos and images.
2. Explain the impact of railroads on the development of the city of Atlanta.
3. Construct a topographic profile.
4. Locate drainage divide on topographic map.
5. Estimate slope of mountain.
6. Estimate perimeter and area of irregular geometric shapes.
7. Explain rationale for using certain specific street patterns in residential subdivisions.
8. Describe factors that influence spread of urbanization in certain directions.
9. Explain symbolism of pictures and mottos on official seals.
10. Identify key literary components of urban legends.

SAMPLE ASSESSMENT RUBRICS

EXAMPLE #1 (relates to Performance Objective #1)

Give students a copy of the topographic map of Stone Mountain found on MAP 7A, METROPOLITAN ATLANTA and ask them to locate the Junior High School building in the town of Stone Mountain (about one map inch north of the letters "Sto" that begin the label for the City of Stone Mountain). Make sure all students can locate this school building on the map. Next, ask them to find that same school building on the Stone Mountain DOQ aerial photograph on IMAGE 7A, METROPOLITAN ATLANTA. Tell students to transfer information from the map to the photograph to assist their search. Once students locate the building, they should bring their aerial photograph to the teacher and point to the school building. The teacher will assign a grade based on this rubric.

A (level 4) – Building is identified correctly.
B (level 3) – Building is identified incorrectly, but within the same city block.
C (level 2) – Building is identified incorrectly and not within the correct city block; but is within a radius of 1,000 feet.
D (level 1) – Building is identified incorrectly and is outside a radius of 1,000 feet; but still within the city limits of Stone Mountain.
F (level 0) – Building is identified incorrectly and is outside of the city limits of Stone Mountain; or is not located at all.

EXAMPLE #2 (relates to Performance Objective #10)

Give students a copy either of the urban legend "The Vanishing Girl" printed on page 7A-13, or a different urban legend. Ask students to identify three major literary strategies used in the story that are common to all urban legends [***possible answers include: telling a supposedly true experience; event happened to author or someone known to author; has horrifying, supernatural, or humorous elements; has connections to community moral standards, prejudices, or societal conventions***].

A (level 4) – Three correct answers given.
B (level 3) – Two correct answers given.
C (level 2) – One correct answer given.
D (level 1) – No correct answer given, but reveals some minimal understanding.
F (level 0) – No correct answer given and no minimal understanding shown.

Cartographic Product Information

MAP 7A: Metropolitan Atlanta

TITLE: Atlanta, GA (topographic map)
DATA SOURCE: Atlanta USGS 1:100,000 Quadrangle
DATE: 1981
SCALE: 1:100,000 [1 inch ~ 1.6 miles] [1 cm = 1 kilometer]
OTHER IMPORTANT DATA:
- The contour interval is 5 meters.
- Note that all contour lines are in metric units; unusual for topographic maps.

POINTS OF SPECIAL INTEREST:
- Stone Mountain (upper-right quadrant below compass rose graphic).
- Kennesaw Mountain National Battlefield Park (extreme upper-left corner of map)
- Soapstone Ridge [un-labeled] (SW De Kalb County, SW of Pantherville)

OTHER FEATURES TO LOOK FOR:
- Hartsfield Atlanta International Airport (bottom-center of map).
- Chattahoochee River (runs diagonally from left-center to top-center of map).

TITLE: Stone Mountain, GA (topographic map)
DATA SOURCE: Stone Mountain USGS 1:24,000 Quadrangle
DATE: 1992
SCALE: 1:17,500 [1 inch ~ 1,500 feet] [1 cm ~ 170 meters]
OTHER IMPORTANT DATA:
- The contour interval is 20 feet.

POINTS OF SPECIAL INTEREST:
- Stone Mountain (right-center of map).
- Stone Mountain Memorial (north side of Stone Mountain).

OTHER FEATURES TO LOOK FOR:
- Stone Mountain Lake (right-center of map)
- Town of Stone Mountain (left side of map)

TITLE: Soapstone Ridge, GA (topographic map)
DATA SOURCE: Southeast Atlanta USGS 1:24,000 Quadrangle
DATE: 1993
SCALE: 1:24,000 [1 inch = 2,000 feet] [1 cm ~ 250 meters]
OTHER IMPORTANT DATA:
- The contour interval is 10 feet.

POINTS OF SPECIAL INTEREST:
- De Kalb County Landfill [un-labeled] (lower-center of map NW of Interchange 39)
- De Kalb County Sewage Plant [labeled 'Sewage Disp Plant'] (top-center of map).

OTHER FEATURES TO LOOK FOR:
- Soapstone Ridge (along south side of South River across lower-center of map).
- Interstate Highway 295 (runs diagonally from lower-left to upper-right of map).

IMAGE 7A: Metropolitan Atlanta

TITLE: Atlanta, GA (NALC satellite image)
DATA SOURCE: EPA & USGS NALC Pathfinder WRS2 Path 19 Rows 36 and 37
DATE: 1991
SCALE: 1:200,000 [1 inch ~ 3.2 miles] [1 cm ~ 2 kilometers]
OTHER IMPORTANT DATA:
- This image is a false-color infrared image, so all true colors have been shifted.

POINTS OF SPECIAL INTEREST:
- Chattahoochee River (crosses image diagonally from lower-left to top-center).

OTHER FEATURES TO LOOK FOR:
- Urbanization (blue coloration) follows interstate highway routes (white color).

TITLE: Stone Mountain, GA (DOQ photo)
DATA SOURCE: Stone Mountain USGS Digital Orthoquad B&W Photograph
DATE: 1993
SCALE: 1:9,000 [1 inch ~ 750 feet] [1 cm ~ 91 meters]
OTHER IMPORTANT DATA:
- This photo has a 2 meter (6.6 foot) resolution

POINTS OF SPECIAL INTEREST:
- Stone Mountain (center of photo).
- The north side of the mountain is in the shadow cast by the mountain.

TITLE: Soapstone Ridge, GA (DOQ photo)
DATA SOURCE: Southeast Atlanta USGS Digital Orthoquad B&W Photograph
DATE: 1993
SCALE: 1:24,000 [1 inch = 2,000 feet] [1 cm ~ 250 meters]
OTHER IMPORTANT DATA:
- This photo has a 2 meter (6.6 foot resolution).

POINTS OF SPECIAL INTEREST:
- De Kalb County Landfill (lower-center of map NW of Interchange 39).
- De Kalb County Sewage Plant (top-center of map).

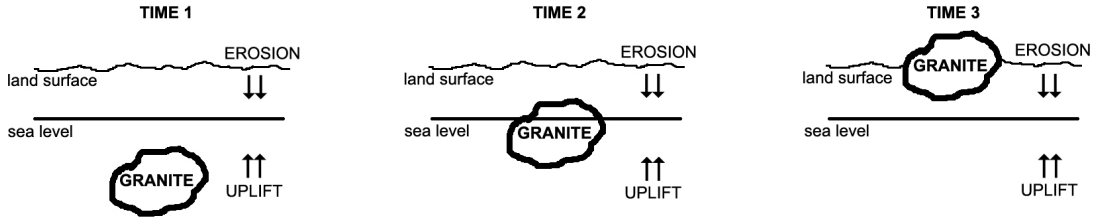
TITLE: De Kalb County Landfill and De Kalb County Sewage Plant (DOQ photos)
DATA SOURCE: Southeast Atlanta USGS Digital Orthoquad B&W Photograph
DATE: 1993
SCALE: Landfill = 1:4,800 [1 inch = 400 feet] [1 cm ~ 48 meters]
Sewage Plant = 1:6,000 [1 inch ~ 500 feet] [1 cm ~ 60 meters]
OTHER IMPORTANT DATA:
- These photos have a 2 meter (6.6 foot) resolution.

POINTS OF SPECIAL INTEREST:
- High resolution photos of Landfill and Sewage Plant.

Stone Mountain

Stone Mountain is the largest of several exfoliation dome mountains that dot the landscape of the Inner Piedmont and Charlotte Belts of the Piedmont region between Atlanta, GA and North Carolina. It is claimed to be the largest single exposed mass of granite rock in the world, exceeding 25 million square feet (2 million square meters). The top of the mountain rises 825 feet (251 meters) above the surrounding landscape and can be seen from great distances away. Most of the granite exposures in the Piedmont are considered to be igneous intrusions, much younger than the pre-existing metamorphic rocks, which were formed during the continental collision of Africa and North America near the end of the Paleozoic Era. The high temperatures and pressures associated with these tectonic forces partially melted the rock to create localized low-density magmas that featured an abundance of quartz and feldspar minerals, the chief building blocks of granite. The molten material slowly migrated upward through the higher-density metamorphic rock until about 230 million years ago when the magma finally cooled enough to solidify into granitic rock at a depth of approximately 6 miles (10 km) beneath the land surface. Because the granite has a lower density than the surrounding rocks, that part of the crust will tend to rise as erosion by wind and water slowly remove the overlying cover of rock and soil. Eventually the land will rise sufficiently for the granite to be exposed at the surface. Once there, more and more of the granite will continue to become exposed as the less resistant rock surrounding the mountain wears away at a much quicker rate.

Figure 7A-1: Formation Process of Granite Dome Mountains



Once the granite mass is exposed at the surface, other forces begin to affect the rock. A process called exfoliation gradually sculpts the mountain into its characteristic dome shape. Although the granite forming Stone Mountain and other similar domed mountains is a very compact and solid rock, it was originally formed under high temperature and pressure conditions deep within the earth. Once the rock is exposed at the surface, at much lower conditions of pressure and temperature, the rock will begin to expand and crack, forming joints that develop parallel to the rock surface. Particularly on steeper slopes, these joints gradually widen and cause large slabs of rock to break loose and slide off the mountain. The freshly-exposed underlying rock will then undergo the same expansion and cracking process over and over again until the entire mass of granite has been broken into pieces, a process that takes many millions of years to complete.

Exposures of solid granite, especially at the top of a mountain, create an especially harsh environment for plants and animals. But the huge rock expanse is not entirely barren. Small-scale exfoliation processes have left hundreds of indentations of different sizes on the surface that fill with water whenever it rains. In between rainstorms, however, these depressions are drier than a desert. Even so, some species of rare plants, such as the Pool Sprite, as well as mosses and lichens, manage to thrive here. The first plants to grow on the rocks are lichens, which help to break apart the rock in the depressions. Mosses are the next plants to take hold and small amounts of soil begin to form. Once soil is present, other plants can take root. During dry spells, the seeds lie dormant and then germinate and flourish again when the pools fill with rainwater. This ecosystem is extremely fragile and can be destroyed easily if disturbed.

The Spaniards were the first Europeans to see Stone Mountain. In 1567, Captain Juan Pardo was sent by Spain to build forts in Georgia. He reported seeing what he called "Crystal Mountain" and discovered on the summit a chest-high wall encircling an area nearly a quarter mile (.4 km) across, built of boulders and loose stone. Over the years, the wall was reputedly destroyed by various men testing their strength by rolling the boulders over the side of the mountain.

Legend says that John W. Beauchamp was the first white settler to claim ownership of Stone Mountain, having purchased it from the local Native Americans for forty dollars and a pony. In 1822, the Georgia State Legislature offered land grants in the Stone Mountain area. A man from Athens, GA reportedly was awarded one of those lots, but after walking 60 miles (97 km) to examine his new property, and finding out that it was mostly bare rock, he traded the land for a mule to ride back home. The town was founded in 1839, under the name of New Gibraltar (someone thought the mountain looked like the Rock of Gibraltar in Europe), but in 1847 the name of the city was changed to Stone Mountain. The mountain was an early tourist attraction and in 1838 a man named Aaron Cloud built a 165 foot (50 meters) tall tower and tavern on the top of the mountain. Unfortunately, the tower later blew down in a tornado. During the Civil War, the flow of tourists stopped, and a group of Union soldiers burned most of the town. After air-mail service was started between Atlanta and New York in 1928, a lighted tower was constructed as a warning beacon. Today a radio/TV tower rises from the top.

Commercial quarrying of the granite did not begin until the advent of the railroads. A spur rail line was built to the mountain in 1847, which carried both rock and tourists. The quarries flourished during the Reconstruction Era following the Civil War and in 1882, the Venable brothers, William and Samuel, purchased the quarries and expanded their operation to include the entire mountain. At peak production, 20,000 train car loads of stone were removed from two quarries on the south side of Stone Mountain. During the Depression years, the WPA (Works Progress Administration) quarried stone from the east side of the mountain. In later years, most of the granite was sold for curb stones or as crushed stone. The last quarries closed in the early 1970s.

Perhaps the biggest attraction at Stone Mountain today is the massive carving on the north face of the granite that was completed in 1970 after two false starts, one in 1923,

and the second in 1928. The carving is 400 feet (122 meters) above the ground and covers an area of 300 acres (121 hectares). It depicts Confederate President Jefferson Davis and Generals Robert E. Lee and Stonewall Jackson on horseback. The figures are 90 feet (27 meters) tall and 190 feet (58 meters) wide and stand out in relief 11.5 feet (3.5 meters) from the side of the mountain. The carving was originally intended to be a Confederate Memorial. The area became a state park in 1958 and several amenities were added to the property. Stone Mountain Creek was dammed to create a large reservoir and a sky-lift was built to transport tourists to the mountaintop. The original plans also called for a paved road to the top of the mountain, but that road was never built. The site hosted several Olympic events during the 1996 Summer Olympics in Atlanta. In 1998, the state leased the park to Silver Dollar City, Inc. (the same company that runs Dollywood Theme Park in Tennessee). With over four million people visiting the Park annually, Stone Mountain has become one of the most popular attractions in the United States and by far the most popular tourist attraction in the state of Georgia.

Stone Mountain is not as well known for its rather infamous racial history. For much of the twentieth century, the Ku Klux Klan held annual rallies at Stone Mountain and quarry owner James Venable ruled the national Klan organization from his home in the town of Stone Mountain. Now, the town is over 60% African-American and has a black mayor who lives in the old Venable house. However, there is still occasional controversy raised over the Confederate themes perpetuated in and around the Park. Concerns have also been raised about over-commercialization of the park. Some local residents have complained that the increase in carnival type amusements is detracting from the natural wonder of Stone Mountain itself.

Urbanization of Atlanta

Due to a combination of factors such as lack of roads, lack of navigable rivers, and fear of Native American attacks, settlers were reluctant to move into the southern Piedmont, which is why most towns in the Piedmont region were established much later than towns along the Atlantic Coast. Some state legislatures attempted to encourage immigration into this area by passing laws that would provide potential settlers with transportation, tools, a year's provisions and even livestock. Also, under colonial law in the 1700s, a settler could claim 50 acres for each member of his family (referred to as a head-right) and also for each servant he might have.

The oldest settlement near the present-day city of Atlanta was called Easton (now known as Piedmont Heights), built around a grist mill on Clear Creek (a tributary of Peachtree Creek). In 1823, a former soldier named Benjamin Plaster was granted 3,000 acres of Indian land along Peachtree Creek and Clear Creek in recognition of his military service during the War of 1812. Plaster's tract featured a prominent knoll called "Council Bluff" where local Native American chiefs met for important meetings. Plaster also built a bridge across Peachtree Creek, and the trail to it became known as Plaster's Bridge Road. The bridge's stone abutments still remain on the creek banks and a short section of the old road, running along the northern boundary of today's Piedmont Heights neighborhood, is now called Plasters Avenue.

Conventional wisdom dictates that major cities can develop only along coastal harbors or navigable rivers, but the city of Atlanta has proven that concept wrong. Atlanta owes its existence to the railroad industry. In 1836, the state of Georgia authorized construction of a state-owned railroad from Chattanooga, TN to the Chattahoochee River, then on to a point at which it could link to privately run railroads coming from Augusta and Savannah through Macon. The surveyors picked a spot (now located along Marietta Street) about a mile east of the modern city center of Atlanta and named it Terminus.

Local legend says that the rail terminal was originally destined for a location near Decatur, but that the citizens did not want the railroad, citing anticipated noise and smoke from the engines and a potential influx of 'undesirable' people. Soon after, a businessman named Samuel Mitchell, who owned 202 acres of woodland a mile south of Terminus, saw an opportunity for profit. By offering the state of Georgia a free right-of-way through his property, and land for a passenger station and a public plaza, he convinced the state to move the end of the railroad to his land. Once that change was accomplished, Mitchell subdivided his land into streets and blocks, selling prime real estate for commercial and residential purposes. The city continued to grow into the late 1850s as freight depots, factories, commercial businesses, and brick buildings up to four stories tall were constructed and a combination city hall and courthouse was also built on his property.

Over its history Atlanta has gone through several name changes. It was called Whitehall for a while, after the name of a main road and a tavern. In 1843, the town was formally incorporated and its name changed to Marthasville, in honor of the governor's daughter. Some residents thought that name was not suitable for a city destined for greatness, and in 1845, the city officially became known as Atlanta (a name derived from the Western and Atlantic Railroad line). That rail line was completed to Chattanooga, TN in 1851, and the line to Augusta began operations in 1845. The final line, to Macon, was completed in 1846.

The topography and geology of the region played a major part in locating at least some of these railroad lines. The railroad from Macon follows the drainage divide between rivers flowing into the Atlantic Ocean and those flowing into the Gulf of Mexico for most of its route to Atlanta. Railroad engineers like to follow drainage divide routes whenever possible so there will be no streams to cross and no need for long bridges to be built. The Brevard Fault Zone runs diagonally across Georgia just northwest of Atlanta. The Chattahoochee River follows this rather straight line of weaker, fractured rock for most of its course in Georgia. As railroad depots and additional rail junctions were added outside of town, many suburban communities sprang up along the rail lines, including East Point, College Park, Marietta, Norcross, Chamblee, Lithonia, and Jonesboro. All of these towns were separated from Atlanta by undeveloped land until the middle of the twentieth century, when they finally became engulfed by the ever expanding metropolis.

During the Civil War, Atlanta was an important manufacturing center for the Confederacy, producing both weapons and supplies. Woolen mills, cotton mills, paper mills, and stone quarries all provided goods that were shipped by rail across the entire South. For that reason, one of the primary objectives of the Union army was to destroy

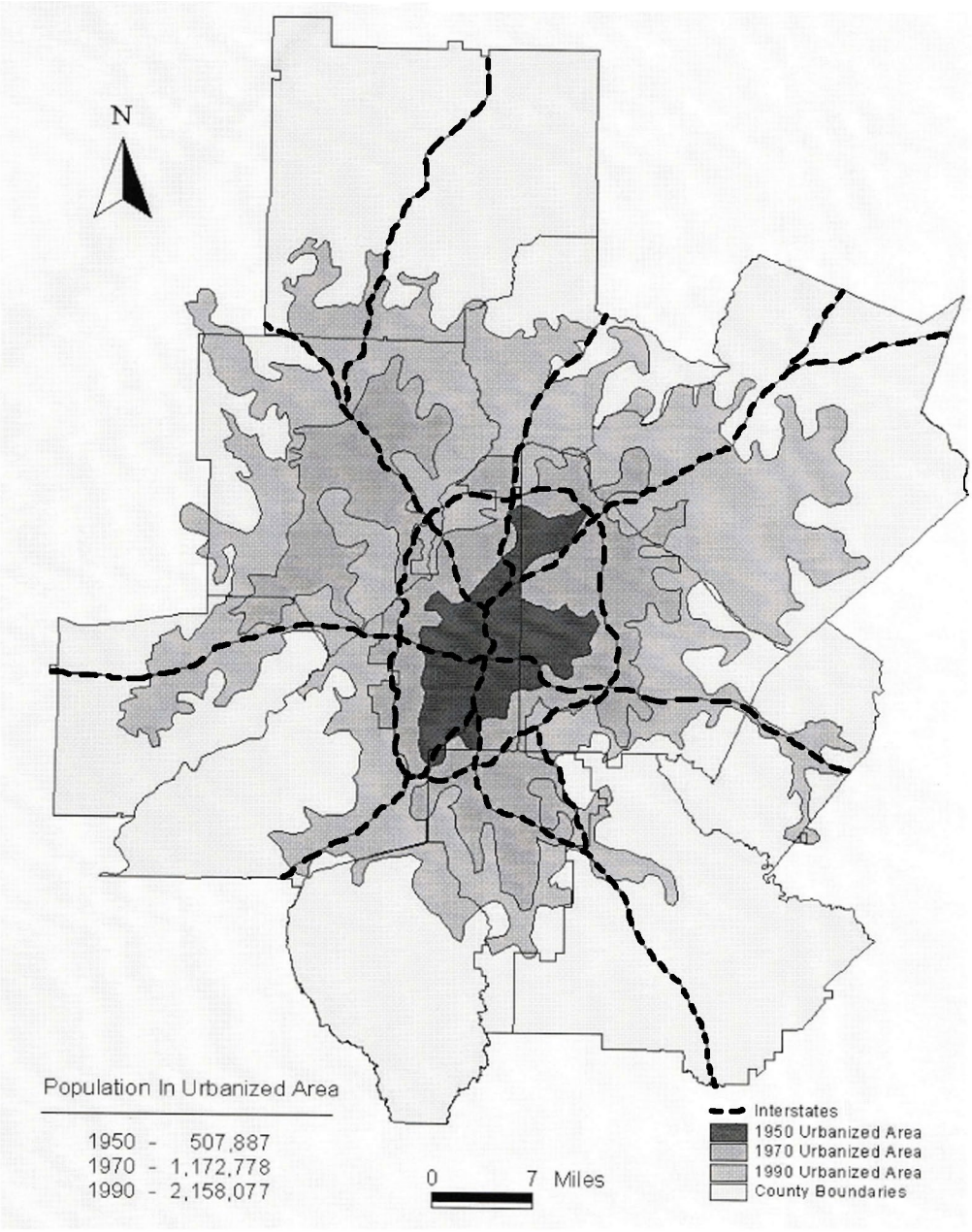
the railroads. The invading Union army used the railroad from Chattanooga, TN as a supply line for their troops. After a resounding defeat at Kennesaw Mountain in 1864, the Union army regrouped and marched around the Confederate army positions to cross the Chattahoochee River. Part of the Union forces headed for Stone Mountain, where they proceeded to destroy the railroad tracks of the Georgia Railroad. The majority of the Union forces proceeded to Jonesboro, winning a major battle there and capturing the railroad to Macon. As Union reinforcements continued to arrive from Chattanooga by rail, Atlanta endured a 42-day siege that ended in the retreat of the Confederate forces, surrender of the city, and the ultimate burning of most of the city. Soon after, General Sherman began his "March to the Sea" following the rail lines, to capture the port city of Savannah. As they advanced, Union troops destroyed the railroad tracks behind them and everything else they could find in a 50-mile (80 km) wide path.

Atlanta quickly reclaimed its role as transportation center of North Georgia in the late 1800s as the city rebuilt and rebounded. The official Atlanta City Seal, adopted in 1887, pictures a phoenix rising from the flames with the motto "Resurgens" meaning "rising again" in Latin, referring to the city rising from the ashes of the Civil War. The first cross-state paved highway, opening in 1929, passed from northern Georgia through Atlanta and then on to Macon, Tifton, and finally Florida. As late as the mid 1930s there were no paved roads linking Atlanta to Augusta, Savannah, or Albany. That situation changed quickly and a full network of paved roads crisscrossed Georgia by 1962. By 1970, the Interstate Highway system was under construction with three major routes meeting in Atlanta. The Atlanta Airport was constructed in 1925, began a profitable air mail service in 1928, and flew its first passengers in 1930. In 1980, the current terminal opened and the airport was re-named William B. Hartsfield Atlanta International Airport after a former mayor of that name.

Urban sprawl greatly expanded after 1960, and by 1980, one-third of Georgia's population lived in the seven-county Atlanta metropolitan region. At one time, Atlanta was considered one of the most heavily forested cities in the country, mostly because a majority of building permits had been issued for single-family housing and many trees were protected as desirable yard amenities. However, as more roads, shopping centers, and office parks were constructed, trees began to disappear. From 1988 to 1998, the thirteen-county metropolitan area lost over 190,000 acres (76,890 hectares) of tree cover, a rate of over 52 acres (21 hectares) per day. As trees disappear, air pollution increases, temperatures increase, and flooding increases. Eventually an urban 'heat island' develops where temperatures in downtown Atlanta can be 12 ^{o}F (6.7 ^{o}C) higher than temperatures in the surrounding countryside. The roofs of large structures like office buildings and shopping malls can get as hot as 150 ^{o}F (66 ^{o}C) in the summer sun.

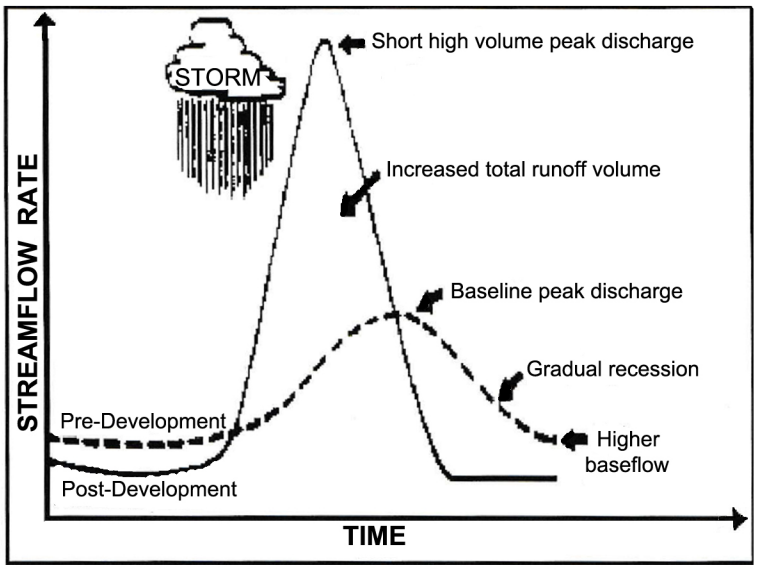
Probably the most devastating effect of tree removal and the paving over of green spaces is that runoff from rainstorms no longer has any way to seep into the ground. The replacement of permeable soil with impermeable parking lots, driveways, and rooftops, increases both the total amount and the intensity of runoff, overwhelming drainage systems and streams and creating flooding hazards. Not only is the frequency of flooding increased, but the increased sediment load carried to streams creates additional erosion.

Figure 7A-2: Growth of Urbanized Area of Atlanta



In recent history, growth has been concentrated along the major highways, especially the interstate highways. Historically, the fastest growing sector has been the I-85 corridor in Gwinnett County (northeast side of Atlanta). But growth has also accelerated to the north, south, and west. Henry County along I-75 (south side of Atlanta) averaged a 7.2% population growth per year throughout the 1990s and is currently one of the fastest growing areas in the nation. In 2000, the Sope Creek watershed near Marietta in Cobb County was chosen to be part of a study of urban watersheds. Over a twenty-year period, the population of Cobb County increased by 127.5%. During that same time period, the average annual peak discharge of the stream nearly doubled.

Figure 7A-3: Effect of Urbanization on Stream Flow



Soapstone Ridge

Soapstone Ridge is a 25 square mile (65 square km) area located in the extreme southwestern corner of De Kalb County. It gets its name from the soft rock with a soapy feel, containing up to 80% talc, that Native Americans quarried over 3,000 years ago to carve into cooking bowls (up to 12 inches [30 cm] in diameter), cooking slabs, and smoking pipes. While easy to carve, soapstone is also durable, heat-resistant, and has a high heat storage capacity. For hundreds of years, soapstone vessels were highly desired as cookware for Southeastern peoples, and it is hypothesized that these quarries supplied trade networks that existed from the Atlantic Coast all the way to Louisiana. Once lighter-weight pottery cookware was invented, the market for heavier stone implements declined and the soapstone was used primarily for ornaments and smoking pipes.

Because of the area's steep slopes and unstable soil, Soapstone Ridge was bypassed for a long time by developers as metropolitan Atlanta expanded outward. The site was listed on the National Register of Historic Places in 1973, but was nearly lost in 1996 when new property owners began development of a major subdivision. Fortunately, a deal was made and six acres (2.4 hectares) containing several quarry sites were sold to the McGarity-Etheridge Archeological Conservancy and ultimately preserved. Examples of all stages of the quarrying and carving operations can be viewed at this site. The carvers primarily used stone axes and other tools made from deer antler and wood.

The unusual rock exposed on Soapstone Ridge is a dark-green actinolite-chlorite-talc schist, that is thought to have originated deep in the earth's mantle before being brought near to the surface along a series of major faults. It is the largest exposure of this type of mantle rock in the eastern United States south of Maryland. The mineral talc, that makes the rock suitable for carving, was not an original mineral in the rock, but was produced through long periods of chemical weathering once the rock reached the surface.

Soapstone Ridge is also home to a major sewage treatment plant and several landfills. As metropolitan regions grow, there is an ever-increasing amount of both human and other waste that must be dealt with. Because the Soapstone Ridge area had not yet been heavily developed, De Kalb County thought this would be a good location for facilities that citizens normally would not want in their backyard; like sewage plants, landfills, and police facilities like the Atlanta Corrections Center and the Metro Corrections Institute. Unfortunately, planners did not consider problems with the underlying rock and other environmental concerns when they chose this site.

The Hickory Ridge Landfill, south of Route I-285, opened in June 1993 and has since closed. The design capacity was eight million cubic yards (6.1 million cubic meters) consisting of both solid waste and cover soil. Both a compacted clay liner and an overlying synthetic liner were used to prevent contaminated water from leaching into the ground. A storm water collection and detention system collected runoff in four temporary storage ponds. Other environmental safeguards included a groundwater monitoring system and a methane monitoring system. The Live Oak Landfill, located just north of Route I-285 is also now closed. During its construction, several soapstone quarries were excavated and studied. A total of 423 soapstone bowls and 119 other soapstone objects were recovered from these quarries before landfill operations began.

One of the key marks of an expanding metropolitan area is the changing location of shopping malls. The oldest mall in Atlanta is the Lenox Square Mall, located in a northeastern area of the city called Buckhead (near where the Fulton/De Kalb county line crosses Route I-85). Later malls such as the South De Kalb Mall in Panthertown (just northeast of Soapstone Ridge), were all located near to or inside of the Interstate 285 beltline. The newest malls are being developed up to 25 miles (40 km) outside of the beltline. Such malls serve as catalysts for further development and have contributed to the continuing loss of wooded areas and a massive increase in traffic that existing roads cannot handle.

Another mark of an expanding metropolitan area is the proliferation of urban legends or myths. Folk tales are usually associated with backwoods communities or traditional societies, but a whole new genre of folklore has arisen out of our modern culture. Such stories are generally circulated as recounting true occurrences that happened to a friend or family member and involved either horrifying, supernatural, or humorous elements. They often contain references to mysterious perils or troubling events, such as disappearances and the strange behavior of certain objects. They are most often circulated orally, but may be spread by any media, including newspapers, e-mail, and various social-media platforms. There is usually a connection to community moral standards, prejudices, or changing societal conventions. Many such legends have circulated for years in different places with changes only in the names of the main characters and the specific locations where the story took place. One of the most popular stories is the tale of the vanishing hitchhiker, which has been around for a long time, but is still probably the best known example of an urban legend. The story of the vanishing girl has also been memorialized in music. A slightly different version of this tale was recorded by the Country Music group “The Country Gentlemen,” under the title, “Bringing Mary Home.”

The Vanishing Girl

[Traditional - Retold and adapted by Libby W. Carnohan]

The road from Mableton to Marietta was especially dark except for the single stream of light from a shadowy moon. The couple drove on, eager to get home and go to bed. They had been visiting a sick relative in Mableton. Their conversation was abruptly interrupted when the man driving the car swerved to miss a young girl walking along the edge of the road. She was dressed in pink satin and white lace and carried only a single rose. The sight of her was so unusual that at first the wary travelers thought that they were mistaken. They slowed, and there in the moonlight the girl stood motioning for them to stop. The couple immediately stopped and asked if the girl needed to be taken somewhere. She replied, "Yes, I must get to the hospital in Marietta. My boyfriend was in an accident, and they took him there. I have to see him." The couple explained that they were going that way and would be glad to help. The wife leaned forward to allow the young girl to get in the back seat. The couple tried, but couldn't get the girl to answer any of their questions. All they heard from the back was a faint whimpering. Finally, the soft noise stopped and the couple tried again to find out more about the accident. This time when the girl did not respond, they stopped and turned around to see if she was all right. Much to their amazement, the seat was empty. The girl had vanished.

So shaken by the incident, the wife insisted that they go to the hospital in Marietta to check on the condition of the young man. But no one at the hospital knew anything about an accident. No young man had been admitted that evening or the evening before. The couple grew more and more frightened. They returned to their car and carefully checked the interior. There under the front passenger's seat, they found a single white rose.

Years later, the couple's grandchildren were visiting with them. The children told them a ghost story they had heard at school. As they told it, there is this young girl who wanders the roads between Mableton and Marietta searching for her boyfriend who was killed in a car accident on the night of their senior prom. Only the truth is, both the young man and the young girl were killed in that accident that night on that lonely road.

Activity 7A-1: Stone Mountain

POWER THINKING EXERCISE - "Shadowy Situations"

While studying the Stone Mountain site in Georgia, you happen to notice something very strange about the black and white photograph on IMAGE 7A, METROPOLITAN ATLANTA. You can see every photographic detail clearly on the south side of Stone Mountain, but at the base of the north side of Stone Mountain, all you can see is a solid black band. When you look at the topographic map on MAP 7A, METROPOLITAN ATLANTA, you see that there is a small pond shown along the base of the mountain that you would expect to be visible on the photograph. What do you think the black band represents and why do you think the pond is not visible?

Once you have figured out that Stone Mountain, like any person, tree, or other object illuminated by full sunlight, casts a large shadow, several other questions come to mind. Discuss in your group how you would answer these questions and try to determine what those answers might be.

- **At what time of day do you think the photograph was taken?**
- **Will the shadow change position during the day? In which direction?**
- **Is there any time during the day when the pond will see the sun?**
- **Will the shadow be the same size in the winter as in the summer?**

Materials
MAP 7A, METROPOLITAN ATLANTA
IMAGE 7A, METROPOLITAN ATLANTA
Figure 3-1: "Landform Regions of the Southeast"
"Index Map of Study Areas"
Wipe-off Pens

PERFORMANCE TASKS

(Icon Key) Overview = ✈; Science = ☼; Math = 💻; History = 🕮; Language Arts = ✍

1. **Construct N-S topographic profile across Stone Mountain. ✈**

   Divide your class into an equal number of groups. Half the groups should construct a profile from the top of Stone Mountain to the bottom of the north slope. The other half of the groups should construct a profile from the top of Stone Mountain to the bottom of the south slope. The two profile graphs can then be joined together to form a complete topographic profile all the way across the mountain.

   Group I North Profile

   Locate the peak of Stone Mountain on MAP 7A, METROPOLITAN ATLANTA (summit is marked as the location of the Beacon)**.** Draw a straight line starting at the 'beacon' to the center of the small pond at the bottom of the north slope of the mountain. Determine the best vertical axis scale by finding the difference between the highest and lowest elevations (the rise) along the drawn line. Mark as many intervals of 20 feet as you need (based on your rise) on the 'y' axis of your graph paper. This is your vertical axis. Be sure your axis is drawn at least one inch from the left edge of your graph paper. Fold the graph paper horizontally along a line representing the

lowest elevation shown on your vertical axis. This fold will become your horizontal, or 'x' axis.
Place the horizontal axis along the line you drew on the topographic map. Be sure the origin point of your graph (where 'x' and 'y' axes meet) is over the location of the Beacon. Starting at the origin, imagine you are walking a path along the line you have drawn. Each time you cross a contour line, stop and plot the elevation corresponding to that point on your graph. Continue your virtual walk, stopping and plotting each contour line, until you reach the small pond. Connect the points you have plotted. This graph represents your profile of the north face of Stone Mountain. How would the shape of the profiles you drew change if you made the horizontal and vertical scales equal?

Group II South Profile

Locate the peak of Stone Mountain on MAP 7A, METROPOLITAN ATLANTA (summit is marked as the location of the Beacon)**.** Draw a straight line starting at the 'beacon' to the center of Venable Lake at the bottom of the south slope of the mountain. Determine the best vertical axis scale by finding the difference between the highest and lowest elevations (the rise) along the drawn line. Mark as many intervals of 20 feet as you need (based on your rise) on the 'y' axis of your graph paper. This is your vertical axis. Be sure your axis is drawn at least one inch from the left edge of your graph paper. Fold the graph paper horizontally along a line representing the lowest elevation shown on your vertical axis. This fold will become your horizontal, or 'x' axis.
Place the horizontal axis along the line you drew on the topographic map. Be sure the origin point of your graph (where 'x' and 'y' axes meet) is over the location of the Beacon. Starting at the origin, imagine you are walking a path along the line you have drawn. Each time you cross a contour line, stop and plot the elevation corresponding to that point on your graph. Continue your virtual walk, stopping and plotting each contour line, until you reach the center of Venable Lake. Connect the points you have plotted. This graph represents your profile of the south face of Stone Mountain. How would the shape of the profiles you drew change if you made the horizontal and vertical scales equal?

Compare the different graphs and explain the different topography on the north and south slopes of Stone Mountain. Use the highest and lowest elevation on your vertical cale to determine the difference in elevation. Use the scale bar on the map to determine your horizontal distance. Use the following formula.

$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{\text{difference in elevation between two points}}{\text{distance between two points}}$$

Is your calculation of the mountain slope an accurate representation of Stone Mountain's topography? Explain why or why not? Why do you think the Confederate carving was placed on the north face of the mountain? Why do you think the granite quarries were located on the south face of the mountain?

2. **Explain distribution of trees on Stone Mountain.** ☼
   Examine the black and white photograph of Stone Mountain on IMAGE 7A, METROPOLITAN ATLANTA, and circle, with a wipe-off pen, several locations on the mountain where trees have been able to grow on the granite rock. Do these areas have anything in common? Explain your answer. Also explain the geologic processes that would permit the growth of trees in these locations and make an educated guess about how long it would take for a section of bare granite rock to alter sufficiently to permit the growth of trees..

3. **Measure length of park railroad line that circles Stone Mountain.** 💻
   Locate the Railroad tracks that circle Stone Mountain on MAP 7A, METROPOLITAN ATLANTA. [Refer to Figure 2-2, Standard USGS Symbols for Topographic Maps, if you need help recognizing the symbol for railroad tracks.] Mark the route of this railroad line with a wipe-off pen. How would you describe the geometric shape formed by your marked line? Discuss in your group the best way to measure the perimeter of an irregular geometric shape. Use your chosen method, and the scale bar on the map, to determine how far you would travel if you rode the Park Train one time all the way around the mountain.

4. **Explain significance of street pattern in town of Stone Mountain.** 🕮
   Locate the town of Stone Mountain on MAP 7A, METROPOLITAN ATLANTA. Carefully examine the particular street pattern found in the section of the town shown in the lower-left corner of the map. What do the symbols on the map tell you about the many occurrences of very short streets that have large black circles at one end? What type of land use would you expect in a town that has this type of street pattern? List some advantages and disadvantages of using this type of street pattern in a town.

5. **Examine consequences of naming things for controversial people.** ✍
   Locate Venable Lake on the Stone Mountain topographic map on MAP 7A, METROPOLITAN ATLANTA (along south slope of mountain near bottom of map). Visitors might naturally assume that the lake was named for James Venable who led the highly controversial national Ku Klux Klan organization in the 1970s, but James Venable also owned the quarry company that mined granite from Stone Mountain and his ancestors, brothers William and Samuel Venable, were the ones who purchased the quarry company in 1882 and made the quarry commercially successful. Discuss in your group how you could determine exactly which person named Venable the lake was originally named for. Also discuss whether the historical truth would make any difference to visitors to the park today who might object to encountering the name of someone whose views and actions they find highly objectionable. What other issues might arise from naming such features after other controversial people?

ENRICHMENT

(Icon Key) Overview = ✈; Science = ☼; Math = 💻; History = 🕮; Language Arts = ✍

1. **Research carving methods used on Stone Mountain.** ☼
   After several failed efforts at starting the carving on Stone Mountain, work-crew foreman Roy Faulkner experimented with a new carving tool, a thermo-jet torch, and discovered that he had a talent for using it. The torch works by heating the surface of the rock with a flame to temperatures as high as 4,000 ^{o}F (2204 ^{o}C). Moisture within the rock is converted to steam and the surface of the rock either pops or flakes off. The carving took six years to complete. Use local library and internet resources to investigate the workings of the thermo-jet torch and explain why it worked so well on the granite rock.

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2. **Identify names associated with Confederacy that are used in park.** ✈
   Locate a map of Stone Mountain Park either on a park brochure or on the Stone Mountain website <https://www.stonemountainpark.com/Maps>. Study the map carefully and identify all the road names and any other park features that are associated with Confederate war heroes.

Activity 7A-2: Urbanization of Atlanta

POWER THINKING EXERCISE - "Water Worries"

You are on the Cobb County Board of Commissioners and you have been receiving a number of complaints lately from residents living in the towns of Oakdale and Potterplace along the Chattahoochee River. Locate these two towns and the Chattahoochee River on the Atlanta topographic map on MAP 7A, METROPOLITAN ATLANTA (look in the upper-left quadrant of the map). The complaints all mentioned the frequent flooding of their neighborhoods by the Chattahoochee River after major storm events. One older gentleman complained that he had lived in the same house along the river in Oakdale for over fifty years and the river had never flooded his yard until recently.

You and several other commissioners have confirmed the problem by visiting the neighborhood to observe the flooding during heavy rainstorms. You have also studied the report documenting flow rate changes in Sope Creek, a tributary of the Chattahoochee River. Refer to the graph in Figure 7A-3 to see the results of that research.

In your group, list some of the reasons that flooding events might be occurring more frequently now in this area. Also study the topography around the Chattahoochee River in these towns and suggest some reasons why this area would be more prone to flooding than other neighborhoods. Finally, suggest some remedial measures the County might take to try and solve the problem. Share your results with the rest of the class.

Materials
MAP 7A, METROPOLITAN ATLANTA
IMAGE 7A, METROPOLITAN ATLANTA
Figure 7A-3, Effect of Urbanization on Stream Flow
Wipe-off Pens
Wide-tip Wipe-off Pens

PERFORMANCE TASKS

(Icon Key) Overview = ✈; Science = ☼; Math = 💻; History = 🕮; Language Arts = ✍

1. **Locate Atlanta features on topographic map and satellite image. ✈**
   Divide your class into seven groups and assign each group one feature to locate on both the Atlanta topographic map on MAP 7A, METROPOLITAN ATLANTA and the Atlanta NALC satellite image on IMAGE 7A, METROPOLITAN ATLANTA. **Note that although the map and the satellite image are printed at different scales, they both cover the exact same geographical area**. Each group should mark their location on both products with a wipe-off pen and then make a brief presentation to the entire class explaining how they located their feature on the satellite image. .

   Group I **Stone Mountain [far-right center of map]**
   Group II **Soapstone Ridge [not-labeled; along southern border of De Kalb County along South Creek, just south of Panthertown]**

Group III **Chattahoochee River (labeled) & Brevard Fault Zone (not labeled) [runs diagonally across map from left-center to top-center]**
Group IV **Kennesaw Mountain National Battlefield Park [top-left corner]**
Group V **Hartsfield Atlanta International Airport [lower-center of map]**
Group VI **Jonesboro (battlefield site) [extreme bottom-center of map]**
Group VII **Terminus (end site of Chattanooga to Atlanta RR located under the letter "S" of the word "State Capital" about one-inch southwest of the first letter "A" in the word "ATLANTA" - in center of map).**

2. **Locate watershed divide between Atlantic and Gulf drainage.** ☼
Locate the Chattahoochee River on the Atlanta topographic map on MAP 7A, METROPOLITAN ATLANTA (river runs from left-center to top-center of map). With a wipe-off pen, trace onto this map the path of the Chattahoochee River and every other tributary you can find that flows into the Chattahoochee River. Now, using a different color wipe-off pen, trace the path of every stream that flows off the eastern edge of this map; and also every tributary stream that flows into those streams.

You should notice a ridgeline running through Atlanta that no streams cross. By definition this is the drainage divide. All drainage that flows westward into the Chattahoochee River eventually enters the Gulf of Mexico. All drainage that flows eastward off the map eventually enters the Atlantic Ocean. Was it a good idea to build the city of Atlanta on a drainage divide? Explain your answer. What features can you find that seem to have a preferred location along the divide? Explain your reasoning.

3. **Estimate percentage of Atlanta area classified as urban.** 💻
Study the Atlanta, GA NALC satellite image on IMAGE 7A, METROPOLITAN ATLANTA. Note that this image is a false-color print where red colors denote healthy vegetation (such as trees and fields) and light-blue colors denote paved urban areas. Use the SE MAPS TRANSPARENT PLASTIC GRID, or some other method to estimate the percentage of the NALC area that is predominantly urban. How accurate is your estimate? Explain your reasoning. Suggest other methods that might give you more accurate results.

4. **Predict locations of future expansion of urbanization.** 🕮
Examine the Atlanta, GA NALC satellite image on IMAGE 7A, METROPOLITAN ATLANTA. Note that the light-blue colors (denoting paved areas) seem to be concentrated along the routes of interstate highways. Also examine Figure 7A-2, "Growth of Urbanized Area of Atlanta." Which interstate highways seem to be attracting the heaviest urbanization? Explain your reasoning. As Atlanta continues to grow, predict the next areas that will experience urbanization and explain why.

5. **Investigate symbolism on City of Atlanta official seal.** ✍
The official Atlanta City Seal, adopted in 1887, pictures a phoenix (a mythical bird) rising from flames with the motto "Resurgens" meaning "rising again" in Latin. What is the symbolism behind using a mythical figure like the phoenix? Why do official seals often use mottos written in Latin? An old saying states "A picture is worth a thousand words." What message do you think Atlanta's citizens get when they look at the seal? Does the seal convey this message better than a written statement would?

ENRICHMENT

(Icon Key) Overview = ✈; Science = ☼; Math = 💻; History = 🕮; Language Arts = ✍

1. **Research information on siege of Atlanta during Civil War.** 🕮
   In 1864, Union forces entered Atlanta from the northwest along the main railroad line. Battles were fought at Peachtree Creek, Ezra Church, and the final battle in downtown Atlanta. Use local library or internet resources to research information about the siege of Atlanta and one or more of these battles. Explain why it took so long for the Union forces to win the city and identify the keys to their victory. Locate these battle sites as closely as you can on the Atlanta topographic map on MAP 7A, METROPOLITAN ATLANTA.

2. **Interpret meanings of local city or school official seals.** ✍
   Research whether your local town, or school, has an official seal. If so, interpret the meanings of any pictures or mottos contained in the seal. Interview any knowledgeable city or school administrators to get additional information. If you cannot find a local seal to examine, use library or internet resources to examine the seal of your state and interpret the meanings of its contents. How, where, and when do local school or city officials refer to the official seal.

Activity 7A-3: Soapstone Ridge

POWER THINKING EXERCISE - "Perimeter Puzzle"

You have been appointed to a position on the Atlanta Regional Board of the Georgia Department of Highways. The Department has been getting an increasing number of complaints about traffic jams along many parts of Interstate Route 285, also known as the Perimeter Highway or the Atlanta Beltline. This 62.5 mile (100.5 km) limited-access highway was built in the late 1960s to provide a quick way for through traffic to avoid having to go through downtown Atlanta. But because of the increasing urbanization of the area (refer to Figure 7A-2, "Growth of Urbanized Area of Atlanta") and the accompanying traffic tie-ups, it now seems to take just as long to drive the beltway route around Atlanta as it would take to drive straight through.

Your job is to design a new beltway, far enough outside of the urban zone to miss all the traffic, but close enough to metro Atlanta so it doesn't take forever to drive around the city. Use a wipe-off pen to draw your proposed new route onto the Atlanta topographic map on MAP 7A, METROPOLITAN ATLANTA. Also use information from Figure 7-2 and from the NALC satellite image on IMAGE 7A, METROPOLITAN ATLANTA to help you decide on the best route. Show your map with your marked route to the rest of the class and explain why you placed the new road where you did.

Materials
MAP 7A, METROPOLITAN ATLANTA
IMAGE 7A, METROPOLITAN ATLANTA
Figure 7A-2, "Growth of Urbanized Area of Atlanta"
Wipe-off Pens
Wide-tip Wipe-off Pens

PERFORMANCE TASKS

(Icon Key) Overview = ✈; Science = ☼; Math = 💻; History = 🕮; Language Arts = ✍

1. **Locate important features on aerial photographs. ✈**
   Refer to the Soapstone Ridge topographic map on MAP 7A, METROPOLITAN ATLANTA to locate the following features. Use the information from the map to locate each feature on the Soapstone Ridge aerial photograph and, if possible, the enlargements of the sewage plant and landfill photographs on IMAGE 7A, METROPOLITAN ATLANTA. Give a brief explanation of why you think each feature was located where you found it.

   Sewage Disposal Plant near Mc Nair High School - (top-center of map)
   Sewage Disposal Plant near mobile home park - (left-center of map)
   Hickory Ridge Landfill - (SE corner of Interchange #39; bottom-center of map)
   Live Oak Landfill - (NW corner of Interchange #39; bottom-center of map)
   South River - (runs west to east across center of map)
   Interstate Highway 285 - (runs southwest to northeast along bottom of map)
   Atlanta Corrections Center - (on Key Road in top-center of map)
   Metro Corrections Institute - (in exact center of map)

2. **Explain occurrences of strange contour-line patterns.** ☼

Most landform features display predictable contour line patterns when drawn on a topographic map. However, there are several locations on the Soapstone Ridge topographic map on MAP 7A, METROPOLITAN ATLANTA that display highly unusual contour line patterns that cannot be explained by natural processes. Divide the class into six groups and assign each group to one of the locations listed below. Each group should study the site carefully and then explain to the class what is unusual about the contour-line pattern and what they think took place at that site to create it.

Mc Nair High School football field - (top-center of map)
Interstate Highway 285 - Interchange #38 - (bottom-center of map)
Hickory Ridge Landfill - (SE corner of Interchange #39; bottom-center of map)
Live Oak Landfill - (NW corner of Interchange #39; bottom-center of map)
Southside Park - (white circle north of Interchange #40; lower-left corner of map)
Long building bordering Fulton/De Kalb County line - (bottom-center of map)

3. **Estimate surface area of athletic fields at Mc Nair High School.** 💻

Locate the baseball and football fields at Mc Nair High School on the De Kalb County Sewage Plant DOQ photographic enlargement on IMAGE 7A, METROPOLITAN ATLANTA (upper-right corner of photo). The football field occupies a rectangular area inside the oval track. The mathematical formula for calculating the surface area of a rectangle is "length x width". Use the scale bar from the photo to measure these dimensions and calculate the area. Compare your answer with the expected area of a typical football field (360 feet by 160 feet). [the field is 300 feet long with an extra 30 feet for each end zone]. How close was your answer to the correct value? Why did your calculation not give you the exact correct answer?

Now try to calculate the surface area of the baseball field. This is a more difficult problem because the field is not laid out in a common geometric shape [and baseball fields do not have standardized sizes]. Discuss in your group how you could design a method for calculating the area of this unusual shape. Once you have decided on a method, use it to estimate the area of the baseball field. Compare your estimates with those of other groups. Which method do you think was most accurate? Explain why.

4. **Explain rationale for locating sewage plants along streams.** 🕮

Locate the following two Sewage Disposal Plants on the Soapstone Ridge topographic map on MAP 7A, METROPOLITAN ATLANTA. Also locate these same plants on the Soapstone Ridge DOQ aerial photograph on IMAGE 7A, METROPOLITAN ATLANTA, and locate the plant near Mc Nair High School on the De Kalb County Sewage Plant DOQ photo enlargement on IMAGE 7A.

Sewage Disposal Plant near Mc Nair High School - (top-center of map)
Sewage Disposal Plant near mobile home park - (left-center of map)

Both sewage plants are located in a low valley next to a stream. Considering the path the sewage would have to take to get to the plant, why is it important to locate such facilities in low-lying areas? Why is it important to locate the plant near a stream?

5. **Write a follow-up story to continue "Vanishing Girl" legend.** ✍
   Using the Atlanta topographic map on MAP 7A, METROPOLITAN ATLANTA, locate the city of Marietta (upper-left corner of map) and the town of Mableton (about ten miles south of Marietta). Read through the story, "The Vanishing Girl" on page 7A-13. One characteristic of urban legends is that the unusual event normally happens more than one time. Write a follow-up story with different main characters in which the girl is picked up by a different car at a different time, but with different results. Be creative in your use of words that generate suspense and surprise.

ENRICHMENT

(Icon Key) Overview = ✈; Science = ☼; Math = 💻; History = 🕮; Language Arts = ✍

1. **Research history of stone bowl carving in North America.** 🕮
   Use local library or internet resources to research information about the Native American groups that developed the techniques for stone-bowl carving that were used at Soapstone Ridge and other sites in North America. Also research the specific tools and techniques that were used.

2. **Identify features/facilities needed for sewage plants and landfills.** ☼
   The two photo enlargements of the De Kalb County Sewage Disposal Plant and the De Kalb County Landfill found on IMAGE 7A, METROPOLITAN ATLANTA, have a resolution accurate enough to identify individual buildings and other features that make up these two facilities. Waste management is a problem faced by every large metropolitan area. Use local library or internet resources to study what items are necessary to have at sewage plants and landfills. Identify as many of these features as you can on the photo enlargements on IMAGE 7A.

SHELBY STAR

February 9, 1990

Evidence indicates that Blacks fought at Kings Mountain

Kings Mountain, NC – by Joe DePriest.

Call him Ishmael Titus.

Born a slave, he substituted for his master in the Patriot Army during the American Revolution. The promise of freedom lured him into a string of battles that lead to the one at Kings Mountain on Oct. 7, 1780.

Most of the blacks at Kings Mountain were servants but there were some free men of color. Their presence at Kings Mountain has been part of battle lore for many years, but Dr. Bobby Moss uncovered their names during research for his book on battle participants.

The discovery of black names, to be on display at the park visitor's center during Black History Month, delighted officials at the Kings Mountain National Military Park: Ishmael Titus, Andrew Ferguson (and his father), Essius Bowman, John Bruddy, and a man known as Primes or Primus.

Legend says Bowman was among those who shot the British commander, Patrick Ferguson.

Andrew Ferguson was born in 1765 in Dinwiddy County, Va. "He and his father were free blacks," says Moss. "Andrew was a blacksmith and was shanghaied by a British naval press gang".

The Fergusons escaped at Charleston and were making their way northward when they encountered a patriot militia. The leader explained to Andrew that he was in big trouble with the British and would probably be hanged for treason if he were caught.

"He probably had Andrew scared a little bit," says Moss. "He told Andrew he needed to be drafted so they could protect him.

Andrew wrote that both he and his father were lucky enough to be drafted. He was later seriously wounded at Guilford Courthouse. "They made a plate by beating silver coins," says Moss, "and put it in his head.

RATIONALE

The Kings Mountain Study Site provides an excellent example of how landscapes and landforms can affect historical events. When the British and American armies met at Kings Mountain during the Revolutionary War, the British forces were not used to fighting in this type of terrain, while the American troops took advantage of their knowledge of the topography to gain a quick victory. The landscape has also figured prominently in the development of the trails and monuments that were later constructed within the national park. As the population of the Piedmont region grew larger, the Kings Mountain area became part of a national transportation corridor between Charlotte and Atlanta that included not only highways and railroad lines, but also oil and natural gas pipelines and electrical transmission lines. The Kings Mountain Belt is also known for its distinctive geology and economically valuable mineral deposits. Several surface mining sites illustrate both the benefits and potential environmental hazards associated with resource extraction. Many of the inactive mines have been reclaimed, although some have not, providing a comparative framework for analyzing and discussing a variety of environmental issues.

PERFORMANCE OBJECTIVES

1. Analyze placement of transportation and utility systems along Interstate 85 corridor.
2. Use mathematics skills to determine slope of land and grade of right-of-ways.
3. Examine effects of proximity of transportation routes on nearby land use.
4. Explain significance of topography to both Patriot and Loyalist forces in battle.
5. Calculate rate of travel of Over-Mountain Men through various landform regions.
6. Compare and contrast motives, slogans, and battle styles of Patriots and Loyalists.
7. Evaluate the social and personal ramifications of Blacks fighting with the Patriots.
8. Correlate occurrences of mineral resources with geology and topography of the area.
9. Document alterations to landscape of strip mines and evaluate environmental impact.
10. Analyze effectiveness of environmental restoration strategies in damaged areas.

SAMPLE ASSESSMENT RUBRICS

EXAMPLE #1 (relates to Performance Objective #1)

Give students a copy of the Grover Quarry photograph on IMAGE 7B and ask them to locate the two power line corridors that intersect at the electrical substation. Within each corridor, have students locate the series of individual tall metal towers that hold up the electrical power lines (use magnifying glasses if needed). Ask students to measure the distance between adjacent towers in several different locations on the photo and then ask them to describe the spacing (evenly spaced or not) and relate the spacing pattern to topographic and/or landscape features.

A (level 4) – Answer indicates towers are NOT spaced evenly and relationship is correct (towers are closer together on hills and farther apart over valleys).

B (level 3) – Answer indicates towers are NOT spaced evenly but relationship is not clearly explained.

C (level 2) – Answer indicates towers are NOT spaced evenly but relationship is incorrect or missing completely.

D (level 1) – Answer indicates towers ARE spaced evenly and a reason is stated that does relate tower spacing pattern to topography in some way.

F (level 0) – Answer indicates towers ARE spaced evenly and reasons are missing.

EXAMPLE #2 (relates to Performance Objective #6)

Ask students to write a paragraph of about 50 words that describes the Battle of Kings Mountain from a language arts perspective. Students are to include words from four different parts of speech (nouns, verbs, adjectives, and adverbs) that effectively describe the physical setting in which the battle took place.

A (level 4) – All four required parts of speech are included in the paragraph and all words effectively communicate subjective information about the battle.

B (level 3) – All four required parts of speech are included in the paragraph, but only some of these words effectively communicate subjective information.

C (level 2) – All four required parts of speech are included in the paragraph but most of the words communicate no subjective information; or only two or three required parts of speech are included and the words do communicate some subjective information.

D (level 1) – Only two or three of the four required parts of speech are included in the paragraph and very little subjective information is conveyed.

F (level 0) – Only one or two of the four required parts of speech are included in the paragraph and very few words convey any subjective information.

Cartographic Product Information

MAP 7B: Kings Mountain Belt

TITLE: Kings Mountain, NC-SC
DATA SOURCE: USGS 7.5-minute Topographic Map Series
DATE: Kings Creek (1970; Filbert (1971); Grover (1971); Kings Mountain (1971)
SCALE: 1:24,000 [1 inch = 2,000 feet] [1 cm ~ 240 meters]
OTHER IMPORTANT DATA:

- The contour interval of most of the map is 20 feet; however a 1.5 inch strip along the entire bottom margin of the map has a contour interval of 10 feet. Also note the color differences in Lake York on opposite sides of this line.
- The vertical splice line running down the center of the map is more difficult to find, but the position can be estimated by noting the different color blue pattern in reservoirs on different sides of the splice line.
- Most strip mines and quarries on this map are denoted by depression contour lines [lines with hachure marks] as well as being labeled.

POINTS OF SPECIAL INTEREST:

- The Vulcan Materials Quarry (formerly Campbell Limestone Quarry) described in 'Case Study #1' is located in the lower-left corner of the map about .5 miles south of Interstate Highway #85 just below the red "4 LANE" label. .
- Henry Knob Mountain, described in 'Case Study #2,' is located in the extreme lower-right corner of the map.
- Kings Mountain National Military Park is located in the lower center of the map (boundary line is the dashed black line that is outlined in red).

OTHER FEATURES TO LOOK FOR:

- The NC-SC state line runs horizontally through the middle of the map.
- The Kings Mountain ridge runs diagonally across the entire map from bottom center to upper right (look for steep slopes - contour lines close together).

TITLE: Kings Mountain National Military Park
DATA SOURCE: USGS 7.5 minute topographic map series – Grover Quadrangle
DATE: 1971 (photorevised in 1993)
SCALE: 1:6,000 [1 inch = 500 feet] [1 cm ~ 60 meters]
OTHER IMPORTANT DATA:

- The Park Walking Trail (dashed black line) continues from the Hoover Monument to the Centennial Monument along the marked 'road' even though This connection is not specifically shown on this map.

POINTS OF SPECIAL INTEREST:

- The U.S. Monument marks the surrender site of British Major Ferguson.
- The Centennial Monument marks the high point of the ridge where battle began.
- The Hoover Monument marks the site where President Hoover gave a speech.

OTHER FEATURES TO LOOK FOR:

- The irregularly shaped building (purple color) in the right center of the map is the Park Visitor Center/Museum building.

IMAGE 7B: Kings Mountain Belt

TITLE: Kings Mountain, NC-SC
DATA SOURCE: NHAP CIR Photographs 173-28 and 173-116
DATE: 1984
SCALE: 1:24,000 [1 inch = 2,000 feet] [1 cm ~ 240 meters]
OTHER IMPORTANT DATA:

- The right half of the photo shows better color differentiation than the left half due to contrast differences in the original photography.
- Lakes and ponds vary in color based on the sediment content of the water (darker blue indicates clear water; lighter milky blue indicates muddy water).
- Long straight white lines of varying width represent utility corridors (pipelines, electric transmission lines, telephone lines) where trees have been removed.

POINTS OF SPECIAL INTEREST:

- The Vulcan Materials Quarry (formerly Campbell Limestone Quarry) described in 'Case Study #1' is located in the lower-left corner of the photograph; look for a long, narrow pond about .5 miles south of Interstate Highway #85.
- Henry Knob Mountain, described in 'Case Study #2,' is located in the extreme lower-right corner of the photograph.

OTHER FEATURES TO LOOK FOR:

- The NC-SC state line is not labeled on the photograph, but can be inferred at the extreme left center of the image by locating a straight-line boundary that separates different land-use patterns.
- Many agricultural fields (especially in lower-right part of photo) show curved red/white stripes representing contour plowing pattern for soil conservation.

TITLE: Grover Quarry, SC
DATA SOURCE: NAPP CIR Photograph 7469-15
DATE: 1994
SCALE: 1:6,500 [1 inch ~ 542 feet] [1 cm ~ 65 meters]
OTHER IMPORTANT DATA:

- This image is an enlargement of the quarry area shown on the center left part of the NHAP photo just southeast of the first interstate exit from the left margin.
- All structures on this photo project shadows (the taller the structure, the longer the shadow). The dark areas in the quarry are shadows, not ponds.

POINTS OF SPECIAL INTEREST:

- The Grover Interchange on Interstate Highway #85 is visible in the extreme upper left corner of the photo (note vehicles on highway).
- The square white structure in the lower right section of the photo is an electrical substation (note power line towers visible along two utility corridors).

OTHER FEATURES TO LOOK FOR:

- Many agricultural fields (especially in lower left portion of photo) show curved red/white stripes representing contour plowing pattern for soil conservation.

Transportation Corridor and Land Use

The settlement of Cherokee and York Counties in South Carolina began in 1755 when a large number of displaced Pennsylvania colonists moved southward to take advantage of free land, an absence of conflict, and the promise of rich iron deposits. Many hoped to "strike it rich" mining the seemingly limitless natural resources. The Pennsylvania connection is still evident today in town and county names like Lancaster, York and Chester, all of which were important Pennsylvania towns during colonial times.

Throughout the Revolutionary War period and even into the late 1800's, the Kings Mountain Iron District produced a variety of weaponry and other implements, such as cannons and cannonballs, guns and ammunition, nails, farm tools, and iron wire. Finished products were shipped all over the country and abroad, usually through the Port of Charleston. In fact, almost all transportation routes in South Carolina before 1900 ran in a north-south orientation, following the major river systems. Just before the Civil War, several iron manufacturing companies pressured the South Carolina legislature to build additional railroads and canals in the area, but the war prevented any action from being taken on these proposals.

Around 1900, a new railroad line, the Southern, linking Washington to New Orleans, was routed through the upstate of South Carolina. This main line rapidly gained freight business and put an end to South Carolina's almost total dependence on the Port of Charleston for commercial exports. Highways soon followed the railroad, connecting many of the railroad towns that had sprung up along the new rail line with other major cities. National Highway 29, designated the "Bankhead Highway", paralleled the Southern Railroad line and became an important travel route even though it was "paved" only with crushed stone. Even other types of transportation systems like those that carry oil and natural gas (pipelines), electricity (power lines), and telephone and cable TV lines preferentially follow this same transportation corridor to achieve maximum efficiency for their distribution networks.

Once the east-west connection was established, the upstate of South Carolina became much more commercially tied to cities like Atlanta and Charlotte than to Columbia and Charleston. Increases in both commercial and personal highway traffic resulted in the construction of Interstate Route 85, first opened in 1964, along basically the same Atlanta-Charlotte route. This corridor has continued to be a magnet to new industry and commercial development all across the upstate. In contrast, areas by-passed by the interstate highway system have experienced major problems in attracting new industry and many have lost existing industries through relocations to sites with easier access to major transportation and utility routes.

Kings Mountain Battlefield Site

The Battle of King's Mountain was one of the major turning points in the American Revolution in the South. It was a battle fought between American patriots and American loyalists (those who remained faithful to England). In fact, the only non-American present was the commander of the loyalist force, Major Patrick Ferguson. As a result of the patriot victory at King's Mountain, the momentum in South Carolina shifted to the patriots.

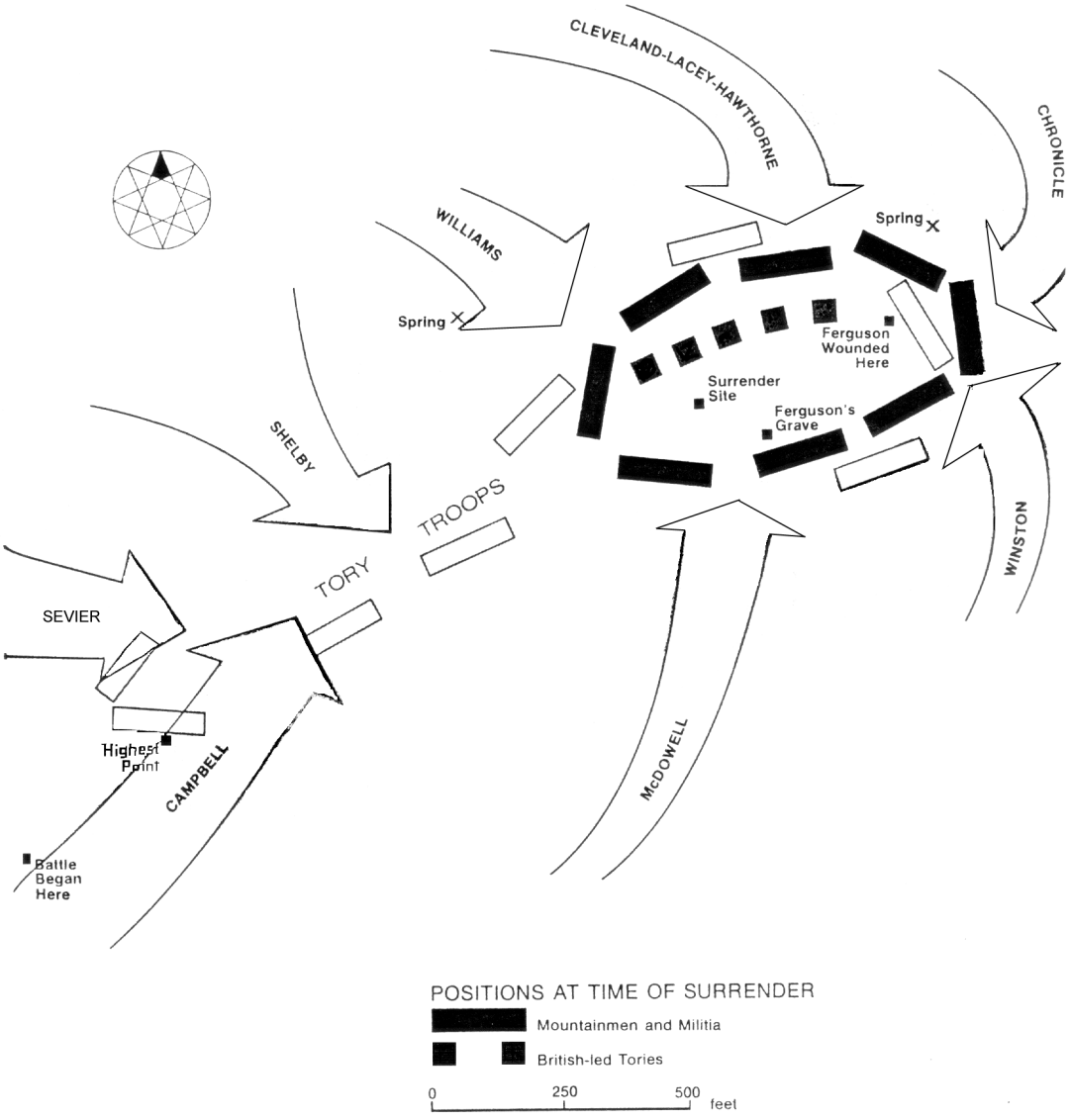
After the surrender of Charles Towne on May 12, 1780, the British had quickly moved to gain control of the rest of South Carolina. Partisans (guerrillas) harassed the British occupying forces but were unable to force the British out of the state. Many of the state's citizens pledged loyalty to the British Crown, and the British moved to enlist these "Loyalties" into a loyalist militia that could be used to secure the state for the Crown. British General Clinton appointed Major Patrick Ferguson to be Inspector of Militia in charge of recruiting such a loyalist Carolina militia. Ferguson, a Scottish officer, had invented a breech-loading rifle. It was superior to the standard issue British musket but the British army failed to adopt it for general use. A courageous officer, Ferguson had lost the use of an arm at the Battle of Brandywine in Pennsylvania. As Inspector of Militia, he quickly recruited a loyalist's militia that he used in the summer of 1780 in the Carolina Backcountry to harass the American patriots. Here he used his militia to hunt down the "rebels (patriots)" while raiding their farms for provisions.

Armed resistance to Ferguson’s raids oftentimes came in the form of patriot militia units of "over-mountain men" who crossed the Appalachian Mountains to challenge the British. Most of these over-mountain men were frontiersmen from the fertile mountain valleys west of the Blue Ridge Mountains. While a number of ethnic groups were represented, the majority of these over-mountain men were Scotch-Irish by descent. The patriot disaster at the Battle of Camden, South Carolina (August 16, 1780) emboldened General Cornwallis to make plans to invade North Carolina. Major Ferguson was ordered to protect General Clinton's left flank, gather intelligence, seize supplies from patriot farms, and to enlist more loyalists. The forces commanded by Major Ferguson consisted of both loyalist provincial troops and militia units. Major Ferguson set up his headquarters at Gilbert Town, North Carolina, and sent a message to the over-mountain men. In the message, he threatened that "if they did not desist from their opposition to the British arms, he would march his army over the mountain, hang their leaders, and lay waste their country with fire and sword."

Instead of intimidating these over-mountain men, Ferguson's message led them to decide to strike first. At Sycamore Shoals (near present day Elizabethton, Tennessee), the over-mountain men mustered on September 25, 1780, under the commands of the patriot militia Colonels Charles McDowell, John Sevier, William Campbell, and Isaac Shelby. After a rousing sermon by the Reverend Samuel Doak who urged the men "to wield the Sword of the Lord and Gideon," they began their march from Tennessee to find Ferguson. Five days later, they made camp at Quaker Meadows on the Catawba River. Here they were joined by other men commanded by Colonels Benjamin Cleveland and

Joseph Winston. So this patriot army now was composed of North Carolinians, Tennesseans, and Virginians. To avoid any personal conflicts among the various regiments, the officers chose Colonel William Campbell to be their leader. Upon receiving news of the approaching patriot army, Major Ferguson began to retreat from Gilbert Town toward Charlotte, North Carolina. Ferguson sent a call to General Cornwallis in Charlotte for reinforcements and on October 1, 1780, appealed to local North Carolina loyalists for help. On the afternoon of October 6, 1780, Ferguson arrived at Kings Mountain, a location that controlled travel routes in this area, where he decided to wait for the reinforcements that never came.

Figure 7B-1: Battle of Kings Mountain



Confident in his ability to defend his position, Ferguson bragged that even "God Almighty can't get me off this mountain." In pursuit of Major Ferguson, the over-mountain men rested at Cowpens, South Carolina, where they received information that Ferguson's force was encamped at Kings Mountain. While at Cowpens, 400 South Carolina patriots joined under Colonels James Williams, William Hill, and Edward Lacey. The patriots traveled through the night in a pouring rain to encircle the mountain. After some initial skirmishes, the battle started at 4 p.m. and was over in about an hour.

The Battle of Kings Mountain was a battle between the British bayonet and the over-mountain men's rifles; between American patriots and American loyalists. Unfortunately for Ferguson, the terrain at Kings Mountain favored the riflemen who used the terrain to their advantage. The mountain rose some sixty feet, was covered in large pines, and was topped by a ridge that runs from sixty to one hundred feet in width. Major Ferguson ordered a series of bayonet charges. The over-mountain men simply fell back seeking cover behind trees and rocks where they then fired into the loyalists lines with well-aimed rifle fire. Ferguson's men relied on massed volley fire and bayonet charges; while the over-mountain men, using the cover available, were able to pick off Ferguson's men with their rifles. With Major Ferguson's bayonet charges beaten back, the patriots gradually tightened the circle (frontiersmen called encircling your enemy a "ring fight") around Ferguson's troops as they gave up ground.

The air was filled with the noise of guns, the screams of the wounded, and the smell of sulfuric smoke. As Colonel Shelby recalled, the "mountain was covered with flame and smoke and seemed to thunder." Seeking to escape, Major Ferguson attempted to break out but was cut down in a hail of bullets. Ferguson's second-in-command then surrendered. However, some of the patriots refused to recognize the white flag. They shouted "Tarleton's Quarter" (meaning no surrender accepted). Nevertheless, the patriot leaders were able to regain control of their men. The British defeat was complete with every loyalist killed (225), wounded (163), or captured (716). The patriot losses were much less-28 killed and 62 wounded.

After the battle, Kings Mountain was covered with the dead and wounded. Fearing the arrival of a British relief force, the patriots failed to properly bury the bodies. Wolves, vultures, and hogs soon descended upon the battlefield and unearthed many of the bodies from their shallow graves. On October 8, 1780, the patriot army withdrew with their wounded and their prisoners into North Carolina where it soon disbanded. The patriot victory won by the over-mountain men at Kings Mountain was one of the turning points of the American Revolution. The news of the patriot victory served to boost patriot spirits while depressing loyalists. It led General Cornwallis to withdraw from North Carolina to Winnsboro, South Carolina. This also bought time for General Greene to organize a new Southern offensive while Cornwallis remained on the defensive.

On the morning of September 26, the men gathered in companies, accompanied by their families for a religious service. The over-mountain men followed various paths that led them across the mountains and then to a rendezvous with destiny at a place known as Kings Mountain, South Carolina. Below is a chronology of this historic trip.

A Hard Road
[Compiled by Larry Greer]

1. **September 25, 1780** The over-mountain men muster (assembly of the militia) at Sycamore Shoals (Elizabethton, TN). So many wanted to go that the young and old men were assigned the duty of staying at home to protect the families of those who went.

2. **September 26, 1780** The first night they camped at Shelving Rock, near the present town of Roan Mountain. Here a council of war was held and plans made to cross the mountains.

3. **September 27, 1780** The second night they camped near the mouth of Bright's Branch where it entered Roaring Creek.

4. **September 28, 1780** That morning they followed a trail along Roaring Creek to Toe River; then they followed along the Toe River until they camped near the town of Spruce Pine, North Carolina, on the third night.

5. **September 29, 1780** The next morning, they moved up Grassy Creek to Gillespie's Gap (on the Blue Ridge). Their leaders decided to divide their force in order to meet the possible threat of British ambush. Colonel Campbell led his men through Turkey Cove, camping on the left side of Bald Mountain. Colonels Sevier and Shelby led their men through the North Cove of Catawba Creek and camped on the right side of Bald Mountain.

6. **September 30, 1780** The over-mountain men were reunited following the Catawba River until they camped at Quaker Meadows (Morganton, NC). Here additional men under Colonel Cleveland and Major Winston arrived.

7. **October 1, 1780** The over-mountain men traveled in a heavy rain and camped at South Mountain Gap. Due to continued rains, it was decided to remain at this camp through October 2. It was here that the officers chose Colonel William Campbell to be their commander. They believed that Major Ferguson was at Gilbert Town, NC.

8. **October 3, 1780** From South Gap the over-mountain men followed Cane Creek and camped at nightfall.

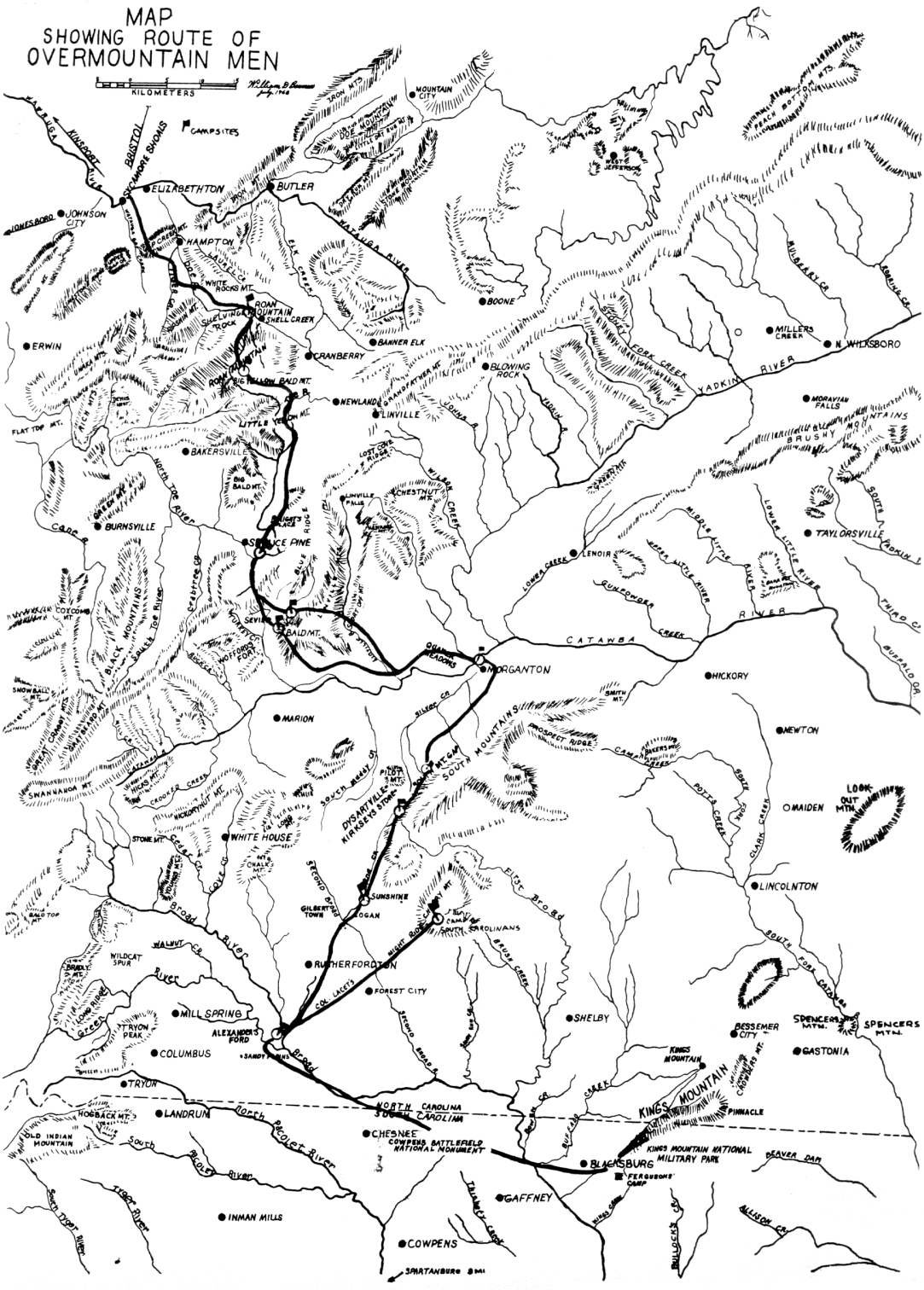
9. **October 4, 1780** They followed Cane Creek and camped near Gilbert Town and discovered that Ferguson had withdrawn heading south.

10. **October 5, 1780** Pursuing Ferguson south, the over-mountain men pushed forward until they reached Alexander's Ford (where the Green River flows into the Broad River). Here they selected their best riflemen and horses to pursue Ferguson.

11. **October 6, 1780** The over-mountain men reach the Cowpens. Here they were joined by South Carolinians under Colonels Williams, Hill, and Lacey. They learn that Ferguson is camped at Kings Mountain, some 30 miles away.

12. **October 7, 1780** After traveling in a pouring rain through the night, the over-mountain men arrive at Kings Mountain around noon on Saturday, October 7, 1780. Here they win a total victory over Ferguson and his loyalist troops.

Figure 7B-2: Route of Over-Mountain Men



Before leaving Sycamore Shoals, Colonel Sevier had asked the Reverend Samuel Doak to speak to the men. Following the early morning worship, the men started their march up Gap Creek with the battle cry, "The Sword of the Lord and Gideon."

Samuel Doak's Famous Sermon and Prayer
--At Sycamore Shoals Muster – September 1780--
[Compiled by Larry Greer]

"My countrymen, you are about to set out on an expedition which is full of hardships and dangers, but one in which the Almighty will attend you."

"The Mother Country has her hands upon you, these American Colonies, and takes that for which our fathers planted their homes in the wilderness - OUR LIBERTY."

"Taxation without representation and the quartering of soldiers in the homes of our people without their consent are evidence that the Crown of England would take from its American Subjects the last vestige of Freedom."

"Your brethren across the mountains are crying like Macedonia unto your help. God forbid that you shall refuse to hear and answer their call - but the call of your brethren is not all. The enemy is marching hither to destroy your homes."

"Brave men, you are not unacquainted with battle. Your hands have already been taught to war and your fingers to fight. You have wrested these beautiful valleys of the Holston and Watauga from the savage hand. Will you tarry now until the other enemy carries fire and sword to your very doors? No, it shall not be. Go forth then in the strength of your manhood to the aid of your brethren, the defense of your liberty and the protection of your homes. And may the God of Justice be with you and give you victory. Let us pray."

"Almighty gracious God! Thou hast been the refuge and strength of Thy people in all ages. In time of sorest need we have learned to come to Thee - our Rock and our Fortress. Thou knowest the dangers and snares that surround us on march and in battle."

"Thou knowest the dangers that constantly threaten the humble, but well beloved homes, which Thy servants have left behind them."

"O, in Thine infinite mercy, save us from the cruel hand of the savage, and of tyrant. Save the unprotected homes while fathers and husbands and sons are far away fighting for freedom and helping the oppressed."

"Thou, who promised to protect the sparrow in its flight, keep ceaseless watch, by day and by night, over our loved ones. The helpless woman and little children, we commit to Thy care. Thou wilt not forsake them in times of loneliness and anxiety and terror."

"O, God of Battle, arise in Thy might. Avenge the slaughter of Thy people. Confound those who plot for our destruction. Crown this mighty effort with victory, and smite those who exalt themselves against liberty and justice and truth."
"Help us as good soldiers to wield the SWORD OF THE LORD AND GIDEON."
"AMEN."

To the Inhabitants of North Carolina
--An address by Major Ferguson in Tryon County, NC – October 1, 1780--
[Compiled by Larry Greer]

Gentlemen:
Unless you wish to be cut up by an inundation of barbarians, who have begun by murdering an unarmed son before the aged father, and afterwards lopped off his arms, and who by their shocking cruelties and irregularities, give the best proof of their cowardice and want of discipline: I say, if you wish to be pinioned, robbed, and murdered, and see your wives and daughters, in four days, abused by dregs of mankind - in short, if you wish or deserve to live, and bear the name of men, grasp your arms in a moment and run to camp."

Mining and Environmental Restoration

The Kings Mountain Belt runs from the Catawba River in North Carolina, southwest through the Gaffney area of South Carolina. Its total length is approximately 50 miles. This geologically important region has been mined for iron, lithium, tin, kyanite, and barium, as well as more common earth resources such as limestone (marble) and granite (pegmatite).

The distinctive mineral wealth in the Kings Mountain area played a big part in the historical development of the region. When the Native American residents agreed to let settlers live in the Kings Mountain area, a floodgate was opened for people with iron mining knowledge, particularly ironworkers from the southeastern part of Pennsylvania. They applied what they knew to the local iron deposits that run the length of the Kings Mountain Belt. Mining began before the Revolutionary War and by 1800, Bessemer City and Lincolnton in North Carolina had become the top iron manufacturing centers in the region. By the time the Civil War started, the iron supply was large enough to contribute significantly to the Confederate war effort. Shortly after the war, the iron industry in the area plummeted due to the shallowness of the local ore deposits and the tremendous economic competition from larger, newly opened iron mines in the Lake Superior region.

The next resource to be exploited in Kings Mountain was marble. The marble belt was discovered to lie just northwest of the iron ore belt. At first, the marble was used as flux in the iron furnaces and to burn in kilns to produce lime. But in more recent years, much of the marble has been crushed, sorted, and sold for road gravel. In 2000, the two largest marble mining companies were Vulcan Materials and the Martin Marietta Company.

Today the most economically prominent resource in the area is lithium. Lithium minerals are obtained from a special type of granite (pegmatite) and the processed lithium ends up in a variety of products like greases, certain rubber products, hypochlorite gas for swimming pools, and additives that serve as catalysts for aluminum production. Other secondary mineral production in the area includes lead, pyrite, barite, kyanite, sillimanite, and some traces of silver and gold. Although mining was the primary attraction that brought many people to the area in earlier times, the modern economy of the Kings Mountain area is much more diversified, although mining still plays an important role. One major difference in modern mining operations is that mining companies now pay much greater attention to the restoration of inactive mining sites thereby preventing some of the environmental damage typically associated with this industry in times past.

Each year, dozens of people are injured or killed in recreational accidents at abandoned quarries. Most victims are young and went to the quarry to swim or ride an ATV. Swimming is a particularly dangerous activity because of steep drop-offs, dangerously cold water, and the presence underwater of sharp rocks, flooded mining equipment, submerged wire, and industrial waste. Rock climbing should also be avoided because rocks along the quarry wall may be unstable and break loose unexpectedly.

Case Study #1

--Vulcan Materials Blacksburg Quarry (just south of Grover, NC)—

The Campbell Limestone Company began to produce marble (the metamorphic form of limestone) at this site in 1954 and continued until 1978 at which point the mine was sold to Vulcan Materials Company, which immediately moved operations to a new site 1/2-mile away. Geologists found the new site by determining the orientation of the marble rock. Joining the two quarry sites proved impossible because landowners who were established on the intervening ground were not willing to sell their property. In the mid 1980's, because mining operations were once again nearing the property line of the neighboring landowners, Vulcan Materials began exploring other nearby properties looking for additional concentrations of high quality marble they could mine.

Most of the rock taken from active quarries today is crushed into various sizes of gravel although a small portion of the marble is still ground up for the production of agricultural lime. Large pieces of stone are sent through a series of crushers to achieve the desired size. The finer the material, the more expensive the product becomes. In 1997, the active mine removed 600,000 tons of rock, which is about 75 truckloads a day. About 15-20% of this material is unusable and ends up being dumped into nearby settling ponds. Eventually these ponds will be restored by filling them in with topsoil and seeding the area with native grasses.

Almost five years of research had to be performed before any digging and drilling could be started at the new site. After exploratory drilling revealed the location of the ore, the land was stripped of trees and excavation of the overburden (loose rock and soil) began. This material was placed away from the quarry to avoid any chance of it being eroded back into the active pit. To comply with current environmental standards, the overburden was seeded with grasses and small plants to help stabilize the ground.

During any surface mining operation, a number of potential hazards must be anticipated and dealt with. The danger of falling rocks is controlled by terracing the sides of the quarry and requiring hard hats to be worn by all personnel at all times on the site for personal protection. Possible flooding problems are controlled by pumps that remove any excess surface water or groundwater that may seep into the quarry. The hazards of road dust are controlled by frequent watering of roadways. Most quarries have a separate area for service and repair of heavy equipment and any large oil or gas containers in use on the site must have their own retention basins to contain any spills that might occur.

After the mine runs out of usable rock, the mine site must be restored to an environmentally stable condition, in harmony with surrounding properties. If the site is vacated completely, then all structures must be removed and any concrete left must be covered by at least 5 feet of topsoil. The slope going down to the mine edge has to have a maximum ratio of 3:1 with a shelf at the quarry edge. The whole property must be enclosed with fence and barbed wire if the quarry is to remain empty. The entire remediation plan must be designed and approved before any mining is allowed to take place. The original Campbell Quarry has already gone through this restoration process. The old mining pit has been filled in and is now a lake. The surrounding support areas have been seeded and planted with trees and other plants that are indigenous to the area. This restoration design blends in well with the normal landscape of the surrounding area, which contains lakes of its own.

Case Study #2

--Henry Knob Kyanite Mine (southeast of Kings Mountain)--

Henry Knob Mountain was once the highest point in all of York County, South Carolina. Composed mostly of hard quartzite rock, the mountain was much more resistant to erosion than the surrounding rock, which was composed of a metamorphosed mud rock called schist. However, the quartzite rock also contained an aluminum-rich mineral known as kyanite, and in 1935 some enterprising miners began carving up pieces of the mountain to extract and process this valuable mineral. Kyanite is a hard, bluish mineral that has a very high melting point. Its primary use is in the manufacture of ceramic items, such as spark plugs, which must withstand not only high operating temperatures, but sudden changes in temperature as well.

Kyanite production from the strip mine increased greatly from 1948 to its peak in the early 1960's. For the most of the decade of the 1960's, South Carolina was the second largest producer of kyanite in the entire country. But the supply of high-quality kyanite was exhausted rather quickly and by 1966 the no longer profitable mining operation shut down completely. By the time mining operations ceased, over 300 feet of the top of Henry Knob had been completely removed and the main excavation pit had cut almost all the way through the hill from one side to the other. Although the kyanite mineral itself is non-toxic, the refining process uses a highly acidic liquid, which was collected in open pits and left to seep into the groundwater system. The leftover rock waste, or tailings, was likewise dumped over large areas of the hillside. At the time of the closing of the mine, close to 2,000 acres of land had been turned into a dead zone with high levels of contamination all around.

In this case, the operators simply abandoned the site and left the area as it was. In most mine closing situations, the owners will either allow the open pit to fill with water and become a lake or they will fill the pit with trash and tailings and turn it into a landfill. But in the case of Henry Knob, nothing was done. Various buildings and parts of buildings were left standing, concrete and other foundation structures were left in place, unburied, and rock waste from screening ponds was left covering most of the perimeter of the site. Some of this material still washes into nearby streams every time it rains.

Fortunately, after decades of neglect, nature has begun to reclaim portions of Henry Knob. Vegetation is slowly starting to cover some of the tailing areas, but it will be a very long time before this corner of York County can again blend in harmoniously with the surrounding landscape.

Activity 7B-1: Transportation Corridor and Land Use

POWER THINKING EXERCISE - "Distressing Deer"

Encounters between deer and automobiles are becoming more frequent as human development encroaches upon woodland areas that had been prime deer habitat. The most frequent opportunities for deer strikes occur when deer follow waterways that are crossed by roads or where deer cross roads as they move from one watershed to another. Your job is to lessen the likelihood of a disastrous deer strike by predicting the movement patterns of the deer in your assigned area and making motorists aware of potential danger areas by installing "deer crossing" signs along the most dangerous sections of your highways.

A. Use a blue wipe-off pen to trace all of the streams and other waterways in the Southwest (lower-left) quadrant of MAP 7B: Kings Mountain. Also, trace these same streams on the Southwest quadrant of IMAGE 7B: KINGS MOUNTAIN.

B. Study the map and aerial photograph to identify locations where you think the deer problems are most likely to occur. On the topographic map, identify and mark with a dot [use a wipe-off pen] all of the places you think need to have a "Deer Crossing" sign installed along a highway.

C. Discuss with your group how many of these places really need signs. The Highway Department budget isn't big enough to put signs everywhere you might want to put them; in fact they have limited you to only ten signs in this whole area. Use a red wipe-off pen to place a big "X" at each of the ten sites along the roads that you selected, Be prepared to explain and defend your choices.

Materials
MAP 7B: KINGS MOUNTAIN BELT
IMAGE 7B: KINGS MOUNTAIN BELT
MAP 3E: POLITICAL SETTING
wipe-off pens
magnifying glass

PERFORMANCE TASKS

(Icon Key) Overview = ✈; Science = ☼; Math = 💻; History = 🕮; Language Arts = ✍

1. **Examine patterns of transportation routes. ✈**
   Kings Mountain lies along the most direct transportation route between the major metropolitan areas of Atlanta, GA, and Charlotte, NC. Refer to MAP 3E: POLITICAL SETTING to locate the cities of Atlanta and Charlotte. Use a wet-erase marker to trace the path of Interstate Highway 85 between these two cities and also trace with a different color marker the path of the Norfolk-Southern Railroad main line that follows approximately the same route. Using a wipe-off pen, mark with a red "X"

the approximate location along this route of the town of Kings Mountain, North Carolina. Which other major Southeastern cities lie along this same route?

More detailed highway and rail networks, as well as other types of transportation routes, can be shown on larger scale maps. Refer to the "Explanation of Topographic Map Symbols" in Chapter 2, or internet sources, to help you identify the following transportation-related features on MAP 7B: KINGS MOUNTAIN. Use a different color wipe-off pen to trace each route. Also, see how many of these features you can find on the aerial photograph on IMAGE 7B: KINGS MOUNTAIN. Also examine the inset aerial photograph of the mine site on IMAGE 7B to get a closer look at some of these features. Use a magnifying glass to get a really close look. Explain how you recognized each feature. In general, how can you recognize a utility corridor on an aerial photograph?

Interstate Highway 85
U.S. Highway Route 29
Southern Railroad Main Line
Underground Pipelines (usually natural gas or oil)
Electric Power Transmission Lines
Telephone Lines

Speculate about why all of these different transportation modes follow approximately the same route in the Kings Mountain area.

2. **Relate transportation routes to drainage patterns.** ☼
Examine MAP 7B: KINGS MOUTAIN and trace with a wipe-off pen all streams lying within two miles of either side of Interstate Highway 85. Use the map scale to determine distance. Which way (compass direction) do most streams north of I-85 flow? Which way (compass direction) do most streams south of I-85 flow? Note that both the highway and the railroad tend to follow a drainage divide. Why do you think transportation engineers prefer to locate roads and railroads along a drainage divide? Explain your answer.

3. **Compare grade of transportation right-of-ways.** 💻
The grade, or gradient (slope), of a transportation right-of-way is determined by the total change in elevation along a specified length or portion of the route divided by the horizontal distance traveled. For each mode listed in the first table below, examine MAP 7B: KINGS MOUNTAIN, to find the highest and lowest elevation along that route shown on the map, and calculate the total topographic relief (highest elevation - lowest elevation). Rank the items in terms of total relief. Which transportation mode is most level? Why do some transportation modes require a more level right-of-way?

For each transportation feature listed in the second table below, examine its route on MAP 7B and select a small section of that route that changes elevation fairly quickly. Mark with a wet-erase marker the highest and lowest points – just on that portion of the route - and calculate the gradient (slope) for only that portion.

Travel Mode	Highest Elevation	Lowest Elevation	Total Relief	Rank (flattest = 1)
I-85				
Southern RR				
Pipeline				
Electrical Powerline				

Travel Mode	Highest Local Elevation	Lowest Local Elevation	Total Local Relief	Horizontal Distance	Gradient (slope)
I-85					
Southern RR					
Pipeline					
Electrical Powerline					

4. **Note impact of Interstate Highway on commercial development.** 🕮
   On IMAGE 7B: KINGS MOUNTAIN, trace the route of U.S. Highway 29 with a wipe-off pen. With a different color marker, trace the route of Interstate Highway 85. Refer to MAP 7B: KINGS MOUNTAIN to get reference information. Note that U.S. 29 and I-85 meet and join in several places. Be sure you follow U.S. 29 all the way through the town of Kings Mountain.

   Examine the aerial photograph to determine the major land uses along each route. Which highway route goes through more small towns and commercially built-up areas? What effect do you think the opening of Interstate 85 might have had on traffic on U.S. Highway 29 and on the small businesses located along that road? Examine the aerial photograph, all along the route of I-85, to find areas where commercial development is starting to show up. What geographic situation appears common to most of those new businesses? Would you recommend commercial development in between two interchanges? What kind of business might do better today on U.S. 29? What kind of business might do better along Interstate 85? Explain your answers.

5. **Write cover letter and report recommending site for new factory.** ✍
   Your group represents a team of planning experts hired by a large manufacturing company, Grandco, Inc., that manufactures marble countertops for kitchens and bathrooms. The company wants to open a new factory in the Kings Mountain area in order to be as close as possible to its source of marble. Your task is to examine MAP 7B: KINGS MOUNTAIN and IMAGE 7B: KINGS MOUNTAIN to find the perfect parcel of land for Grandco, Inc. to build its new factory. This company uses lots of raw materials and ships its product all over the country, so it needs quick and easy access to both railroad and highway transportation. Mark your recommended site on MAP 7B with a wipe-off pen.

   After you have completed the site selection process, you must compose a report to the company explaining why you are recommending that location. The report should be

accompanied by a cover letter using proper format for a business letter. Be sure your report includes the following parts:

-description of the exact location in relation to local landmarks
-description of land surface of site, including current land use
-explanation of why this site is a good one for the factory (be persuasive)

ENRICHMENT

(Icon Key) Overview = ✈; Science = ☼; Math = 💻; History = 🕮; Language Arts = ✍

1. **Interview owners of small businesses along 'old road'.** ✍
   If your town is near an interstate highway, or any other limited access highway, write or telephone the owners of several small businesses that are located along the "old road" that used to be the main highway before the new interstate highway was built. Interview these store owners by asking them how the new highway has affected their business and how they handled the change.

2. **Investigate utility line placement in your home town.** ✈
   Contact your local utility company (electrical power, telephone, natural gas, etc.) to obtain maps or other information about the routing of utility corridors in your home town. If the maps are laminated, mark utility routes with different color wet-erase markers. Analyze the placement of these corridors and speculate about reasons for this placement.

Activity 7B-2: Kings Mountain Battlefield Site

POWER THINKING EXERCISE - "Time Transfer"

Modern maps and aerial photographs do not accurately represent landscapes of two hundred or even one hundred years ago, because so much has changed in the way of new roads and structures, and new and different land uses. To understand the true ground situation at the time of the Battle of Kings Mountain, you must visualize the landscape the way it looked back in 1780. Your task is to modify the regional air photo on IMAGE 7B: KINGS MOUNTAIN, to accurately represent the battlefield as it existed at the beginning of the Revolutionary War. Locate the boundary of the Kings Mountain National Military Park on the regional topographic map on MAP 7B: KINGS MOUNTAIN. Use a wipe-off pen to transfer this boundary line (be as accurate as possible), onto IMAGE 7B. On both the aerial photograph and the topographic map, identify and label all features, natural and man-made, which would NOT have been there in 1780. With this information in mind, speculate about - and then list - the reasons you think British Major Ferguson might have selected this part of Kings Mountain to set up camp with his troops. Based on the map and photo information, mark and label locations that you think his troops might have gotten food and water? Be prepared to share your opinions, labeled maps, and rationale in a brief class presentation.

Materials
MAP 3A, LANDSCAPES AND LANDFORMS
MAP 3F, CULTURAL SETTING
MAP 7B, KINGS MOUNTAIN BELT
IMAGE 7B, KINGS MOUNTAIN BELT
Figure 7B-1: "Battle of Kings Mountain"
Figure 7B-2: "Route of Over-Mountain Men"
Travel Log (page 7B-9): "A Hard Road"
Ferguson's Address (page 7B-11): "To the Inhabitants of North Carolina"
Doak's Address (page 7B-11): "Sermon and Prayer"
Newspaper Article (page 7B-1): "Evidence Indicates Blacks Fought at Kings Mountain"
Wipe-off Pens

PERFORMANCE TASKS

(Icon Key) Overview = ✈; Science = ☼; Math = 💻; History = 🕮; Language Arts = ✍

1. **Locate landscape features at battle site. ✈**
   Refer to Figure 7B-1 "Battle of Kings Mountain," to locate the positions of the British army and the American patriot forces at the beginning of the battle. Transfer all of this information to the "battleground inset map" in the upper left hand corner of MAP 7B: KINGS MOUNTAIN, using a wipe-off pen. Then use a different color marker to mark the final troop positions at the end of the battle. Note that the "Highest Point" marked on Figure 7B-1 is at the same location as the Centennial Monument on the inset map and that the "Surrender Site" in the Figure is now marked by the U.S. Monument.

Study the topography of Kings Mountain (refer to patterns of contour lines on the inset map), and list several landform-related obstacles that you think the American patriots had to overcome to reach the British forces. Identify the most significant way you think landscape features influenced the result of the battle. Where do you think Ferguson was trying to lead his troops just before the British had to surrender?

2. **Compare slope differences for regiments of Patriot forces.** ☼

American patriot forces approached the British position on Kings Mountain from all sides. Use the information in figure 7B-1 "Battle of Kings Mountain" to determine the exact location and movement of each regiment of patriot troops up the slope of Kings Mountain. Each class group should select a different Patriot Commander from the list below and mark on the "Battleground Inset Map" on MAP 7B: KINGS MOUNTAN with a wipe-off pen the approach route of that regiment to the top of the mountain. Then calculate the slope of the hillside that your assigned set of troops had to climb. Compare your results with the results of other groups and decide which regiment you think had the hardest time climbing the mountain. Explain how the pattern of contour lines on the map can give clues about the steepness of the slope.

Group A - Chronicle	Group E - Shelby
Group B - McDowell	Group F - Williams
Group C - Campbell	Group G - Cleveland-Lacy-Hawthorne
Group D - Sevier	Group H - Winston

Locate on the "Battleground Inset Map" of MAP 7B (mark location with a wipe-off pen) the positions of the two springs that are indicated on Figure 7B-1 "Battle of Kings Mountain". Which set(s) of troops would have most likely encountered the springs in their attack on the mountain? Propose a geologic explanation about why you think the springs occur where they do. Share your hypothesis with other groups and evaluate how well each explanation fits the local geologic setting.

3. **Determine rate of travel of "over-mountain" men.** 💻

Use figure 7B-2, "Route of Over-Mountain Men" and the information contained in the travel log, "A Hard Road," on page 7B-9,10 to trace the route of the over-mountain men from Elizabethtown, Tennessee to Kings Mountain, South Carolina. Locate and mark each daily campsite location of the American patriot army. Using the map scale, determine the travel distance between each encampment. Assume that the patriot army was able to march for 10 hours each day. Use the travel distance and time information to calculate an average rate of travel for each day. Set up a data table that pairs travel rate versus day number and then construct a line graph that illustrates this relationship. What was the average rate of travel for the period covered in the chronology? What landscape factors may have caused the over-mountain men to exceed or fail to achieve this average rate of travel on any given day?

Also trace this route as best you can on MAP 3A: LANDSCAPES AND LANDFORMS. Identify several landscape related obstacles that you think might have created travel difficulties for the troops. What landform features do you think might have led the over-mountain men to choose the route they did? Contrast the way they crossed those obstacles in 1780 versus the way we would cross them today.

4. **Explain significance of Blacks fighting for the patriot militia.** 🕮
Read the newspaper article on page 7B-1, "Evidence indicates that blacks fought at Kings Mountain." Explain why you think the publisher thought this story would be of interest to newspaper readers. Based on your reading of this article, do you think that free Blacks were treated any differently than Black servants by the militia? Use references from the newspaper article to back up your answer.

List all of the places mentioned in the newspaper article that Andrew Ferguson visited after he escaped from the British Navy at Charleston. Locate as many of these places as you can on MAP 3F: CULTURAL HERITAGE. In your opinion, did Andrew Ferguson join the militia voluntarily? Explain your answer.

5. **Evaluate effects of speeches on public opinion.** ✍
Read both Major Ferguson's address "To the inhabitants of North Carolina" and Reverend Samuel Doak's "Sermon and Prayer" at the Sycamore Shoals muster site on page 7B-12. Most of the settlers who received Ferguson's threatening letter lived in the valleys of the Broad, Catawba, and Yadkin rivers. Most of the militia inspired by Reverend Doak came from settlements along the Holston and Watauga rivers. Use Figure 7B-2 on page 7B-11 and MAP 3A: LANDSCAPES AND LANDFORMS to locate these river valleys.

Why do you think Ferguson's words were so persuasive to the Loyalists? Why do you think Doak's words were so persuasive to the Patriots? Why do you think Ferguson's words upset the Patriots so much? Why do you think Doak's words upset the Loyalists? What phrases or word choices were particularly helpful to each author in communicating the intended message to their targeted audience. Pick one example from each author and explain the emotional impact of the text on the listener. Speculate about how you think the words of each author reached the ears of the opposite side? As word was passed along, what changes or additions do you think might have been made to the text? Rewrite both of these persuasive arguments in modern day language so that your classmates can understand the references better. (A dictionary and thesaurus might be helpful.)

ENRICHMENT

(Icon Key) Overview = ✈; Science = ☼; Math = 💻; History = 🕮; Language Arts = ✍

1. **Research careers of Kings Mountain commanders.** 🕮
   Use the background information on pages 7B-7,8 and Figure 7B-1, "The Battle of Kings Mountain" to identify the patriot and loyalist commanders at Kings Mountain. Choose one of these commanders to research. Give a detailed account of their contributions before, during, and after the battle. Locate on MAP 3A: LANDSCAPES AND LANDFORMS the general area that your chosen commander came from. List any places in the Southeast (rivers, towns, mountains, counties, etc.) that have been named for them.

2. **Write obituary for Major Ferguson.** ✍
   Locate on figure 7B -1 "Battle of Kings Mountain" the spot where British Major Patrick Ferguson was wounded and mark this location on the battleground map inset on MAP 7B: KINGS MOUNTAIN with a wipe-off pen. Also find and mark the location of his grave. Pay close attention to the landscape features at each of these two sites.

   Obituaries are short tributes, usually printed in newspapers, written about famous people who die. Write an obituary for Major Ferguson, being sure to include references to landscape features at the spot he was wounded and at the spot he was eventually buried. Some groups should write his obituary from the British loyalist point of view, other groups should write from an American patriot perspective. Take turns reading the obituaries to the class and discuss the different "spin" put on this event by the different sides.

Activity 7B-3: Mining and Environmental Restoration

POWER THINKING EXERCISE - "Noisy Neighbors"

Strip mines usually require a lot of land and frequently use dynamite and heavy earth moving and rock cutting equipment. Very few people want to live next to mining sites, but this type of industry is an important asset to the community because it provides jobs and supports the local economy.

Select the quarry shown on the inset aerial photograph on IMAGE 7B: KINGS MOUNTAIN and also select at least two other quarries that appear on the larger aerial photograph. Be sure to doublecheck the locations of your selected quarries on the topographic map on MAP 7B: KINGS MOUNTAIN to be certain you selected an actual quarry and not some other feature. [Note: the quarry featured on the inset photo is not shown on the topographic map but is located just south of Interstate 85 at Exit # 4.]

Make a checklist of all land uses that occur around the boundaries of each of your selected quarries. Use the following land-use categories for your checklist: agriculture, forest, residential, commercial, highway, and railroad. Rank these categories in order from most abundant to least abundant for each mine site and compare your ranking with lists from other groups.

Discuss in your group how compatible or incompatible each land-use category would be alongside an active strip mine. How well does your ranked list agree with your compatibility data. How much further can each of your selected strip mines expand before it runs out of available room? Mark these potential expanded boundaries on the aerial photographs on IMAGE 7B: KINGS MOUNTAIN with a wipe-off pen. What factors do you think ultimately determine the maximum size limit of a strip mine? What do you predict will happen to the mining property after all available land has been completely mined out?

Materials
MAP 3B, GEOLOGICAL SETTING
MAP 3E, POLITICAL SETTING
MAP 7B, KINGS MOUNTAIN BELT
IMAGE 7B, KINGS MOUNTAIN BELT
Case Study #1 (page 7B-13): "Vulcan Materials"
Case Study #2 (page 7B-14): "Henry Knob"
Wipe-off Pens

PERFORMANCE TASKS

(Icon Key) Overview = ✈; Science = ☼; Math = 💻; History = 🕮; Language Arts = ✍

1. **Analyze pattern of strip mine locations. ✈**
   Locate and circle with a wet-erase marker all of the strip mine sites you can find on the large topographic map on MAP 7B: KINGS MOUNTAIN. What map features are common to all of these mines? Briefly describe how to quickly recognize a strip mine on a topographic map. Are these mines randomly distributed throughout the area, or do you see a particular pattern to their occurrence? Explain your answer.

2. **Document environmental problems at Henry Knob.** ☼
   Locate Henry Knob Mountain in the lower right hand corner of both the large topographic map on MAP 7B: KINGS MOUNTAIN and the large aerial photograph on IMAGE 7B: KINGS MOUNTAIN. Read through Case Study #2 on page 7B-14 and identify features on both the map and the photo that correspond to the events described in the case study. Notice the different dates shown in the margins of the photo and the topographic map. How many years passed between the time the map was published and the time the photo was taken? Compare the map and the photo to document the changes that have occurred to the industrial waste ponds shown on the topographic map during this time. Also document the changes in local forest cover that have occurred during that same time interval? Predict one additional change to the mine site that you would expect to be visible on a photo taken in the future ten years from now.

3. **Predict size of smallest detectible object.** 💻
   The infrared aerial photo inset of the mine site that is printed on IMAGE 7B: KINGS MOUNTAIN has been enlarged significantly from the original photograph. With this amount of magnification you can see cars and trucks on the interstate highway as well as individual houses and other buildings along the sides of the secondary roads. However you cannot see or identify individual people or animals (cows, horses, etc.). Based on your knowledge of typical dimensions of cars, houses, and other features you can see, use the principles of ratio and proportion to predict the size of the smallest object that you will be able to detect on the inset photo. Now look at the main photo on IMAGE 7B. Predict the size of the smallest object that would be detectable on that image. Estimate the scale factor difference between the two photographs.

4. **Examine changes through time at strip mine site.** 🕮
   Note that the strip mine site on the infrared aerial photo inset on IMAGE 7B: KINGS MOUNTAIN looks a little different in shape and size from the same feature on the main photo. The inset photo was taken in 1994, while the main photo was taken in 1984. The large topographic map on MAP 7B: KINGS MOUNTAIN, dated 1971, does not show the strip mine site at all. Read through Case Study #1 on page 7B-13 and identify features on each of the photos that correspond to events described in the case study. List specific items or features on the topographic map that were moved or destroyed when the strip mine was first constructed. Pay special attention to changes in stream drainage in the area.

5. **Write a letter describing environmental impacts of strip mines.** ✍
   A friend of yours has two cousins, named Mickey and Misha, who have lived in the Kings Mountain region for many years. Mickey lives by Mill Creek just below the original Campbell strip mine described in Case Study #1 on page 7B-13. Misha lives by a small tributary of South Fork Crowders Creek just below the Henry Knob mine site described in Case Study #2 on page 7B-14. Locate both of these places on the large topographic map on MAP 7B: KINGS MOUNTAIN.

Your friend knows that you are working on a written report about the environmental impacts of strip mining that is due soon and suggests you contact Mickey and Misha to ask for some first hand accounts about the effects of mining. Your friend warns you that Misha is always complaining about the polluted conditions in the stream behind her house because the Henry Knob mine site was never properly cleaned up and restored, while Mickey is always bragging about the clean water and green fields in back of his house because the former marble quarry was reclaimed properly. You decide that contacting your friend's cousins is a good idea that will help you get a good grade on your report, so you e-mail each of them asking for some details about how the neighboring mine sites have impacted them personally.

Your group will be assigned to compose one reply from either Mickey or Misha. Because your reply will be included in a school report, you should use complete sentences and proofread your text to make sure you are using correct grammar and spelling. Be sure that your responses reflect the opinions of the cousin doing the writing and try to use a lot of adjectives to describe your living conditions in a more interesting style. Refer back to the two case studies on pages 7B-13 and 7B-14 if you need additional information.

ENRICHMENT

(Icon Key) Overview = ✈; Science = ☼; Math = 💻; History = 🕮; Language Arts = ✍

1. **Research mining company efforts to help the environment.** 🕮
   Write to a local or national mining company or trade association that operates strip mines in the Southeastern United States and ask them to describe their procedures for reclaiming used land that is no longer being actively mined. Also ask what specific mineral or rock resources they are mining, what these minerals or rocks are used for, and how the company minimize the effects of water, soil, and air pollution during the mining operation. Ask the company to describe some of the environmental problems associated with their specific mining operation and how they are solving these problems. Locate at least one quarry operated by that mining company and mark its location as closely as you can on MAP 3E: POLITICAL SETTING.

2. **Design and create poster about specific mineral resource.** ☼
   Read through the list of minerals mined in the Kings Mountain Belt and choose one that interests you. After you discover what rock type is associated with that resource, identify other likely regions where that resource might be found by marking probable locations on MAP 3B: GEOLOGICAL SETTING with a wipe-off pen. Research how that resource was formed and what it is used for today. Also look up information on how the resource is usually mined and how it is processed into final products. Share this information with the rest of the class by making a poster or an electronic slideshow.

COLUMBUS LEDGER-ENQUIRER

April 10, 1995

Visit to a Favorite Spot on Pine Mountain

By Richard Hyatt

Reporters were following Franklin D. Roosevelt but the pace was slow. Five days before, he had rushed them into the Little White House for a quick press conference. Since then, the newsmen had been relaxing, but this morning Merriman Smith rented a horse and was riding a dusty mountain trail.

It was a nasty horse and the reporter was keeping a tight rein on him. Around the curve came a familiar Ford automobile, spooking the unsuspecting horse. Smith pulled on the reins and let Roosevelt pass.

Roosevelt turned to speak, his voice wonderful and resonant. He did not sound like the tired old man that had slumped in his wheel chair when they got there.

While they were in slow-moving Meriwether County, the world was moving at a faster pace. The Nazis were on the run and were burning towns as they retreated. That afternoon at the Little White house, FDR called four Secret Service men and asked them to go for a little ride. He didn't say where.

They went to the top of Pine Mountain to a spot called Dowdell's Knob. From there, it seemed like you could see the whole world.

"Leave me alone here," Roosevelt told the agents. "Come back when I signal." Such requests were normal for those who worked around Roosevelt, so they left him alone at the overview and walked down the road and made themselves comfortable on a rock.

This was his favorite spot on the mountain. He had brought friends there for so many years. There had been much laughter. This spring afternoon there was only peace and quiet.

The agents had smoked several cigarettes when they heard the honking of the horn. Climbing up the hill, they got back into the car and started the winding trip back to Warm Springs.

Nothing was said about what he saw. Nothing could have told them that this would be his final look at the land he loved so much.

RATIONALE

Pine Mountain is a forested ridge in west-central Georgia located 70 miles (113 km) southwest of Atlanta and 20 miles (32 km) north of Columbus. The ridge stretches between the Chattahoochee and the Flint rivers and is both a topographically and geologically unique feature. The mountain displays several geologic structures that help answer the question "Why are there mountains here?" The area also has a human history that spans important parts of both the nineteenth and twentieth centuries. The site is strongly connected to the life and politics of President Franklin D. Roosevelt, as the Warm Springs resort served both as health spa for the President and as a rural retreat from the stresses inherent in political leadership. Roosevelt spent so much time at Warm Springs that it eventually became known as the "Little White House." The Pine Mountain region also features several depression-era farms that participated in the Federal Pine Mountain Valley Rural Community Project. The town of Pine Mountain also offers the botanical wonders of Callaway Gardens.

PERFORMANCE OBJECTIVES

1. Locate specific sites and landscape features on different types of map products.
2. Examine placement of Pine Mountain Valley Rural Community.
3. Demonstrate ability to read and interpret geologic maps.
4. Document effectiveness of soil conservation techniques on farmland.
5. Construct pie chart graphs to visualize percentage change in land cover.
6. Determine bearings and distance of landmarks from a central point.
7. Identify changes in land use and explain reasons for change.
8. Explain how connections to President F. D. Roosevelt changed Warm Springs.
9. Practice proper form for writing a personal letter.
10. Explain origins of words and place names related to geography.

SAMPLE ASSESSMENT RUBRICS

EXAMPLE #1 (relates to Performance Objective #3)

Give students a copy of the Geologic Map of Harris County (on MAP 7C) and ask them the following three questions: "What rock type underlines Pine Mountain?" [*Hollis quartzite*]; "How can you tell from the map when a rock unit has been folded?" [*rock outcrop pattern curves or is repeated in a parallel ridge nearby*]; "How can you tell the angle at which a rock unit is dipping into the ground?" [*the wider the outcrop pattern, the closer to horizontal; the narrower the outcrop pattern, the closer to vertical*].

A (level 4) – All three answers are correct.
B (level 3) – Only two answers are correct.
C (level 2) – Only one answer is correct.
D (level 1) – No answers correct, but answers show some comprehension of map.
F (level 0) – No answers correct, and answers show little or no comprehension.

EXAMPLE #2 (relates to Performance Objective #8)

Ask students to list three changes that happened in or near the town of Warm Springs, Georgia after President Franklin D. Roosevelt started visiting the area. [possible answers include but are not limited to: *name of town was changed, Little White House was built, FDR Foundation was founded; medical visitation to springs increased greatly, tourism increased, State Park was established on Pine Mountain*]

. A (level 4) – All three answers are correct.
B (level 3) – Only two answers are correct.
C (level 2) – Only one answer is correct.
D (level 1) – No answers correct, but answers show some comprehension of topic.
F (level 0) – No answers correct, and answers show little or no comprehension.

Cartographic Product Information

MAP 7C: Pine Mountain Belt

TITLE: Pine Mountain, GA (topographic map)
DATA SOURCE: Thomaston and Opelika USGS 1:100,000 Quadrangles
DATE: 1981 (Thomaston) and 1982 (Opelika)
SCALE: 1:100,000 [1 inch ~ 1.6 miles] [1 cm = 1 kilometers]
OTHER IMPORTANT DATA:
- The contour interval is 5 meters.
- Note that all contour lines are in metric units; unusual for topographic maps.
- Shaded yellow regions represent outcrops of Hollis Quartzite rock.
  Thick black lines border the yellow shaded areas on both sides.
- Some contour lines in the left half of the map are faint or indistinct.

POINTS OF SPECIAL INTEREST:
- Pine Mountain and Oak Mountain show up clearly running west to east.
- Lake Harding (Chattahoochee River) runs north to south along left edge of map.
- Flint River runs north to south along right edge of map.
- Franklin D. Roosevelt State Park is located in the top center of the map.
- Callaway Gardens is just a few miles west of Franklin D. Roosevelt State Park.
- Town of Warm Springs is about ten miles east of F.D. Roosevelt State Park.
- Lake Florence is one mile north of Pine Mountain in the top-left center of map.

OTHER FEATURES TO LOOK FOR:
- Dowdell Knob (highest point on Pine Mountain) is located about six miles southwest of the town of Warm Springs.

TITLE: Geologic Map of Harris County, GA
DATA SOURCE: Georgia Geological Survey Archives, R.D. Bentley
DATE: 1968
SCALE: 1:66,000 [1 inch ~ 1.05 miles] [1 cm ~ .66 kilometers]
OTHER IMPORTANT DATA:
- There are many different kinds of black lines present on this map:
  solid single lines are streams solid double lines are roads
  various short-dashed lines are utility lines, pipelines, or powerlines
  some contour lines are shown on Pine Mountain near F.D.R. State Park
  long-dashed lines ——— ——— are boundaries of geologic rock units
  all hand-written text refers to rock unit identifications

POINTS OF SPECIAL INTEREST:
- Dowdell Knob (highest point on Pine Mountain) is located in the far upper-right corner of the map just east of Franklin D. Roosevelt State Park.
- Martin's Knob Lookout Tower is on Oak Mountain; four miles east of Hamilton.
- Callaway Gardens is located just west of Franklin D. Roosevelt State Park.

OTHER FEATURES TO LOOK FOR:
- Note that most geologic rock units run approximately parallel to each other in an east-west direction, although in a few places the rock outcrops look folded.

IMAGE 7C: Pine Mountain Belt

TITLE: Pine Mountain, GA (SLAR [radar])
DATA SOURCE: Phenix City USGS 1:250,000 Radar Mosaic
DATE: 1992
SCALE: 1:100,000 [1 inch ~ 1.6 miles] [1 cm = 1 kilometer]
OTHER IMPORTANT DATA:
- Rivers & lakes show up black because radar beam is deflected away from sensor.
- Black areas along ridgelines are shadows cast by mountains blocking radar beam.

POINTS OF SPECIAL INTEREST:
- Ridges of Pine Mountain and Oak Mountain show up clearly running east-west.
- Lake Harding (Chattahoochee River) and path of Flint River show up clearly.

OTHER FEATURES TO LOOK FOR:
- Interstate Highway 185 is visible in lower section of image.

TITLE: Pine Mountain, GA (NALC [satellite])
DATA SOURCE: EPA & USGS NALC Pathfinder WRS2 Path 19 Row 37
DATE: 1991
SCALE: approximately 1:175,000 [1 inch ~ 2.75 miles] [1 cm ~ 1.6 kilometers]
OTHER IMPORTANT DATA:
- This image is a false-color infrared image, so all true colors have been shifted.
- This is a summer image, with leaves on trees, so forested areas look red.

POINTS OF SPECIAL INTEREST:
- Ridges of Pine Mountain and Oak Mountain show up clearly running east-west.
- Lake Harding (Chattahoochee River) and path of Flint River show up clearly.

OTHER FEATURES TO LOOK FOR:
- Interstate Highway 185 is visible in lower section of image.

TITLE: Lake Florence, GA (topographic map)
DATA SOURCE: Pine Mountain USGS 1:24,000 Quadrangle
DATE: 1964 (photorevised 1985)
SCALE: 1:5,000 [1 inch ~ 415 feet] [1 cm ~ 50 meters]
OTHER IMPORTANT DATA:
- The contour interval of this map is 20 feet.

TITLE: Lake Florence, GA (Black and white aerial photographs)
DATA SOURCE: U. of Georgia Air Photo Archives B&W Photo ATX 41-83; 4FF-126
DATE: 1938 and 1964
SCALE: 1:5,000 [1 inch ~ 415 feet] [1 cm ~ 50 meters]
OTHER IMPORTANT DATA:
- Note the very different land use and land cover surrounding Lake Florence.
- Note the location of the dam at the north end of Lake Florence.

Geography and Geology of Pine Mountain

The Appalachian Piedmont landscape typically consists of rolling hills and generally low relief. A prominent exception to this pattern is seen in the Pine Mountain Belt, which forms a distinctive topographic break between the Inner Piedmont Belt and the Uchee Belt. Pine Mountain consists of a distinct series of ridges stretching from east of the Flint River in central Georgia to Auburn, Alabama. As the Chattahoochee River is approached, Pine Mountain breaks up into a series of discontinuous ridges and hills that continue into Alabama and finally disappear beneath the Coastal Plain west of Auburn. A second less pronounced ridge called Oak Mountain runs parallel to Pine Mountain along most of its eastern exposure.

Differential weathering and erosion of rocks of distinctly different character produced the ridges of Pine and Oak Mountains. There are four main rock units exposed in this area: the Cunningham granite, the Sparks schist, the Hollis quartzite and the Manchester schist. Of these the Hollis quartzite is most resistant to weathering and erosion. Wherever the Hollis is present at or near the surface, a hill or ridge has formed. Wherever the other units are exposed, weathering and erosion have been more effective at lowering the level of the land.

Except for the Cunningham granite-gneiss, the other three units are all meta-sedimentary rocks. This means that they were another kind of rock first and were later changed by geologic processes into the rocks we see today. The Sparks and Manchester schists were once mudstone or shale, while the Hollis quartzite was once quartz sandstone. These original sediments were deposited a long time ago as extensive sheets or layers on top of the Cunningham granite, a rock unit that was then exposed along the granitic edge of the original North American continent. Following deposition, these layers were involved in several tectonic episodes associated with mountain building in the Appalachian region. During this process, they became so deeply buried that they were changed by the high heat and pressure into the rocks we see today. The granite was also changed into another type of metamorphic rock called gneiss. Long periods of slow uplift, weathering, and erosion followed, stripping away enough overlying material to expose all of these older rocks at the surface.

An especially interesting area of erosion is seen where the Flint River cuts through the east end of Pine Mountain. Here a broad expanse of the Hollis quartzite is breached revealing the underlying Cunningham gneiss. Subsequent differential erosion has generated a circular outcrop pattern producing the valley called The Cove. Another strange outcrop pattern occurs on Pine Mountain just east of Lake Harding. In addition to being metamorphosed, these layers were also faulted and folded by tectonic forces. In this area, part of the curved section of the fold has been eroded away, leaving the two sides of the fold exposed at the surface separately in a roughly parallel outcrop pattern.

Figure 7C-1: Outcrop Pattern of Folded Hollis Quartzite

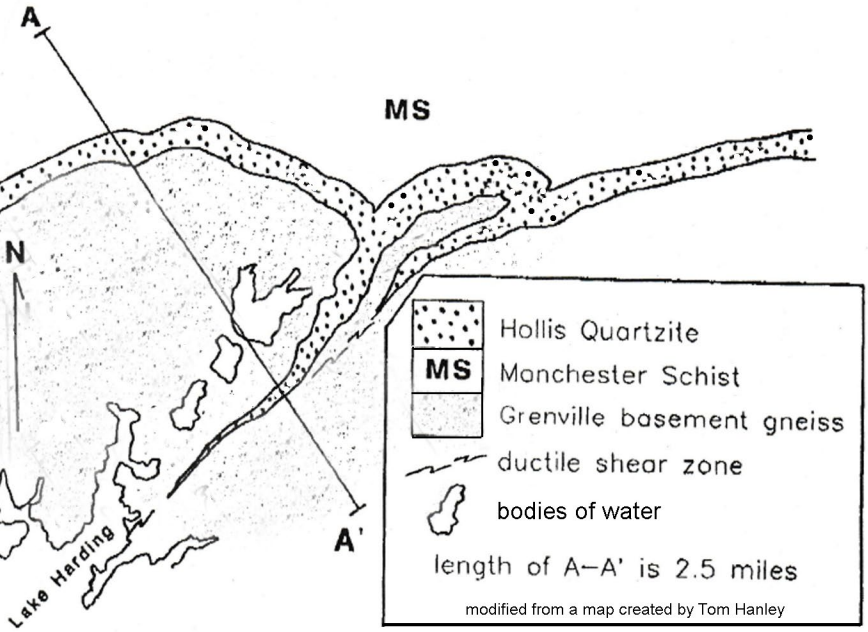
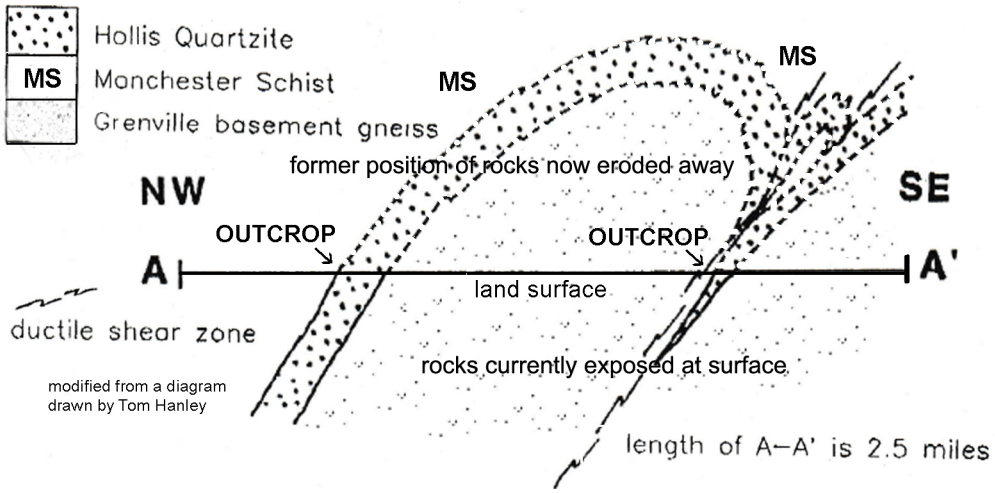


Figure 7C-2: Cross-Section through Folded Hollis Quartzite



If the Hollis quartzite were not folded or faulted, the outcrop pattern would appear as a simple linear band, with about the same width everywhere. But because of the tectonic deformation, the quartzite intersects the surface at different angles at different locations and the ridges formed by the quartzite are wider in some places than others and are not always continuous. Gaps in the mountain form whenever the quartzite unit has been completely eroded away, exposing the weaker underlying rocks. Multiple parallel ridges (such as Pine Mountain and Oak Mountain) can occur whenever a folded section of the quartzite has been partially uplifted above the surface and the curved section along the fold axis has subsequently been eroded away. The schists are the weakest rocks, being composed primarily of feldspar, mica, and quartz. Gneisses have intermediate resistance, being composed primarily of feldspar, quartz, and hornblende amphibole.

History and President Roosevelt

Native Americans occupied the Chattahoochee and Flint River valleys for thousands of years before Europeans entered the region. The most recent Native American residents, the Creeks, shared the area during the 18th Century with Europeans until they were forced to leave in the early 1800's by the Treaty of Indian Springs (1825). Agriculture, both crops and cattle, dominated the area until fairly recently and still forms a very significant part of the region's economy. Small communities such as Chipley (now called Pine Mountain), Hamilton, and Bullochville (now called Warm Springs) grew up to serve the agricultural industry. Small grain mills and manufacturing facilities took advantage of the local availability of water power. By the early 20th Century a significant part of the area had been cleared for farming. By the mid-20th Century, however, much of the cleared land was re-planted with pine for the timber industry.

The Callaway Family became major landowners in the western part of the Pine Mountain area in the early part of the 20th Century. They had founded Manchester as a cotton mill town and later replanted a large acreage of farmland in pines and dedicated a significant portion of the land they replanted to re-establishing native animal and plant communities, recreation and education. Callaway Gardens was established in 1952 to carry out these goals in a resort setting that has become a prime tourist attraction in the region. Mr. Cason Callaway was a friend of Franklin Delano Roosevelt, known to most Americans as FDR.

Warm Springs was originally named Bullochville and had been a place that people had visited for years convinced that the naturally heated water (88°F [31°C]) had curative powers. Native Americans had brought their wounded warriors here and wealthy Georgia residents had built fancy summer retreats. However, the town is best known for being the site of the 'Little White House', where President Roosevelt spent his happiest times with those who loved him the most. Warm Springs was also the place of Roosevelt's death in 1945. The town has constructed two museums that chronicle FDR's life in Georgia. The FDR State Park was established alongside and to the north of Pine Mountain just east of Callaway Gardens. A scenic highway, the 23-mile long Pine Mountain Trail, winds its way back and forth across and along Pine Mountain from U.S. Highway Alt. 27 north of Hamilton to the radio tower south of Warm Springs.

Franklin Roosevelt first came to Warm Springs in 1924, while he was governor of New York, and stayed in a cottage owned by William Hart of Columbus. Roosevelt recounted later that he didn't sleep much that night because of the "squirrels running across the roof." He stayed there two weeks and later returned for an extended stay. When he found that the soothing waters brought back a measure of strength to his legs, and helped him overcome some of the effects of the polio that he had contracted several years earlier, Roosevelt bought the entire property for $200,000 and in 1927 established the Warm Springs Foundation. Within days, crippled children and adults began arriving. Local youth were hired as 'push boys', whose job it was to push wheelchair patients to treatment or therapy. From the start, Roosevelt made it known that Warm Springs was as much his home as Hyde Park in New York, or Washington. He built his cottage there in

1932, the same year he was elected president. The cottage was fairly modest, consisting of one story and only six rooms, but had a sundeck that overlooked a heavily wooded ravine. He often threw parties for local residents and had a habit of frequenting The Cove, a secluded spot along the Flint River where moonshine flowed like water. Residents of The Cove were dirt poor, common people that did not have electricity or telephones. Historians surmise that Roosevelt's association with these rural residents helped shape many of the New Deal programs he introduced later in his presidency.

Depression Era Farms and Land Use Changes

By 1935, the United States was in the depths of the Great Depression that had started in 1929. During his presidency, Franklin D. Roosevelt addressed those difficult times with an unprecedented degree of direct federal intervention in the economy and in the greater society. Reforestation and soil conservation programs, started by the New Deal in the 1930's, permanently changed the appearance of forests and farmlands in the Piedmont. The Federal Soil Conservation Service (FSCS) was established in 1935. This government agency provided technical assistance to farmers in terracing, strip cropping, crop rotation, pond construction, and the planting of legumes such as soybeans and kudzu. In addition, the Agricultural Stabilization and Conservation Service (ASCS) administered a variety of separate federal subsidy programs. It also encouraged farmers to practice better farming methods and allowed them to reduce agricultural output in return for government benefits. As farming declined and farmland was abandoned, especially after 1950, a succession of vegetational changes began to occur on this land. The natural biologic succession progressed through various stages from cleared land, to pine forest, and eventually to a mature climax oak-hickory forest.

An important discovery was made by Dr. Charles Herty, a Georgia chemist, in 1930, that had a major impact upon Piedmont forestry. Dr. Herty invented a method for making paper from loblolly pine, the most common pine tree growing in the Piedmont. The promise of profits from growing pines encouraged farmers to plant their worn-out cotton lands in pine seedlings. The planting of loblolly pines has helped to fight soil erosion in the Piedmont and led to a major reforestation of the region. These pines continue to be planted by forestry companies, state forestry officials, and private landowners, so that today it has become the most common tree in the Piedmont.

While Roosevelt was President, the Pine Mountain Valley Rural Community Project (PMVRCP) was established east of the town of Hamilton to help lure laborers back to the land from the cities. The purpose of the project was to develop a prosperous rural-industrial community that would enable Georgia's displaced city workers (mostly from Macon, LaGrange, and Atlanta) to be rehabilitated to a life of subsistence farming and part-time industrial employment. The community occupied approximately 12,870 acres (5,208 hectares) and was laid out on the land of an old plantation. It encompassed an area between Oak and Pine Mountains about five miles west of Shiloh, to two miles east of Hamilton. Lots ranged from 1.5 to 60 acres (.6 to 24 hectares). Smaller lots were clustered near a community headquarters. Occupants of these lots were expected to farm for their own consumption and work at small industries that would be set up in the valley.

Larger lots were sited farther away from headquarters. These were meant to supply more distant markets as well as provide local small industries with raw materials.

The Rural Rehabilitation Program in Washington set specific qualifications for participation in the program. Participants had to be city dwellers who had lost their jobs due to the disastrous economy and who had an above average education. They also had to be white, relatively youthful, healthy, and from a middle class background with farming experience or be able to demonstrate adaptability to farming. Heads of families of settlers started arriving in the spring of 1935. Supervised by the Works Progress Administration (WPA), they built 210 houses, each with an adjacent barn or storage unit. The settlers were paid for this labor and purchased the houses with government loans.

The project was eventually incorporated as the Valley Corporation. After a rocky start, the corporation became efficient under the leadership of Tap Bennett. He specified farming techniques and established modern, successful dairy and poultry (egg) operations. Their main markets were Columbus, the Fort Benning military base, and Atlanta. Wheat and oats produced by the program supported the dairy and poultry operations. The corporation built its own electrical generating facility that not only met its own needs, but also produced revenue by selling excess electricity generated on site to the Georgia Power Company and other distributors. Highly productive springs from Pine Mountain provided abundant water for a community water system.

Though the Valley Corporation was doing a little better than breaking even, it was also carrying debt from many of its farmers. The lack of substantial profits prevented the corporation from making significant capital investments. Later, an increase in urban industrialization due to the start of World War II, and the military draft drew away many people from the valley. Congress finally pulled the plug on the project in 1944. All of the properties had been sold by the end of 1946. Though the Pine Mountain Valley Rural Community Project could not be considered a financial success, it did serve its purpose. It had given many impoverished Georgia families a glimpse of hope, food, and shelter and a measure of dignity during the hard times of the Great Depression.

Life in Pine Mountain Valley

--excerpted from a report by WLTZ; Columbus/Phenix City; March 23, 2009--

The Pine Mountain Valley Chamber of Commerce is working to preserve an oral history of the Pine Mountain Valley Resettlement Project. One of their sources is Bobby Haralson, whose father was in the first group of settlers that came down and lived in the tents first, then in the barracks. The Haralson family finally moved into their new home in October 1935. The resettlement village in Pine Mountain Valley was a godsend for farmers living in the valley after the Great Depression. More than 200 prefab houses were built over two years. Haralson remembers the Depression being a great time, because ". . . our families were closer together and we lived so well and the houses had electricity, plumbing, and you know, running water." Those amenities were very rare for so many people living in rural America at that time.

Activity 7C-1: Geography and Geology of Pine Mountain

POWER THINKING EXERCISE - "Ridge Runner"

You have been hired as a guide for a group of Spanish explorers trying to travel from the Gulf of Mexico to northern Georgia, where they have heard there is a lot of gold. Your party has a hand-drawn map from a previous expedition that suggests the best route would be to travel up the Apalachicola River and then follow the Chattahoochee River to its source. However, when you reach the present-day site of Columbus, Georgia, one of your Native American scouts informs you that following that route would lead you past some Native villages whose inhabitants were not treated well by the previous expedition. The scout recommends that you follow the Chattahoochee River only until you come a high mountain ridge running off to the east. You are told to follow that ridge until you reach another large river (the Flint River) and then follow that river to its source which will take you very close to the upper portion of the Chattahoochee River. By taking the detour, you can avoid the hostile Natives and still reach the land of gold.

First, trace with a wipe-off pen your route from the Gulf of Mexico to Pine Mountain on MAP 3A, LANDSCAPES AND LANDFORMS. Continue to trace your route along Pine Mountain until you reach the Flint River. Also trace the Pine Mountain route on the Pine Mountain, GA topographic map on MAP 7C, PINE MOUNTAIN BELT. Locate at least two spurs from the ridge that are dead ends; and locate at least two passes (low points) along the ridge. What would be the advantages of taking the ridge route (besides avoiding unfriendly Natives)? What might be some disadvantages?

Materials
MAP 3A, LANDSCAPES AND LANDFORMS
MAP 7C, PINE MOUNTAIN BELT
IMAGE 7C, PINE MOUNTAIN BELT
Figure 7C-2, "Cross-Section through Folded Hollis Quartzite"
Wipe-off Pens

PERFORMANCE TASKS

(Icon Key) Overview = ✈; Science = ☼; Math = 💻; History = 🕮; Language Arts = ✍

1. **Compare topographic expression of ridges on various images. ✈**
   With a wipe-off pen, trace the ridges of Pine Mountain and Oak Mountain on the Pine Mountain, GA topographic map on MAP 7C, PINE MOUNTAIN BELT. Note that the yellow shading on the map highlights some of the ridgelines. Trace those same ridges on the Pine Mountain, GA SLAR image and NALC image on IMAGE 7C, PINE MOUNTAIN BELT. Explain how you can recognize the position of these ridges on each of the images. What are the advantages and disadvantages of using the SLAR image? What are the advantages and disadvantages of using the NALC image?

   Locate the following key features on the topographic map and on both images (NALC and SLAR). Explain how you were able to locate each feature.

Interstate Highway #185 (left portion of map)
Lake Harding (far left portion of map)
Flint River (far right portion of map)
Dowdell Knob (high-point on Pine Mountain; top center of map)
The Cove (circular area along Flint River at far-right portion of map surrounded by yellow shaded Pine Mountain [Hollis Quartzite])

2. **Complete shading of Pine Mountain map in Harris County. ☼**
Portions of the Pine Mountain, GA topographic map on MAP 7C, PINE MOUNTAIN BELT are shaded yellow wherever the Hollis Quartzite is exposed at the surface. Note that a thick black line borders the yellow shading on all sides. However, the Harris County portion of this topographic map is not shaded at all and there is no black boundary line shown. Using the geologic map of Harris County on MAP 7C, search for all exposures of "Hollis Quartzite" or "quartzite" (sometimes abbreviated as "qtzite" or referred to as "metaquartzite") and transfer this data to the topographic map using a wipe-off pen.

Once you have transferred all of the data you can find on the geologic map, shade in those specific locations on the topographic map and draw a black boundary line on both sides. Review the overall topography of Pine Mountain and shade in any additional locations that you suspect might be underlain by quartzite rock, even if the geologic map did not indicate this.

3. **Determine scale of Pine Mountain NALC image. 💻**
The Pine Mountain, GA topographic map on MAP 7C, PINE MOUNTAIN BELT and the SLAR and NALC images on IMAGE 7C, PINE MOUNTAIN BELT all cover approximately the same area. The fractional scale of both the topographic map and the SLAR radar image is 1:100,000. The NALC satellite image does not indicate a fractional scale, although a graphic scale is provided. Note that the size of the NALC image is smaller than the SLAR image, even though the two images have the same geographical coverage. Use information from the graphic scales of both images to set up a series of ratios that will enable you to calculate the fractional scale of the NALC image. Compare your result with other groups and be prepared to explain the methodology you used to arrive at your answer.

4. **Explain why communities in 'The Cove' were so isolated. 🕮**
Locate The Cove on the Pine Mountain, GA topographic map on MAP 7C, PINE MOUNTAIN BELT and also on the NALC satellite image and the SLAR radar image on IMAGE 7C, PINE MOUNTAIN BELT. This circular valley is located on the far-right edge of the map and is surrounded by the Pine Mountain ridge. Explain why this community would be more isolated from the outside world than a place like nearby Warm Springs (located north of Pine Mountain in top center of map). The Cove was also well known for production of moonshine (illegal liquor). Why do you think moonshiners would prefer to base their operations in The Cove rather than in Warm Springs? Examine the path of the Flint River through The Cove. Based on the topography, explain why roads into and out of The Cove do not follow this river.

5. **Explain origins of words and place names around Pine Mountain.** ✍
   Geographic place names are seldom randomly assigned, but usually have either a historical context or have some other connection to the landscape of the region. Certain occupations also have been given nicknames that relate to some aspect of the work. Consider each of the following names found on the Pine Mountain topographic map on MAP 7C, PINE MOUNTAIN BELT and speculate about why that particular name was chosen for that feature. You may wish to consult a dictionary for help.

   Pine Mountain
   Oak Mountain
   Chattahoochee River
   Flint River
   Town of Warm Springs
   Harris County
   The Cove (circular area along Flint River at far-right portion of map)

   A major occupation of the residents of The Cove is reported to have been the making of 'moonshine'. The people involved were known as 'moonshiners'. Why do you think illegal liquor would be called 'moonshine'? Why do you think the makers would be called 'moonshiners'?

ENRICHMENT

(Icon Key) Overview = ✈; Science = ☼; Math = 💻; History = 🕮; Language Arts = ✍

1. **Construct a scale model of Pine Mountain.** ☼
   Use the Pine Mountain, GA topographic map and the Geologic Map of Harris County on MAP 7C, PINE MOUNTAIN BELT to construct a scale model of the Pine Mountain/Oak Mountain area. Use different colors of modeling clay to represent different geologic rock units. Use Figure 7C-2, "Cross-Section through Folded Hollis Quartzite" as a guide to geologic structures.

2. **Compare Geologic Map of Harris County with published maps.** ☼
   The Geologic Map of Harris County on MAP 7C, PINE MOUNTAIN BELT, was a preliminary sketch generated by R.D. Bentley in 1968. Use local library or internet resources to find a more recent geologic map of this part of Georgia and compare the published map to the preliminary product. How accurate was Bentley's work?

Activity 3C-2: History and President Roosevelt

POWER THINKING EXERCISE - "Secret Service"

During the years of World War II, it was well known that President Roosevelt spent a lot of his time at the town of Warm Springs, Georgia. Our nation's enemies would certainly have loved to find a way to assassinate him if they could. It was the job of Secret Service agents to protect the leader of the free world wherever he went, including Georgia. As one of these agents, you have been assigned the task of researching the Warm Springs area and identifying any security risks you think might exist.

Locate the Little White House on the Pine Mountain, GA topographic map on MAP 7C, PINE MOUNTAIN BELT (on south side of Warm Springs next to Pine Mountain). Then, with a wipe-off pen, draw a circle on the map with a radius of three miles, with the Little White House at the center of the circle. Within that circle, identify every feature, both natural and artificial, that you think might pose a security risk for the President and offer a suggestion that would make the site more secure.

Materials
MAP 7C, PINE MOUNTAIN BELT
IMAGE 7C, PINE MOUNTAIN BELT
TRANSPARENT PLASTIC GRID
newspaper article, "Visit to a Favorite Spot on Pine Mountain" on page 7C-1
protractor
wipe-off pens

PERFORMANCE TASKS

(Icon Key) Overview = ✈; Science = ☼; Math = 💻; History = 🕮; Language Arts = ✍

1. **Locate features in or near Warm Springs that relate to FDR. ✈**
   Read the newspaper article, "Visit to a Favorite Spot on Pine Mountain" on page 7C-1. Pay special attention to all place names that are referenced in the article. Mark each of the following locations with a wipe-off pen on the Pine Mountain topographic map on MAP 7C, PINE MOUNTAIN BELT and explain how each site is connected to President Franklin D. Roosevelt.

   Town of Warm Springs (upper-center portion of map)
   The Little White House (on south side of Warm Springs next to Pine Mountain)
   Meriwether County (county at top of map in which Warm Springs lies)
   Pine Mountain (long ridge below town of Warm Springs)
   Dowdell Knob (on top of Pine Mountain southwest of Warm Springs)

2. **Explain origin of springs at Warm Springs. ☼**
   Locate the town of Warm Springs on the Pine Mountain, GA topographic map on MAP 7C, PINE MOUNTAIN BELT (upper-center portion of map north of Pine Mountain). Locate Warm Spring Branch (flowing north on the west side of town) and Cold Spring Branch (flowing north on the east side of town). Explain how each

stream got its name. Geologists tell us that the Hollis quartzite is a permeable rock unit and that the surrounding rocks, consisting of gneisses and schists, are much less permeable. Study the outcrop pattern of the Hollis quartzite and propose a reason why so many springs are found along the base of Pine Mountain. Also propose a reason why springs located in the Warm Springs area have a much higher flow volume than springs located elsewhere on Pine Mountain.

3. **Determine bearings to prominent features from Dowdell Knob.** 💻
Locate Dowdell Knob (on top of Pine Mountain southwest of Warm Springs) on the Pine Mountain, GA topographic map on MAP 7C, PINE MOUNTAIN BELT. This peak has the highest elevation anywhere on Pine Mountain and was a favorite place for solitude and inspiration for President Roosevelt. Put yourself in Roosevelt's place on top of the mountain and determine the directional bearings (compass directions) and distances to several landmarks he would have been able to see from that site. Use the compass rose printed on the Geologic Map of Harris County as your directional reference (the compass orientation of both maps is the same). Use the map scale to measure distance. With a wipe-off pen, place a large dot on the topographic map on top of Dowdell Knob. Also locate and place a dot on each of the landscape features listed below that would be visible from the top of the mountain.

   a. Use a ruler to draw a line from the top of Dowdell Knob to each feature listed.
   b. Measure distance to each feature and use map scale to determine distance in miles.
   c. Place the TRANSPARENT PLASTIC GRID over the compass rose on the map and align the grid so that the vertical lines on it are parallel to north and south on the compass rose.
   d. Keep the grid's vertical lines parallel to the north-south axis on the compass rose and slide the grid to the left so that the right-hand edge of it touches the top of Dowdell Knob.
   e. Draw a line bisecting Dowdell Knob along the edge of the grid and label it North and South at the appropriate ends.
   f. Remove the grid, place a protractor on the top of Dowdell Knob, and draw a line perpendicular to the north-south line already drawn. Label this new line East and West at the appropriate ends. (You have now oriented the map to the compass and are ready to provide compass bearings to each of the landmarks listed).
   g. Place the protractor along the north-south line you've drawn bisecting Dowdell Knob, with zero degrees pointing north.
   h. Measure the angle of each line segment pointing to features east of your north-south line and write the number of degrees on those line segments.
   i. Flip the protractor around so that the zero degree marker points south along your north-south line.
   j. Measure the angle of each line segment pointing to features west of your north-south line and write the number of degrees on those line segments.
   k. Add 180 to each of the angles obtained in the previous step to obtain compass bearings for all landmarks west of Dowdell Knob.
   l. Fill in the following table giving information for each feature or landmark. The first location is done for you as an example.

Feature or Landmark seen from Dowdell Knob	Distance from Dowdell Knob	Compass bearing from Dowdell Knob
Huckleberry Pinnacle	*14 miles*	*73 degrees*
lookout tower on Cove Mountain		
Mitchell Gap		
lookout tower on Oak Mountain		
lookout tower on Pine Mountain		
town of Warm Springs		
town of Hamilton		
town of Shiloh		
town of Pine Mountain Valley		
town of Manchester		
town of Mountain Hill		

4. **Determine alternate route from Dowdell Knob to Warm Springs.** 🕮
   Locate Dowdell Knob (on top of Pine Mountain southwest of Warm Springs) on the Pine Mountain, GA topographic map on MAP 7C, PINE MOUNTAIN BELT. You have accompanied President Roosevelt on one of his many trips to this mountain, which is just a short drive from the Little White House in Warm Springs. Use a wipe-off pen to draw on the map the normal route you would take to get to Dowdell Knob.

   Unfortunately, when you attempt to drive back to Warm Springs, you notice that the road is blocked at the Meriwether/Harris County Line by a landslide. So you will have to find an alternate route to return to Warm Springs. Study the road network on the map and decide what route would get you back to Warm Springs the quickest. Once you have made your decision, mark this alternate route on the map with a wipe-off pen. Determine the total mileage traveled on this alternate route and estimate the total trip time assuming you can drive those roads at 30 miles per hout.

5. **Write a memorial and suggest placement location.** ✍
   President Roosevelt died in his adopted home of Warm Springs on April 12, 1945, less than a month before the end of World War II in Europe. The town of Warm Springs has contracted with you to construct a stone memorial with a brief tribute to FDR and to identify a suitable location to place the memorial. Construct a graphic organizer listing all of the contributions Roosevelt made to the Pine Mountain Area. Using that information, write a paragraph, about twenty-five words long, that would fit on the memorial. Finally, look over the Pine Mountain, GA topographic map on MAP 7C, PINE MOUNTAIN BELT, and pick a location that you think would be the best place to site the stone memorial.

ENRICHMENT

(Icon Key) Overview = ✈; Science = ☼; Math = 💻; History = 🕮; Language Arts = ✍

1. **Research properties of springs at Warm Springs. ☼**
   Use local library or internet resources to research the properties of the springs that President Roosevelt visited at Warm Springs, Georgia. Compile information about the flow rate, chemical composition and temperature of the water and how the water was used for medical therapy. What facilities exist today for visitors to receive treatment?

2. **Write letter to editor describing legacy of President Roosevelt. ✍**
   During the Great Depression, people either loved or hated President Franklin D. Roosevelt. Those who loved him admired all that he was willing to do to help the unfortunate. Those who despised him felt he had no legal right under the United States Constitution to borrow money for his charitable goals. They felt he was making the office of president much too powerful and putting the nation deep in debt.

   Take one of these positions and brainstorm ideas to support your position in a letter to the editor of your local newspaper. Create a rough draft, then edit, revise and publish it. Share your letters with the rest of the class and decide which letters are most persuasive and why.

Activity 7C-3: Depression Era Farms and Land Use Changes

POWER THINKING EXERCISE - "Farming Formula"

The year is 1935. Your family has been selected from a pool of applicants suffering through the Great Depression to participate in a new project called the Pine Mountain Valley Rural Community Project. You will have to move from Atlanta, where you used to work for a textile company before you got laid off, to the experimental community near Hamilton, Georgia. To get on the applicant list, you had to "demonstrate farming experience or show adaptability to farming." You wrote on the application form that your family had planted a garden in Atlanta [you didn't tell them that your garden was in your back yard and consisted of only four tomato plants]. Nevertheless, your family was selected for the project and assigned to an egg-producing farm (even though you know nothing about chickens).

Although you don't have any experience with chickens or egg production, you are grateful for the opportunity to leave the city and want your new venture to be successful. After moving to the new community, you meet with your new neighbors and find that they don't know any more about raising chickens than you do. Divide your class into several small groups and brainstorm about what you think you will need to be successful at this new business. Make separate lists of 'buildings you will need'; 'equipment you will need'; and 'supplies you will need'. Once your lists are complete, share them with other groups to see if they thought of additional items that you did not. How many of these necessary items do you think the Rural Community Project will be able to provide for you?

Materials
MAP 7C, PINE MOUNTAIN BELT
IMAGE 7C, PINE MOUNTAIN BELT
TRANSPARENT PLASTIC GRID
story, "Life in Pine Mountain Valley" on page 7C-9
Wipe-off Pens

PERFORMANCE TASKS

(Icon Key) Overview = ✈; Science = ☼; Math = 💻; History = 🕮; Language Arts = ✍

1. **Locate site of Pine Mountain Valley Rural Community. ✈**
   The Pine Mountain Valley Rural Community covers all the land between Pine Mountain and Oak Mountain from five miles west of the town of Shiloh to two miles east of the town of Hamilton. Locate this area on the Pine Mountain, GA topographic map on MAP 7C, PINE MOUNTAIN BELT and outline it on the map with a wipe-off pen. Also outline this same area on the NALC satellite image and the SLAR radar image on IMAGE 7C, PINE MOUNTAIN BELT. Briefly describe the topography of this area and the pattern of the drainage system within it. Make an educated guess as to why this particular area was chosen for the Rural Community site. What physical and/or landscape features would such a community need to possess to be successful. Explain your reasoning.

2. **Document effectiveness of soil erosion control methods.** ☼
One of the tasks of the Civilian Conservation Corps (CCC) during the Great Depression was to implement soil conservation techniques on eroded farmland. An example of such techniques is the introduction of contour plowing on farmland surrounding Lake Florence. Locate Lake Florence on the Pine Mountain, GA topographic map on MAP 7C, PINE MOUNTAIN BELT (upper left part of map north of Pine Mountain). Then examine the Lake Florence, GA topographic map and the two aerial photographs on IMAGE 7C, PINE MOUNTAIN BELT.

Locate areas of significant soil erosion on the 1938 aerial photograph (eroded areas are bare looking). Mark these areas on the photo with a wipe-off pen. With a different color wipe-off pen, mark areas where contour plowing has been implemented (these areas have patterns that look like parts of concentric circles). Locate the areas of significant erosion on the Lake Florence topographic map. What type of landscape is most prone to soil erosion? Locate the areas of contour plowing on the Lake Florence topographic map. What type of landscape is present at those sites? Are you able to correlate the contour lines on the topographic map with the contour plowing on the photo? What effect would the lessening of soil erosion have on the health of Lake Florence? How much soil erosion do you see on the 1964 photograph?

3. **Construct pie charts to quantify changes in land use.** 💻
A quick look at the two black and white aerial photographs on IMAGE 7C, PINE MOUNTAIN BELT indicates that land use around Lake Florence has changed drastically from 1938 to 1964. Constructing two pie chart graphs, one for 1938 and one for 1964 will help you quantify and visualize this change. Each pie chart will measure the relative percentages of three land-use types: water, forest, and farmland.

Place the TRANSPARENT PLASTIC GRID over the 1938 aerial photograph so that the small squares on the grid cover the entire area of the photograph. First count the total number of squares that cover the entire area of the photograph. Next, count the number of squares that cover each land use type and record these numbers. Now place the GRID over the 1964 photo so that the small squares cover the entire photo. Count the number of squares that cover each land use type and record these numbers. For each year, percentages for each land use can be calculated by dividing the number of squares representing each use by the total number of squares covering the photo area.

4. **Identify changes in land use around Lake Florence.** 🕮
Examine the Lake Florence topographic map and the two black and white aerial photographs on IMAGE 7C, PINE MOUNTAIN BELT. Make special note of roads, buildings, and other features that are shown on the map. How many of these same features can you find on either of the two photographs? What is the biggest difference in land use shown on the two photographs between 1938 and 1964? Why do you think land use changed so much over a period of twenty-six years? Predict changes to this area that you think might happen in the next twenty-six years.

5. **Write letter describing life in Pine Mountain Valley project.** ✍
   Read the story "Life in Pine Mountain Valley" on page 7C-9. Pretend that you are Bobby Haralson, or someone very much like him, who has recently moved to this community. Write a personal letter, using proper grammar and format, to your grandmother back in Atlanta who has never traveled outside of that city. Describe the environment of your new home using plenty of adjectives that will add detail to your description and help your grandmother visualize the landscape. Also describe the amenities of your new house and be sure to convey how happy you are to be living in such a modern community. Because this is a personal letter, you should include several personal references to how your life has changed.

ENRICHMENT

(Icon Key) Overview = ✈; Science = ☼; Math = 💻; History = 🕮; Language Arts = ✍

1. **Research a New Deal program.** 🕮
   Use local library or internet resources to research some of the programs that were included in President Roosevelt's New Deal to help fight the Great Depression and aid the unemployed. Pick one of these programs and research how successful it was, and how it changed or otherwise affected life in your community, town, or state.

2. **Analyze depression era song lyrics.** ✍
   Obtain from a local library, music store, or internet source, recordings of one or more examples of Woody Guthrie's Depression Era music. Woody Guthrie was an American songwriter famous for writing folk songs about 'hard times'. His most famous recording is "This Land is Your Land." Listen to some of his songs to get a feel for the sufferings people of that generation went through. Guthrie also wrote several patriotic songs in support of President Roosevelt's New Deal programs. Discuss in your groups how songs can serve as a type of propaganda to get people to support new programs or ideas.

THE STATE

July 4, 1994

Congaree Canoeists Find Rapids Rough; Some Capsize

By Michelle R. Davis
COLUMBIA, SC.

A holiday canoeing trip down the Congaree River turned into a frightening ride through rapids for a group of 20 friends Sunday.

Ten canoes capsized while traveling down the river, and several boaters had to be rescued. All of the canoeists were wearing life preservers and nobody was injured. The group put their boats in the water Sunday afternoon at Hope Ferry. They planned to canoe down the river and land past the Gervais Street Bridge - a six-hour trip.

But several sets of rapids flipped canoes, forcing paddlers to quit and pull out of the water early. Others continued down the river.

Sharon Ramsey of Columbia said her canoe capsized and she was left stranded on an island in the middle of the river. Jennifer Hartshorn, also of Columbia, hung on to a tree after her canoe floated away.

Robert Stambaugh of Columbia, who fishes nearly everyday on the river, saw Ramsey and picked her up in a motorboat, then got Hartshorn.

"They're not the only ones I've rescued," said Stambaugh, who estimated he pulls about 15 people a year from the Congaree. You better know the river or you'll end up like them - hanging on to a tree."

Although several people on the trip said the water was swifter than usual, Anthony Walker of the state Dept. of Natural Resources said the river level was normal.

South Carolina Electric & Gas Co. spokesman Roger Schrum said he could not estimate how much water was being released from Lake Murray, but the company was using all five turbines at the time.

Wade Osburn of Columbia helped rescue one canoe. He had been inner tubing down the river with some friends who decided not to chance the rapids. He continued down the river and an hour later, his girlfriend, Margaret Jordan, was waiting onshore.

"I'm going to the pool next weekend," she said. "I'm not doing this again."

RATIONALE

Columbia was named the Capital City of South Carolina because it is in the geographic center of the state and because it was located along the Fall Line Zone where two major Piedmont rivers, the Broad and the Saluda, join to form the Congaree River. Most of the old city actually sits on a higher elevation portion of the Coastal Plain called the Carolina Sand Hills. In the early 1800's the Columbia Canal was constructed so boats could bypass the rocky shoals safely. After the coming of the railroads, the Canal was modified to serve as a power source for hydroelectric generators and machinery in local cotton mills. The rise of cotton mills in the south not only boosted the local economy, but also gave rise to a new type of community, referred to as the 'mill village', and a new class of urban worker whose lifestyle was very different from their former work on the farm. The mill system was particularly hard on children and well publicized abuses led to the passage of some of the nation's first child-labor laws. Columbia played an important role during the Civil War and was one of the major southern cities invaded by General Sherman during the final year of the war.

PERFORMANCE OBJECTIVES

1. Compare and contrast Piedmont and Coastal Plain landscapes along Fall Line Zone.
2. Examine ways cities harness and utilize water in river systems.
3. Recognize location of Fall Line Zone on topographic maps and aerial photographs.
4. Trace the path of Sherman's march through Columbia, noting famous landmarks.
5. Explain how person can be viewed as 'hero' by one group and 'villain' by others.
6. Explain how street patterns, street names, and other city features change over time.
7. Evaluate validity of various stories about how the Columbia fire started.
8. Explain necessity for early cotton mills to be located along a river or canal.
9. Analyze social and economic structures and culture of mill village communities.
10. Use ratio and proportion to determine whether or not mill workers were 'underpaid'.

SAMPLE ASSESSMENT RUBRICS

EXAMPLE #1 (relates to Performance Objective #1)

Give students a copy of Figure 7D-2, "Map of Columbia, 1850" and ask them to formulate an hypothesis that might explain why most of the east-west trending streets in the historic section of Columbia north of Gervais Street do reach all the way to the Congaree River and most of the east-west trending streets south of Gervais Street do not reach the river. [*Best answer is that north of Gervais Street is Piedmont landscape and south of Gervais Street is lower Coastal Plain topography subject to frequent flooding*].

A (level 4) – Hypothesis is stated logically and relates areas to particular regions.

B (level 3) – Hypothesis has a few logical gaps but is essentially correct.

C (level 2) – Answer mentions landscape differences in Piedmont and Coastal Plain areas but answer is not stated in the form of a logical hypothesis.

D (level 1) – Landscape differences between Piedmont and Coastal Plain are not mentioned at all or are described incorrectly and/or hypothesis is lacking.

F (level 0) – Landscape differences not mentioned at all and no logical hypothesis.

EXAMPLE #2 (relates to Performance Objective #2)

Give students the following economic data about the Columbia Canal for the year 1827 and ask them to calculate how many years it would take to pay off the construction costs of the canal and make a profit at that rate. Students must show work for full credit.

Total construction cost of canal (in 1827 dollars) = $206,000
Total number of bales of cotton shipped through canal in 1827 = 45,612
Cost of shipping one bale of cotton through canal = $ .10

A (level 4) – Answer correct (45.16 years) and all work is shown correctly.

B (level 3) – Answer correct (45.16 years) but all work is not shown - or work is shown correctly, but answer is incorrect due to a single calculation error.

C (level 2) – Work shows that data is understood and problem is set up logically, but multiple calculation errors cause wrong answer to be given.

D (level 1) – Work reveals that student comprehends data, but is unable to set up the problem in a logical manner to generate a realistic answer.

F (level 0) – Work indicates that student does not understand data and is unable to set up a logical mathematical relationship - or problem is left blank.

Cartographic Product Information

MAP 7D: Columbia

TITLE: Columbia, SC (topographic map)
DATA SOURCE: Columbia North and Southwest Columbia USGS 1:24,000 Quadrangles
DATE: Columbia North = 1972 (photorevised 1990)
Southwest Columbia = 1972 (photorevised 1982)
SCALE: 1:24,000 [1 inch = 2,000 feet] [1 cm ~ 240 meters]
OTHER IMPORTANT DATA:
- The contour interval of this map is 10 feet.
- The splice line joining the two map quadrangles is marked by a horizontal line across the center of the map where the two different shades of red touch.
- The large un-named river flowing towards Columbia from the north (upper center of map) is the Broad River.

POINTS OF SPECIAL INTEREST:
- The Columbia Canal runs along the east bank of the Broad and Congaree Rivers.
- The State Capitol Building is located on the southeast corner of Gervais Street and Assembly Street – in the center of the original planned city.
- The old Columbia Duck Mill (now the State Museum) is the gray shaded building located across the Columbia Canal from the power plant next to the Gervais Street Bridge.
- The original planned city is bounded by Elmwood Avenue on the north, Harden Street on the east, Heyward Street on the south, and the Congaree River.

OTHER FEATURES TO LOOK FOR:
- Two large granite quarries are on either side of Congaree River (south of city).
- The Columbia Metropolitan Airport is at extreme lower left corner of the map.

TITLE: Downtown Columbia, SC (historic map)
DATA SOURCE: A perspective map drawing by C. Drie entitled "Birds-Eye View of the City of Columbia" that is on file in the Library of Congress and is currently published by Historic Urban Plans, Inc. of Ithaca, New York
DATE: 1872
SCALE: approximately 1:6,000 [1 inch ~ 500 feet] [1 cm ~ 60 meters]
OTHER IMPORTANT DATA:
- This map is a perspective drawing, meaning objects near bottom of the map appear larger than objects near top (compare different sizes of city blocks).
- Artists visited the city to sketch buildings, streets, railroads, bridges, trees, and rivers in order to make this map. The effect is almost like looking at the city from a "bird's eye view" perspective and gives the impression of aerial photography. But this map was made long before airplanes were invented.

POINTS OF SPECIAL INTEREST:
- The State House is located on the northeast corner of Senate & Assembly Streets.

OTHER FEATURES TO LOOK FOR:
- South Carolina College is bounded by Sumter, Bull, Pendleton, and Green Streets

IMAGE 7D: Columbia

TITLE: Columbia, SC (NHAP [infrared aerial photograph])
DATA SOURCE: NHAP CIR Photograph 43-104
DATE: 1983
SCALE: 1:24,000 [1 inch = 2,000 feet] [1 cm ~ 240 meters]
OTHER IMPORTANT DATA:
- This image is a false-color infrared image, so all true colors have been shifted.
- Portions of the left side of this image look washed out or show strange coloration due to imperfections in the original photograph.

POINTS OF SPECIAL INTEREST:
- The Olympia Mill Village is located south of Heyward Street and west of Assembly Street, just to the east of the big quarry on the east bank of the Congaree River. The old mill buildings are the two large gray buildings on the south side of Heyward Street.
- The football stadium for the University of South Carolina (oval shape) is located about one mile east of the granite quarry on east side of the Congaree River

OTHER FEATURES TO LOOK FOR:
- Two large granite quarries are on either side of Congaree River (south of city).
- The rock shoals and rapids in the Broad, Saluda, and Congaree Rivers show up as white spots and streaks in the rivers.
- Note the water color difference between the Broad and Saluda Rivers.

TITLE: Downtown Columbia, SC (NAPP [infrared aerial photograph])
DATA SOURCE: NAPP CIR Photograph 1372-028
DATE: 1989
SCALE: approximately 1:6,400 [1 inch ~ 533 feet] [1 cm ~ 64 meters]
OTHER IMPORTANT DATA:
- This image is a false-color infrared image, so all true colors have been shifted.
- Buildings, trees, and other features in photograph cast shadows that show up as large black rectangles or other shapes. Where shadows are present, other features are not recorded on photo (example: where shadows cross streets).

POINTS OF SPECIAL INTEREST:
- The South Carolina State House (capitol building) is in the block to the south-east of the intersection of Gervais and Assembly Streets (refer to map).
- The campus of South Carolina College (now the University of South Carolina) occupies most of the area east of Lincoln Street and south of Pendleton St.
- The Columbia Cotton Duck Cloth Mill (now the State Museum) is located on the east bank of the Columbia Canal where it ends just north of the Gervais St. bridge. The electrical power plant is located on the west bank of the canal.

OTHER FEATURES TO LOOK FOR:
- Streets, highways, and bridges that are paved with asphalt show up as 'blue-gray' on the photograph while those paved with concrete show up as 'white'.

The Fall Line Zone and the Columbia Canal

The Fall Line Zone marks the boundary between the Piedmont and the Coastal Plain landform regions. The Zone is easily located along major river valleys by documenting the first occurrence of rock rapids upstream from the ocean. The more resistant rocks of the Piedmont Region and the less resistant rocks of the Coastal Plain Region do not erode at equal rates. As a result, a river channel in the Coastal Plain Region is always slightly lower in elevation than the same channel in the Piedmont, forming telltale rapids where the two regions meet. The Fall Line is often portrayed as a single line of rapids that is clearly visible at a single location but it is much more accurately described as a broad zone that may extend for one or two miles upstream from the first appearance of rapids.

The city of Columbia straddles the Piedmont/Coastal Plain boundary. Much of the higher part of the city lies along a narrow, irregular band of rolling hills known as the Carolina Sandhills. This part of the Coastal Plain ranges from 250 to 450 feet above sea level and represents the remains of an ancient shoreline that left behind sandy deposits between 55 and 100 million years ago when sea level was much higher than it is today. Along major rivers, however, the sand deposits have been eroded away completely and the river channel transitions directly from its shallow, downcutting Piedmont mode to a broad, deep, meandering floodplain mode. In the Columbia metropolitan area, two Piedmont rivers, the Broad and Saluda, combine at the Fall Line Zone to become the Congaree River. Rapids and rocky shoals are visible in the river channel for nearly two miles downstream of this junction, eventually disappearing beneath the overlying Coastal Plain sediments. The lowest areas of the city lie along the broad Congaree River floodplain.

The city of Columbia owes its early commercial success to its placement along the Fall Line Zone. By the early 1700s, the population of the interior areas of the Carolina colony, including the Piedmont, had reached significant levels and local farmers needed a way to get their crops to market. Most farmers chose to transport their cargo by boat as many Piedmont rivers were navigable for reasonable distances during most of the year and coastal rivers were fully navigable to the sea. However, any cargo shipped downriver from the Piedmont had to be unloaded when boats reached the shoals and rapids of the Fall Line Zone. After a short transport over land, the cargo was re-loaded onto another boat for the rest of the trip to the coast. Both Fort Congaree, established in 1718, and Fort Granby, established in 1749, were built across the river from present day Columbia. These outposts served as early trading centers as well as a settlement for the workforce that was needed to move cargo around the rapids. After the Revolutionary War, settlers began to move into the upstate in much greater numbers, establishing new homesteads, growing new crops, and shipping vast amounts of their produce to markets in Charleston through the city of Columbia.

It soon became apparent to the South Carolina General Assembly that a better transportation system had to be designed for upstate planters to get their produce, primarily cotton, to the Charleston market. One idea that received wide popular support was the construction of a canal to circumvent the shoals and rapids at Columbia. In 1819, construction began on the Columbia Canal, which originated between Lumber (now called Calhoun) and Richland streets and terminated opposite the Granby landing. This Canal had five turning basins and an eight-foot wide towpath running on both sides of the earthen banks, which were planted with grass. Completed in 1824 at a cost of $206,000, the Columbia Canal was designed to take advantage of a natural ravine located between the center of the city and the Congaree and Broad rivers.

The dreams of the canal enthusiasts were realized fully in 1827, when a total of 45,612 bales of cotton were shipped through this passageway. However, the coming of the railroad in 1834 severely curtailed the role of the "Canal Age" in South Carolina. Railroads expanded during the period of 1832-1860, as steam-powered rail proved to be a more efficient mode of transport than river barge. By 1842, the Columbia Canal no longer served as a major transportation link, and instead became relegated to serve as a source of water power. In the 1860's during the Civil War, gunpowder was manufactured using power from the canal. Later the State Penitentiary built new facilities on the banks of the Congaree River and used water from the canal to operate a grist mill and a saw mill, and also to run pumps that provided water for residents of the City of Columbia.

By 1888, the city planners embarked on an innovative program designed to make Columbia an important industrial center by using hydroelectric power from the canal. The canal was widened and deepened from Gervais to Lumber (Calhoun) streets and lengthened by 2.875 miles at the north end along the Broad River to increase the total flow of water. Also, an earthen dam was placed just above Gervais Street, blocking off the southernmost segment of the original canal. The lower section of the canal was abandoned because new levees would have been required below Gervais Street on both sides of the canal. Above Gervais Street higher land formed the eastern bank of the Canal. Electricity was generated at the new dam, then transmitted by wire to factories and other users. The Columbia Canal Dam remains virtually intact today and is still used as a primary source of peak electrical power for the city of Columbia. The final expansion of the canal was completed in 1891, and included a massive diversion dam, entry lock, and bulkhead at the upper end of the canal. In addition, a weir was built to control the level and flow of the water. Old maps as well as modern aerial photographs reveal clear evidence that the original canal once extended below Gervais Street.

Figure 7D-1: Original Plan for City of Columbia, 1786

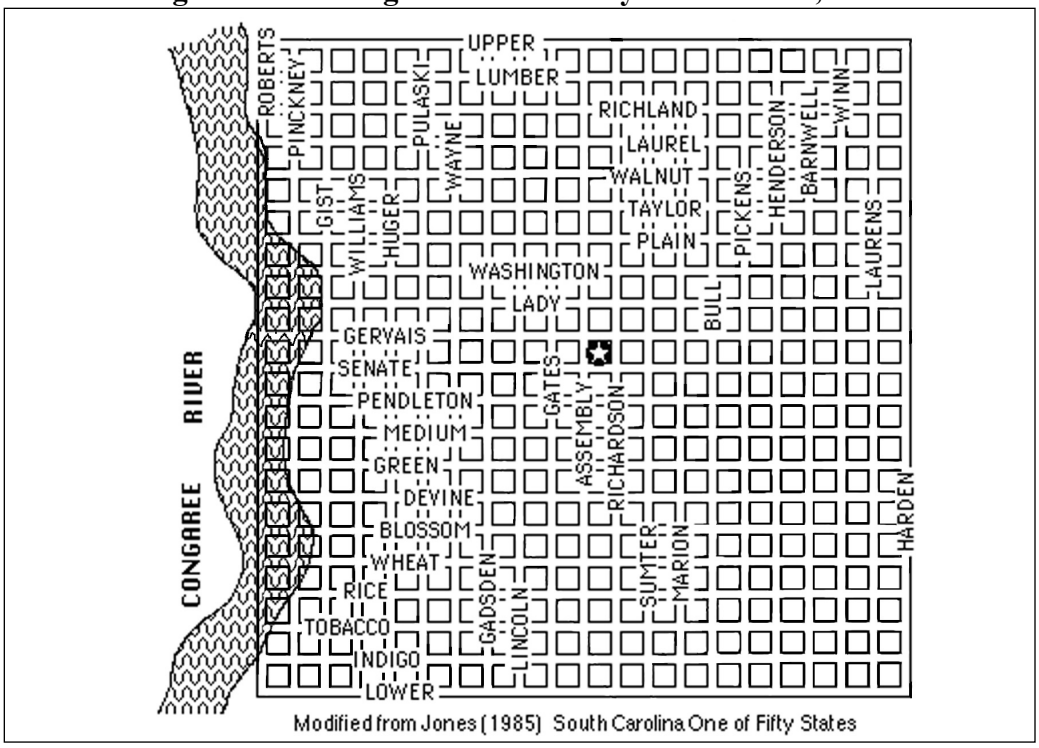
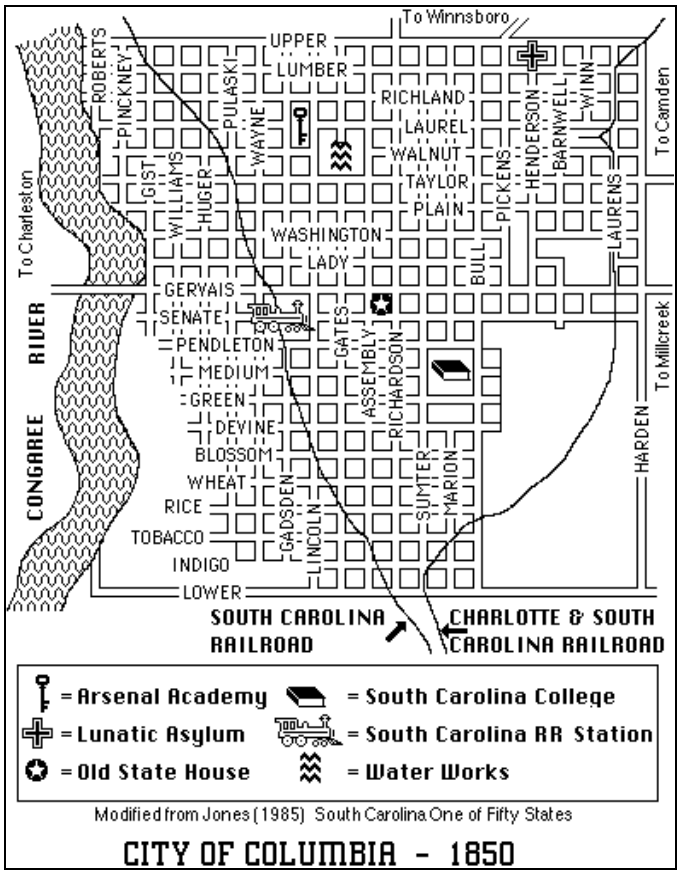


Figure 7D-2: Map of Columbia, 1850



Columbia and the Civil War

Although General Sherman's attack on Columbia is recognized as one of the major events of the Civil War, the city actually remained outside of the war zone until the very end. Nevertheless, a military atmosphere pervaded the town because of its training academy, prisoner of war camps, Confederate offices, and army hospitals. The population of Columbia had soared from 8,000 to 20,000 during the War years, as many refugees came from Charleston and Georgia to find work. Goods manufactured in the Columbia area for the Confederate Army included cannon balls, swords, bayonets, silver-plated copper buttons, wool hats, leather shoes, tents, knapsacks, socks, yarn and medicines. Confederate money was printed in Columbia after the minting operation was moved from Richmond, Virginia. The mint building is still standing today at the northeast corner of Gervais and Huger Streets. In addition, the city became a safe depository for many public and private artifacts. Items such as the bells of St. Michael's church in Charleston, rare books from the Charleston Library, silver plated items, valuable papers, and bank funds were all sent to Columbia for safe keeping. Other valuable possessions were sent from as far away as Georgia. Charleston merchants even sent large quantities of whisky to Columbia for safe storage.

It was toward the close of the Civil War that Union General William T. Sherman, began his infamous march through the South. After Sherman and his troops left Atlanta, they crossed through Georgia to the city of Savannah, pillaging and destroying mansions, homes, barns, fields, and forests along the way. News reports of the time refer to huge columns of smoke and burnt chimneys that marked his sixty-mile wide path. When Sherman left Savannah, most South Carolinians thought he would strike at the port city of Charleston. Consequently, many citizens left Charleston for Columbia or sent their goods there for security reasons. Not until Sherman left Orangeburg in partial ruins on February 13th 1865 and turned his 20,000 troops and 250 wagons toward Columbia did most citizens realize that the capitol city was his next target. By then all of the railway lines had been destroyed and there was no communication possible except by word of mouth. As Sherman approached Columbia, the city residents burned the Congaree River Bridge to try and slow the invading army's advance. The following excerpt is taken from Sherman's personal diary recounting his version of the events of the day.

Entry from General Sherman's Diary
--excerpt from Sherman's personal diary; February 16, 1865--

Early next morning (February 16) the head of the column reached the bank of the Congaree opposite Columbia, but too late to save the fine bridge which spanned the river at that point. It was burned by the enemy. While waiting for the pontoons to come to the front, we could see people running about the streets of Columbia occasionally small bodies of cavalry, but no masses. A single gun of Captain De Gress' battery was firing at their cavalry squads, but I checked the firing, limiting him to a few shots at the unfinished state house walls, and a few shells at the railroad depot to scatter the people who were seen carrying away sacks of corn and meal that we needed. There was no white flag or manifestation of surrender.

In Sherman's diary entry the "enemy" he referred to was a group of South Carolinians defending their city. Today, six brass star markers on the South Carolina State House facade indicate the damage to the structure done by Captain De Gress' twenty-pound Parrot cannons. The shells were fired across the Congaree River from a site along the west bank that is identified today by a historical marker along U.S. Highway 378 in West Columbia. February is part of the winter wet season in South Carolina and so the Congaree River at that time was full of water and too broad and swift for a safe crossing. Therefore Sherman ordered his troops to go north and cross both the Saluda and Broad rivers instead, an approach which was less treacherous. Some sources report that Sherman and his troops spent the night on an island close to the present site of the Riverbanks Zoo.

On the morning of February 17, 1865, at 9:30 AM, Columbia Mayor Thomas J. Goopdwyn sent a message of surrender to General Sherman. The mayor himself carried the white flag of surrender and met Sherman north of the city. In the surrender agreement Sherman pledged to respect private property. Then, flanked by three generals, Sherman led the Fifteenth Corps into Columbia and marched down Main Street towards the Capitol building. However, as the Federal troops began to enter the city, the situation deteriorated rapidly. Several accounts report that whiskey stores were broken into and kegs were opened on the streets. Plundering by both citizens and soldiers became rampant. By sundown, fires began breaking out all over Columbia. A strong wind was whipping up a dust storm and pieces of cotton from broken bales blew like a snowstorm covering trees and shrubbery. Flames spread like a prairie fire all over the downtown area of Columbia and many citizens panicked as buildings were engulfed in a holocaust of flame. The streets of Columbia had turned into chaos. Of the 124 inhabited city blocks, 84 were burned to the ground.

A primary source account of the burning of Columbia is found in a diary kept by Emma LeConte, the seventeen-year-old daughter of Joseph LeConte who was the chemistry professor at South Carolina College (Now the University of South Carolina). [After the war, Joseph LeConte and his brother left South Carolina for California, where they founded the University of California at Berkeley.] The family was living on the college campus in a three-story building, where Emma could easily observe what was happening to Columbia as Sherman's troops took over the city. The college campus in Columbia, which had been turned into a hospital, was not torched or pillaged. Neither was the LeConte's campus residence. Emma LeConte imparts a civilian's insight into the war years and paints a graphic picture of the characteristic social structure and attitudes of the South's upper class.

One Account of the Burning of Columbia

--excerpt from the diary of Emma LeConte, February 1865--

Entry for February 17, 1865

At about six o'clock, while it was still quite dark and all in the room were buried in profound slumber, we were suddenly awakened by a terrific explosion. The house shook-broken windowpanes clattered down, and we all sat up in bed, for a few seconds mute with terror. My first impression on waking was that a shell had

struck the house, but as soon as I could collect my senses I knew that no shell could make such a noise . . . . Whatever the cause, the effect was to scare us very effectively and to drive away all thoughts of sleep . . . . After breakfast the cannon opened again and so near that every report shook the house . . . . The negroes all went uptown to see what they could get in general pillage, for all the shops had been opened and provisions were scattered in all directions. Henry says that in some part of Main Street corn and flour and sugar cover the ground...the negroes are very kind and faithful. They have supplied us with meat and Jane brought Mother some rice and crushed sugar for Carrie . . . . A gentleman told us just now that the Mayor had gone forward to surrender the town.

One o'clock p.m.

Well they are here. I was sitting in the back parlor when I heard the shouting of the troops. I was at the front door in a moment, Jane came running and crying, 'Oh, Miss Emma, they've come at last!' She said they were then marching down Main Street, before them flying a panic-stricken crowd of women and children who seemed crazy. I ran upstairs to my bedroom just in time to see the US. flag run up over the State House.

Later

General Sherman has assured the Mayor that he and all the citizens may sleep as securely and quietly tonight as if under Confederate rule. Private property shall be carefully respected. Some public buildings have to be destroyed, but he will wait until tomorrow when the wind shall have entirely subsided . . .

Entry for February 18, 1965 *(Written on February 18th about February 17th)*

At about seven o'clock I was standing on the back piazza in the third story. Before me the whole southern horizon was lit up by camp fires which dotted the woods. On one side the sky was illuminated by the burning of Gen. Hampton's residence a few miles off in the country, on the other side some blazing buildings near the river . . . . The fire on Main Street was now raging, and we anxiously watched its progress from the upper front windows. In a little while, however, the flames broke forth in every direction. The drunken devils roamed about, setting fire to every house . . . . The firemen attempted to use their engines, but the hose was cut to pieces and their lives threatened. The wind blew a fearful gale, wafting the flames from house to house with frightful rapidity. By midnight the whole town (except the out-skirts) was wrapped in huge blaze.

Many other tales have been told about the night the city turned to fire -- some accurate according to historians, some fictionalized by the survivors and the storytellers. The account that follows is one such unauthenticated version of events. The author is unknown. Today, the original First Baptist church building, referenced in this account, still stands as a classic historic reminder of 18th Century architecture displaying the characteristic columns, brickwork, and interior decorations of that period. The Methodist church was rebuilt in 1866. Both churches still have active congregations today.

Another Account of the Burning of Columbia
--traditional, author unknown--

The day was filled with the necessary preparations anyone can take for impending disaster. Guns cleaned, silver hidden from enemy eyes. The men met, and the women prayed. A group of worshippers congregated at the First Baptist Church on Plain Street (now Hampton Street), between Sumter and Marion Streets. Too innocent to imagine the worst, they sat solemnly in the pews and asked God Almighty to protect them from Sherman and his men. But, not every Christian waited for the Lord to do all the work. The custodian stationed himself outside the walls of the sanctuary, and there he promised to stand against the on-coming enemy.

No one could have envisioned the devastation and the sound of guns echoing in the abandoned streets. No one. Not even the stoic figure who stood alone to face the enemy. Finally his opportunity came. A soldier approached him, and ordered him to name the place he guarded. Without so much as a moment's hesitation, the man said, "Sir, this is the house of my Methodist brothers." The soldier questioned him again, asking for the location of the First Baptist church, known to be the regular meeting place of the secession convention. This single saint replied, "Why, sir, that would be the spire you see down the street, that way." With that the soldier turned and ordered those who had gathered around him to march on.

That night many prayers were offered to the Lord including the one of the guilt-ridden hero who had sent the army to burn down the Washington Street Methodist Church at the northeast corner of Washington and Marion Streets.

Life in a Mill Village

Cotton was truly "king" of commodities when South Carolina, along with much of the South, established a one-crop economic system during the early 19th Century. Most of the cotton was originally shipped by boat to New England or even Europe for processing into finished textile products. However many merchants felt that South Carolina should become more self-sufficient as a state and try to build its own cotton mills and manufacture its own cloth. The Fall Line Zone was an excellent location for these early textile mills because the drop in river level across the rapids produced enough energy to power large waterwheels that turned the machinery to operate the looms. Wealthy entrepreneurs from the north and from Europe began to view the southern states as a good place to invest their money and many businessmen established textile mills and their associated mill villages along southern rivers, including the Congaree River in Columbia. The legacy of these businessmen lives on in the names of streets, towns, and colleges in South Carolina and other states. At the peak of the cotton-based economy, South Carolina alone boasted a total of 115 cotton textile mills.

By the turn of the 20th Century, hydroelectric power had become the primary source of energy for producing cotton cloth and it was no longer necessary for mills to be built along rivers. With railroads being used more and more to transport cotton bales to the mills and finished fabrics to market, river transportation also became increasingly

obsolete and rail access became the most important consideration for locating new mills. By the mid 20th Century, trucking had taken over a significant share of the textile transportation market from the railroads.

A prime example of a successful early 20th Century cotton mill is the Columbia Cotton Duck Cloth Mill located on the eastern bank of the Columbia Canal facing Gervais Street. This mill was built by Baltimore businessman Charles K. Oliver in collaboration with Aretas Blood, President of the Columbia Water Power Company, and has the distinction of being the first electrically operated mill in the world. On June 11, 1895, fourteen 65 horsepower alternating current motors build by the General Electric Company were installed in the ceiling of the mill and hooked up to transmission wires bringing current from the electrical generators located next to the Columbia Canal dam. A mill village was subsequently built across the Congaree River in what is now West Columbia. Mill workers walked to work by crossing the Gervais Street Bridge. This housing development was known as the Columbia or Brookland Mill Village. The Columbia Duck Mill ceased operations in the late twentieth century and the building now houses the South Carolina State Museum.

Several other cotton mills were located in the Columbia area once electrical power became a reliable source of energy to run the mill looms and other machinery. The Pacific Mills Company ran a thriving business by locating along existing railroad lines just outside the southern city limits of Columbia on Heyward Street. The Olympia Mill Village housed workers for this mill and is an excellent example of a self-contained community with its own school, general store, park areas, and churches. As with many mill towns, the streets in one direction were numbered (1st, 2nd, 3rd, etc.) and the streets running in the other direction were alphabetical (A [Ashley] Street, B [Berkeley] Street, etc.). This same letter pattern is used in one section of the Brookland Mill Village as well.

Cotton mills were very labor intensive operations and mill owners often had to scour the countryside to find enough factory workers. In the Columbia area, workers were often recruited from nearby Sandhills farms where poor white families were trying to eke out a living on the poor sandy soils. Often these families suffered from malnutrition and other diseases such as malaria. Once the newly recruited families arrived at the mill village, housing was assigned based on the number of family members and strict rules were laid down for all to follow as they went to work. Unlike their previous farm life, which varied with the seasons, mill work went on day after day and week after week with little or no variation. Most mill shifts ran twelve hours a day and six days a week for the entire year. The machinery was loud because of the constant noise of belts and metal clanging together. Ventilation in most mills was very poor resulting in the air being filled with cotton dust or lint, which ended up covering the mill workers from head to toe. The dust was hard to wash off and as a result mill workers were sometimes nicknamed "lint heads." Lung diseases became prevalent, shortening the life expectancy of many workers.

Figure 7D-3: Brookland Mill Village Map, Columbia, 1886

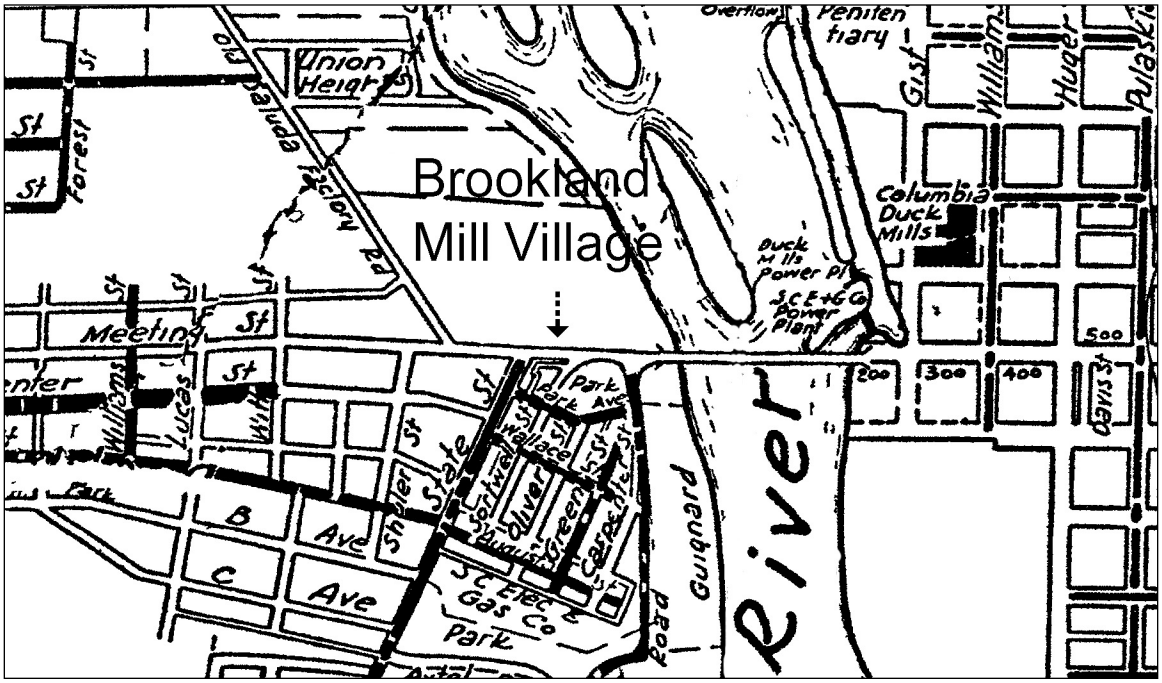
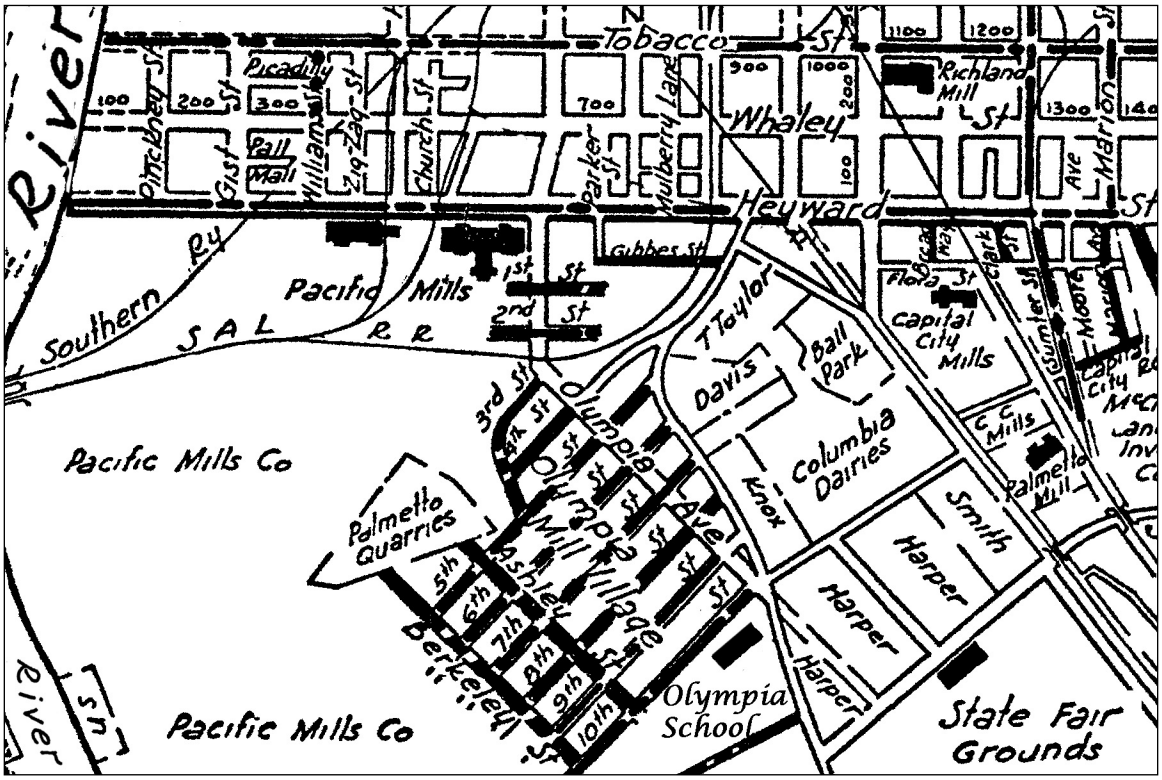


Figure 7D-4: Olympia Mill Village Map, Columbia, 1926



The entire family worked for the mill from the time the children turned six years old until they died. It soon became an accepted way of life for several generations of such families to live in company owned row houses, charge their food at the company store, and work from dawn to dusk their entire lives. In return, mill families for the first time received a pay envelope with cash at the end of the week, even though the amount was meager. Later, the company built churches and schools for mill families, who seldom had the time or desire to read or to learn or even to travel outside the mill village. Many white farmers and businessmen, and even some blacks tended to look down on mill families and called them "po' whites" or "po' buckras." Eventually, new government regulations addressed child labor abuses and related issues by legislating a minimum age for mill workers and mandating a shorter work week. Such laws improved the quality of mill village life significantly.

Company Owned Housing Rules

--typical of most mill villages, author unknown--

1. *Do not use more lights than are absolutely necessary.*
2. *When leaving a room or the house turn off all lights.*
3. *No lamps larger than those consuming 75 Watts are to be used.*
4. *Lamps will be placed in houses one time and are to be left when tenant moves.*
5. *Water must be cut off during freezing weather so as to prevent freezing and bursting of pipes. Each house has a cut off valve which will be found in many cases in a terra cotta pipe directly to the rear of houses, not more than five feet from the house. Should tenant be unable to find valve, make inquiry at office.*
6. *When toilet becomes stopped up and the cause for same is found to be other than toilet paper, tenant will be required to pay all cost attached to repairs.*
7. *Keys are to be returned to the office when tenant vacates.*
8. *No tenant will subrent rooms without permission from the office.*
9. *Premises must be kept CLEAN at all times.*
10. *No wagons, vehicles or stock of any kind are to be kept anywhere on the village except in those places provided by the Company of the same.*
11. *Each tenant will be held directly responsible for the property upon which he lives and any damage to the same must be paid by the said tenant.*
12. *The Company solicits the co-operation of each tenant in keeping the village an attractive place in which to live.*

At the Columbia Mill, a seventy-two hour workweek was required of all mill workers up until 1892, when Governor Tillman pushed the South Carolina Legislature for passage of a sixty-six hour workweek law. Mill workers still worked twelve hours a day Monday through Friday with Saturday afternoon and all day Sunday off. Mill village families generally had little contact with people outside of their own village; however mill owners often sponsored sports teams as well as other organized recreational activities that led to heated competition between rival mill teams, especially in baseball.

Some influential outsiders, both local residents and some wealthy out-of-state aristocrats, became concerned about the long working hours of the mill workers, especially the children. One such individual was a northerner, Maria Van Vorst, who wrote about social problems and described vividly the lifestyle of the mill workers and the working conditions within the Olympia and Granby mills, both located in Columbia near the Congaree River.

Maria Van Vorst Opposes Mill Children Exploitation

--a recounting of conversations, published in 1903--

Before leaving for Columbia, SC, Maria dined with friends who owned a half interest in several South Carolina mills. Their table was laden with the best that the market could buy. Their children led happy carefree lives and played with a variety of toys. During the dinner conversation, Marie casually asked: "Do you know that in your mills in South Carolina to-night, as we sit here, little children are working at the looms and frames - little children, some of them no more than six years old?" The hostess replied, "I don't know it; and I can't believe it!"

Maria told her she would see just how true this report was. Arriving in Columbia, SC, about the turn of the 20th Century, Maria took a mill job so she could see first hand the working and living conditions and the daily routine of the mill workers. She stayed in a small shanty with eleven others. All of the men slept to the right of the kitchen and women and children slept to the left. She described the air as foul. By 5:45 a.m., they had eaten breakfast and were ready to start their twelve-hour day, which began at 6 o'clock. Working by her side was a small girl of eight. Her skin was weathered, rough and resembled hide; yet the girl doggedly grasped her spools. Her hair was tangled with cotton threads and bits of lint. From her mouth exuded a black stain of snuff as she chewed the root. Maria documented twelve-hour working days with only Saturday and Sunday off, low pay, and other menial working conditions before contacting "The State" newspaper. She was politely told, "We need no aid! The people of South Carolina are aroused to the horror and will cure it themselves..."

Upon return to the North, Maria had lunch with her mill owner friend. After seeing the friend's children frolic in and out of the house, Maria told her about the horrors of mill village life. Her friend said, "Those little children - love the Mill! They like to work. It's a great deal better for them to be employed than for them to run the streets! I believe that they are really very happy."

Maria asked her friend, "What do you think of a model mill with only nine hours a day labour, holidays and all nights free, schools, where education is enforced by the State; reading-rooms open as well as churches - amusement halls, music, recreation and pleasure, as well as education and religion?"

Her friend replied, "I think that united, concentrated action on the part of the cotton mill owners might make such a thing feasible; for us to try it alone would mean ruin." Maria replied, "Not ruin, a reduction of income."

She replied, "We couldn't compete. To compete, I must have sixty-six hours a week!"

In 1902, George R. Webb, a member of the South Carolina legislature from a mill village near Aiken, introduced the "Child Labor Bill." At that time there were no limitations on the age of children working in textile mills. Twelve-hour days were expected. Many children began working at the age of six. Webb's legislation was labeled the "Ten Hour Work Limitation Bill." He knew that his fellow legislators who had no contact with mill family working conditions must be persuaded. While visiting the Granby Cotton Mill, he saw an eleven-year-old boy who was dwarfed, very pale, and tired looking. His poor health had resulted from long working hours. His mother agreed to bring the boy to a night legislative session. Mr. Webb exhibited this boy in front of the speaker's desk. Then he called a page, who was a healthy robust boy of the same age to come forward so legislators could make a comparison. This strategy was very effective and Webb's bill became the first Child Labor Bill passed in South Carolina.

Other leaders in the fight for child labor laws were South Carolina Governor McSweeney, and N.G. Gonzales, the editor of Columbia's major newspaper, *The State*. By 1903, children under twelve were prohibited entirely from working in factories. This is the same year that Maria Van Vorst published her account exposing the problems of mill village life. In 1907, South Carolina enacted a sixty-two hour maximum workweek in mills. However, companion proposals calling for the minimum age of mill workers to increase from twelve to fourteen and for compulsory school attendance failed. In 1917, when Richard I. Manning was Governor, the minimum age for mill workers was finally raised to fourteen, but compulsory education was again rejected.

Eighteen years later in the mid 1930's, a newspaper article was read to students at the Olympia Mill School outlining very graphically the plight of the mill worker. It was considered by the public to be a "most vicious attack" on mill workers, but <u>not</u> on the cotton mill owners. The article appeared in a college newspaper and outlined in graphic detail the plight of the mill workers. Upon reading this open letter, the superintendent of Olympia Mill School called a student body assembly so the letter could be read to them.

Newspaper Article Read at Olympia Mill School

--article from college newspaper, author unknown, April 1935--

Your shoulders are humped and your head is bent; your dull gray eyes are spiritless and your mouth is just a hard straight line in a yellow face under the blue lights of the mill. You are diseased and unhealthy looking, standing there in your faded overalls with one suspender loose. Your face is cracked and your throat and lungs are lined with cotton.

Every night the whistle blows and you plod home to swallow your bread and beans, comb the cotton from the straggly gray hair, wash your wrinkled face, and then lie down on your hard, unclean mattress until the whistle's blast calls you back to your machine in the mill.

In those close, four-room green and yellow houses filled with soot from the mill's smokestack and dust from the road, you breed countless children, dirty and ill-fed, who will grow up to take your place in the cotton mill.

You are narrow-minded and ignorant, you with your six years of schooling. And you are afraid, afraid of your bosses, afraid of being laid off. You are desperately frightened by knowledge. Therefore you shun it, and are content to stay a coward.

Recreation for you is in talking baseball and in seeing, on Saturday nights, some cheap Western movie full of guns and ropes and horses and fights. And your pleasure is wasting your nickels in the drug store slot machine.

On your day off, dressed in your shiny cheap suit and dingy white shirt, you come down to the village square and sit in the sun in front of the company store and spit tobacco juice on the sidewalk from between your decaying yellow teeth. You gossip with other factory bucks, and miss the clamor of the mill.

You join a union and pay your dues. And you attend meetings where loud-mouthed bunk-shooters shout lies at you and yell against the stretched-out, and tell you that if you strike and lose your jobs you will no longer be poverty-stricken. And you believe them. These mealy-mouthed hypocrites tell you that you are the salt of the earth and bulwark of the nation, and then grab your dollar contributions "to the cause" and put it in their pockets, while your children go without shoes.

On Sunday you put on your red tie and go to church with your consumptive wife, and while she goes in and sits on the left side of the narrow wooden church you stand outside, you and your cronies, and spit tobacco juice. And then you go in and sit down on the right side away from your wife. You hear the preacher speak of Christian living and high ideals. What do you know about high ideals, you broken $16-a-week mill hand?

Listen, you lint-head you are just another poor, illiterate, cotton mill worker. You stand with a thousand others just like you for five days a week, eight hours a day, running and watching and nursing and tending a power loom all for 40 cents an hour. What do you know about life? What do you know about music? What do you know about 'love?' What could you know about anything? You are dead! You died on your 16th birthday when you went to work in the cotton mill.

After hearing the first paragraph, the student body interrupted the reader by loud boos and catcalls. When the reader finished, the entire student body rose in a crescendo of howls and boos. The principal stood before the podium and reminded the student body that the "pen was mightier than the sword." He also reminded the students that "they were there to become scholars, and that is what they shall be!" After hearing about the reading at the Olympia Mill School assembly, the South Carolina House of Representatives adopted a resolution to have the author of this article examined at the state mental hospital on Bull Street. The author, who himself worked in a mill, protested that his letter had been misinterpreted and that it had been written in "free verse and style," as an assignment in a journalism class. The author explained that he had attempted to copy the style of Carl Sandburg. Some accepted the writer's explanation, but most did not. For the students at Olympia Mill School, this letter and the reaction to it became a rude wake up call that united the student body in their efforts to become better educated. A few years later in 1938 during President Franklin D. Roosevelt's administration, both federal and state governments ended child labor under the age of sixteen and lowered the workweek to forty hours. For the most part, these laws remain in effect today.

Activity 7D-1: The Fall Line Zone and the Columbia Canal

POWER THINKING EXERCISE - "Risky River"

Your group has been hired by the State Insurance Commission to make a presentation to the Columbia City Zoning Board regarding new building codes to regulate construction in river floodplains. Insurance companies don't want to have to insure buildings in floodplains because they know that rising river levels will eventually cause water damage to structures and the companies don't like to take risks that will cost them more money than they collect from property owners. In preparation for your presentation, you have just received a copy of the U.S. Army Corps of Engineers Special Hazard Information Report outlining 50-year, 100-year, and 500-year flood levels for the Congaree, Broad, and Saluda rivers in the Columbia area. These flood levels indicate the probability of a flood of that magnitude occurring once during that time interval, but does not predict exactly when that event will happen. Use a wipe-off pen to mark each location on the topographic map on MAP 7D, COLUMBIA. Use contour line information to mark estimated flood levels on the map for the 50-year, 100-year, and 500-year floods. Transfer this floodplain information to the large aerial photograph on IMAGE 7D, COLUMBIA and list current land uses in the floodplain area. Identify structures currently at risk and propose some future land uses of the floodplain that do not require the construction of new buildings.

	50-year Flood	100-year Flood	500-year Flood
Congaree River at Seaboard Coast Railway	115 ft	153 ft	162 ft
Congaree River at Gervais Street Bridge	153 ft	157 ft	171 ft
Broad River at Interstate Highway 20	174 ft	177 ft	185 ft
Saluda River at Interstate Highway 26	178 ft	180 ft	184 ft

To avoid confusing potential real estate developers, you must write a new section to the city code, which precisely defines the areas that fall into the "floodplain" category. Make your language as simple as possible, but also as precise as possible. Your group should be prepared to defend your definition and justify the wording in your proposed revision to the city code.

Materials

MAP 7D, COLUMBIA
IMAGE 7D, COLUMBIA
MAP 3A, LANDSCAPES AND LANDFORMS
Figure 7D-2: "Map of Columbia, 1850"
Newspaper Article, "Congaree Canoeists Find Rapids Rough; Some Capsize", page 7D-1
Wipe-off Pens

PERFORMANCE TASKS

(Icon Key) Overview = ✈; Science = ☼; Math = 💻; History = 🕮; Language Arts = ✍

1. **Compare & contrast Piedmont & Coastal Plain areas of Columbia. ✈**

Part I Piedmont Landscapes

Use contour line information from the topographic map on MAP 7D: Columbia, to describe the landscape characteristics of the Piedmont portion of Columbia. Is this area best described as flat, hilly, or mountainous? Look over the entire upper portion of the map and record the location and elevation of the highest and lowest points in the area of Piedmont topography, and enter your data on the chart provided below. Add the two elevations together and divide by two to estimate the 'average elevation' of the Piedmont area. Record the difference in water elevation between the Broad River at the top of the map and the Congaree River at the Gervais Street Bridge in downtown Columbia. Enter this data on your chart also and then calculate the river gradient (divide elevation difference by horizontal [ground] distance between the two points).

Part II Coastal Plain Landscapes

Use contour line information from the topographic map on MAP 7D: COLUMBIA, to describe the landscape characteristics of the Coastal Plain portion of Columbia. Is this area best described as flat, hilly, or mountainous? Look over the entire lower portion of the map and record the location and elevation of the highest and lowest points in the area of Coastal Plain topography, and enter your data on the chart provided below. Add the two elevations together and divide by two to estimate the 'average elevation' of the Coastal Plain area. Record the difference in water elevation between the Congaree River at the Gervais Street Bridge in downtown Columbia and the Congaree River at the bottom edge of the topographic map. Enter this data on your chart also also and then calculate the river gradient (divide elevation difference by horizontal [ground] distance between the two points).

Use the information gathered from Part I and Part II to fill in the chart that follows. Once you complete your chart, write a brief narrative summary describing the differences in average elevation, relief, and average slope (river gradient) between the Piedmont and Coastal Plain.

	COMPARING REGIONAL CHARACTERISTICS	
CHARACTERISTIC	**PIEDMONT Part I**	**COASTAL PLAIN Part II**
Highest Elevation (location & height)		
Lowest Elevation (location & height)		
Relief (highest - lowest)		
Average Elevation		
Change in River Elevation		
River Gradient		

2. **Interpret infrared (false-color) aerial photographic image.** ☼

Infrared aerial photographs are printed using a special 'false-color' shifting procedure that prints each color at the next shorter wavelength. For example, on a false-color image, a red car would appear to be yellow; a yellow car would appear to be green; and a green car would appear to be blue. Vegetation reflects strongly in infrared wavelengths that we cannot see; so when these infrared images are printed, the color is shifted to the next shorter wavelength (red) portion of the spectrum, which we can see. Therefore, healthy vegetation will always appear bright red on a false-color image. Clear blue water will have its color shifted as well, to the shorter violet wavelengths. On some photographs, the violet appears to be almost black. Water with lots of sediment in it often looks brownish or greenish to us, so on a false-color image, the muddy water will appear as a milky blue color.

Use your knowledge about color shifting to interpret the following features on the large aerial photograph on IMAGE 7D, COLUMBIA. Refer to MAP 7D, COLUMBIA if you need help locating any of these features.

a. Describe the water quality (clear or muddy) in the Broad River
b. Describe the water quality (clear or muddy) in the Saluda River
c. Describe the water quality (clear or muddy) in the Congaree River
d. Describe the water quality (clear or muddy) in the Columbia Canal
e. Describe the water quality (clear or muddy) in the pond at Huger and Richland Sts.
f. Does the Football Stadium near the bottom of the photograph use real grass or artificial turf for its playing field? Justify your answer.
g. Which bridges over the river have a concrete road surface, and which are asphalt?

3. **Determine length changes of Columbia Canal over time.** 💻

Read through the description of the original Columbia Canal of 1819 on page 7D-6 and trace with a wipe-off pen the route of this original canal onto the topographic map on MAP 7D, COLUMBIA. Note that this route does not match exactly the modern canal route. Use the scale bar on the map to measure the length of the original canal. Compare the path of your tracing to the path of the canal shown on the Downtown Columbia Historic Map on MAP 7D. Estimate the river elevations at both the northern and southern ends of the original canal and calculate the approximate drop in elevation between these two points.

Now trace the route of the 1888 canal, which is essentially the modern extent of the canal. Use the map scale on MAP 7D to measure the length of the modern canal. Estimate the river elevations at both the northern and southern ends of the modern canal and calculate the approximate drop in elevation between these two points. Use percentages to express how much longer the modern canal is than the original and how much higher the drop in elevation is for the modern canal versus the original.

4. **Correlate city land use patterns to landscape region.** 🕮

Use the smaller aerial photograph on IMAGE 7D, Columbia, to examine the geographic distribution of major land use categories in the City of Columbia. Explain

how you can recognize residential areas. Are these mostly in the Piedmont or the Coastal Plain section? Explain how you can recognize industrial areas. Are these mostly in the Piedmont or Coastal Plain section? Explain how you can recognize agricultural areas. Are these mostly in the Piedmont or Coastal Plain section? Give some possible reasons why each land use would favor its particular landscape region.

Examine the Downtown Columbia Historic Map on MAP 7D, COLUMBIA and compare the street pattern to Figure 7D-2, "Map of Columbia, 1850." What differences stand out between streets in the Piedmont section of the city versus streets in the Coastal Plain section of the city? Give some possible reasons why these exist.

5. **Re-tell canoeist story from different perspective.** ✍
Read the newspaper article, "Congaree Canoeists Find Rapids Rough, Some Capsize," on page 7D-1. The writer tells where the canoeists started their trip (Hope Ferry) and where they planned to end their trip (Gervais Street Bridge). However, there are no other specific geographic features mentioned in the entire story. Consult both the topographic map on MAP 7D, COLUMBIA and the aerial photograph on IMAGE 7D, COLUMBIA to locate the starting and ending points and use a wipe-off pen to circle these locations on both the map and the photo.

The writer presents an objective point of view, focusing on a factual recounting of the events that took place. She briefly mentions the stories of two specific canoeists, Sharon Ramsey and Jennifer Hartshorn. Select one of these two people and write a journal entry representing the day's events from their personal subjective point of view. Be sure to use plenty of adjectives to describe the events and concentrate on accurately portraying the feelings and concerns of the person you are representing. Use a wipe-off pen to trace the inferred route of your selected canoeist on the topographic map on MAP 7D, COLUMBIA and indicate the most likely place where her boat capsized.

ENRICHMENT

(Icon Key) Overview = ✈; Science = ☼; Math = 💻; History = 🕮; Language Arts = ✍

1. **Determine when and how often the Congaree River floods.** ☼
Research seasonal flow rates of the Congaree River, including the number of floods per year, and their expected severity. How often does the river reach flood stage? Which month has the highest flow; the lowest flow? Mark the position of the flood limit of the highest and lowest months on the topographic map on MAP 7D, COLUMBIA with a wipe-off pen.

2. **Relate Columbia Fall Line Zone location to other cities.** ✈
Examine MAP 3A, LANDSCAPES AND LANDFORMS, and trace with a wet-erase marker the boundary between the Piedmont and Coastal Plain regions; known as the Fall Line Zone. List all major cities located along this line. How many of these cities are capital cities of states? Explain why so many capital cities were located along the Fall Line Zone.

Activity 7D-2: Columbia and the Civil War

POWER THINKING EXERCISE - "Crossing Crisis"

Because of its position on the Fall Line Zone of a major river system, the Columbia area has served as a transportation crossroads even before there was a city located there. Divide into three groups, one dealing with Native American travelers in the 1500's (before the city existed); one dealing with the time of George Washington in the late 1700's (when the city had just been started and was only a few years old); and one dealing with General Sherman's time in the mid 1800's (basically the same timeframe as the Downtown Columbia 'Birds Eye View' map). Each of these groups is confronted with a similar problem - how and where to cross the river to get from one side to the other. Use MAP 7D, COLUMBIA and IMAGE 7D, COLUMBIA to investigate this problem, but remember that some features on these cartographic products might not have been there at the time you are researching.

Carefully examine the physical features shown on both the aerial photographs and the topographic map and pick the most favorable location at which a large group of people could cross the river. Use a wipe-off pen to trace this route onto the topographic map on MAP 7D. Describe how such a crossing might have been attempted and make a list of all of the materials and/or supplies you would have needed to make the crossing.

Write down any other natural factors you can think of that would have made the crossing either easier or more difficult. Compare answers with other groups to see if crossings in different historical periods were always made at the same locations and under the same environmental conditions.

Materials
MAP 7D, COLUMBIA
IMAGE 7D, COLUMBIA
Figure 7D-1: "Original Plan for City of Columbia, l786"
story, "One Account of the Burning of Columbia" on page 7D-9 and 7D-10
story, "Another Account of the Burning of Columbia" on page 7D-11
Wipe-off Pens

PERFORMANCE TASKS

(Icon Key) Overview = ✈; Science = ☼; Math = 💻; History = 🕮; Language Arts = ✍

1. **Locate famous Columbia buildings and other historic sites. ✈**
   Emma LeConte (writer of the diary entry on Page 7D-9,10) lived on the campus of South Carolina College in one of the houses on the southeast corner of Pendleton and Sumter Streets. This original part of the college campus is bounded by Bull, Sumter, Pendleton, and Green Streets and is referred to as the "horseshoe," a "U"-shaped, tree-filled area surrounded by classrooms and faculty residences. The buildings around the horseshoe are visible on both the Downtown Columbia Historic Map and the topographic map on MAP 7D, COLUMBIA. Locate the "horseshoe" on both the historic and topographic maps and also on the NAPP aerial photograph on IMAGE 7D, COLUMBIA, and pick out as best you can the site of Emma LeConte's house.

Locate the old Confederate Mint building [north side of Gervais Street between Huger and Pulaski Streets] on the Downtown Columbia Historic Map on MAP 7D. This building, which is shown with no roof, was the site of the Evans and Cogswell printing establishment, where Confederate money was printed during the Civil War. It was reported burned in 1865 by Sherman's troops. Later it became the site of the state liquor dispensary. Today, it is an abandoned warehouse in need of repair.

Read "Another Account of the Burning of Columbia" on Page 7D-11 and locate on the Downtown Columbia Historic Map on MAP 7D the two churches (Baptist and Methodist) that are referenced in that story. The Baptist Church is designated by the number '20' and the Methodist Church is designated by the number '17' on the historic map. Suggest an explanation for why the Union soldiers might have believed the sexton when he directed them to the 'wrong' church.

2. **Approximately what time of day was the aerial photograph taken. ☼**
Use the NAPP aerial photograph on IMAGE 7D, COLUMBIA to estimate the time of day that the photograph was taken, based on the angle indicated by shadows cast by various city buildings. You will actually be using the buildings like huge sundials and reading the angle each shadow makes relative to the direction of true north. At local noontime, the shadow should point directly north. Sketch a diagram showing the various positions of the sun in the sky over Columbia during different times of day. Determine which way the shadow should point in the morning, and which way it should point in the afternoon. Look at several shadows on the aerial photograph and estimate as closely as you can the exact time of day that the photograph was taken. How different would your answer be if Daylight Savings Time was in force here?

The sun's position in April (when this photograph was taken) is approximately 5 degrees north of the celestial equator. Columbia is situated on the 34th parallel of latitude north of the equator. At midday (local noon) the sun would therefore appear to be about 60 degrees above the horizon and building shadows would be at their minimum length. Locate the tall building on the northeast corner of Assembly and Gervais Streets [refer to topographic map on MAP 7D for street names] and use the scale bar on the aerial photograph to measure the shadow length. Refer to your answer about what time of day the photo was taken to infer how long the shadow should be at local noon. Use the inferred shadow length from this building and the formula printed below to calculate the approximate height of that building. Note: Look up the tangent of 60 degrees and sketch a diagram showing similar triangles to visually outline your trigonometric procedures.

$$\text{height of building} = \text{Tangent } 60° \times \text{length of shadow}$$

3. **Analyze the cannon attack on the South Carolina State House. 💻**
General Sherman's attack on Columbia began along the west bank of the Congaree River, in modern day West Columbia. A historical marker stands along Highway #378 halfway between the Gervais Street bridge (Meeting Street) and the Highway #12 bridge. Locate this site on the topographic map on MAP 7D, COLUMBIA and

mark this spot with a wipe-off pen. Also locate the South Carolina State House (capitol building), at the southeast corner of Assembly and Gervais Streets in downtown Columbia and mark this spot with a wipe-off pen. Use the scale bar on the map to measure the horizontal distance between the two points. Also use contour line data to estimate the elevation of both points. Draw a cross-section diagram in which the horizontal scale and vertical scale are equal and place both points in their proper position on this diagram. Draw your best estimate of the path a cannon ball would travel when fired from the west bank of the Congaree River towards the State House. At approximately what angle would the cannon have to be tilted to allow the cannon balls to hit the target when the cannons were fired?

4. **Compare modern city plan to original specifications.** 🕮

The original plan for Columbia set by the state legislature in 1786 called for a two mile by two mile square plot of land near Friday's Landing to be divided into ten streets, at least 60 foot wide, per mile. These provisions called for a total of 400 square blocks to be laid out, each block having an area of two acres, each block divided into one-half acre lots making a total of eight lots per block. Four acres were set aside for a State House to be built at the intersection of the two principal streets, each 150 feet wide, which were named Assembly and Senate to honor the state legislative bodies. As detailed on Figure 7D-1, 'Original Plan for City of Columbia, 1786,' the downtown area was bounded by Upper Street to the north, Harden Street to the east, Lower Street to the south, and the Congaree River to the west. Use a wipe-off pen to outline the downtown historic district on both the Historic Map and the Topographic Map on MAP 7D, COLUMBIA. Use information from both maps to assess how well the original plans were followed. Fill in the following chart comparing the 1872 Historic Map and the 1972 Topographic Map. Answer 'yes' or 'no' for each item.

SPECIFICATION	1872 HISTORIC MAP	1972 TOPO MAP
2 mile by 2 mile square plot		
streets not less than 60 feet wide		
main streets: Assembly & Senate		
main streets are 150 feet wide		
main streets wider than		
ten streets per mile		
total of 400 blocks in downtown		
each block has area of 2 acres		
four acres set aside for state house		
streets go all the way to river		

Compare the Historic Columbia and topographic maps on MAP 7D and make a list of all streets you can find in the historic downtown area whose names were changed between 1872 and 1972. Also speculate on what happened to the small streams that are visible on the 1872 historic map, but not on the modern topographic map.

5. **Write story about person who was both a hero and a villain.** ✍
   Some people do things that are viewed as heroic by one segment of the population and villainous by another segment. Two examples are highlighted in the story entitled "Another Account of the Burning of Columbia" on Page 7D-11. The unnamed soldiers who burned the Methodist Church were viewed as heroes by the Union army but as villains by the citizens of Columbia. Likewise, the unnamed custodian at the Baptist church who sent the soldiers across the street to burn the 'wrong' church was a hero to Baptist church members, but a villain to Methodist worshippers. Using this story as a model, put yourself in the place of a citizen of the city of Columbia during the Civil War. Write a story about something you might have observed or done which would appear heroic to one side and villainous to the other. Use the Historic Columbia Map on MAP 7D, COLUMBIA, to pinpoint a location for your story and include specific site references that clarify where your story took place. Share these stories within your group and select your favorite to tell to the entire class.

ENRICHMENT

(Icon Key) Overview = ✈; Science = ☼; Math = 💻; History = 🕮; Language Arts = ✍

1. **Research system for naming streets in Columbia.** 🕮
   The city of Columbia used a very structured system for naming its streets. The north-south trending streets east of Assembly Street were named for famous South Carolina Revolutionary War generals. The north-south trending streets west of Assembly Street were named for Continental Army generals from other states who fought in South Carolina. The east-west trending streets north of Senate Street were named for local South Carolina statesmen, United States President George Washington and his 'lady' (Martha Washington), local trees (Walnut, Lumber, and Laurel), and the nearby Taylor Plantation, known as 'The Plain'. The east-west trending streets south of Senate Street were mostly named for agricultural commodities (wheat, rice, etc.), with a few streets honoring famous Columbia citizens (Pendleton, Green, Devine). Select a person or a commodity memorialized in a street name in historic downtown Columbia and research their contributions to the history of South Carolina or the nation. Use a wipe-off pen to trace the length of your selected street on the Historic Columbia Map on MAP 7D, COLUMBIA.

2. **Compare Emma LeConte's writing style to modern diaries.** ✍
   As you read Emma LeConte's diary entry describing the Fall of Columbia ("One Account of the Burning of Columbia" on page 7D-9 and 7D-10), identify examples of unusual sentence structure, and point out outdated usage in spelling, punctuation, and the use of pauses. How does her journal entry format differ from what we would expect from a modern writer entering data on "Facebook™" or sending a text message? Rewrite at least one of her paragraphs using today's style and format, including modern punctuation and abbreviations. LeConte's style is identified with the aristocratic class of Southern culture of the time. Explore how phrases and comments in a modern text message can be used to gain information about the social status of the writer.

Activity 7D-3: Life in a Mill Village

POWER THINKING EXERCISE - "Mill Mania"

By the 1880's, entrepreneurs from northern states and Europe were competing with each other to set up as many cotton mills as possible in southern cities. These businessmen would build mills anywhere they could find a source of water power to turn the machinery used to run looms for weaving cloth from raw cotton. The owners typically would also construct a nearby mill village for workers that would usually contain about 20 houses as well as a church, a school, and a company store.

You have been sent to Columbia by a New York businessman to scout out a site for a new cotton mill that his company plans to build in this city. Your task is to study the Downtown Columbia Historic map on MAP 7D: COLUMBIA to locate a prospective site for a new cotton mill and associated mill village. You must consider the availability of transportation routes for getting bales of cotton to the mill, a water power source sufficient to run the mill, and a transportation system capable of getting the finished goods to market.

Use a wipe-off pen to sketch drawings (to scale) of a cotton mill and the associated mill village buildings listed above (20 houses, church, school, company store) on MAP 7D. Also write a brief report to your boss explaining your choice of site based on landscape features and the ability to harness the necessary water power and meet transportation needs.

Materials

MAP 7D, COLUMBIA
IMAGE 7D, COLUMBIA
Figure 7D-3: "Brookland Mill Village Map, Columbia, 1886"
Figure 7D-4; "Olympia Mill Village map, Columbia, 1886"
story, "Maria Van Vorst Opposes Mill Children Exploitation", page 7D-15
story, "Newspaper Article Read at Olympia Mill School", page 7D-16, 7D-17
story, "Company Owned Housing Rules", page 7D-14
Wipe-off Pens

PERFORMANCE TASKS

(Icon Key) Overview = ✈; Science = ☼; Math = 💻; History = 🕮; Language Arts = ✍

1. **Locate and characterize mill villages in Columbia.** ✈
   The Columbia Duck Mill is shown on Figure 7D-3 "Brookland Mill Village Map, Columbia, 1886" on Page 7D-13. The mill is on the northeast corner of Gist and Lady Streets by the Columbia Canal. The Columbia Duck Mill Village, often called the Columbia Mill Village, is a neat little section of houses located just west of the Congaree River south of Meeting Street. Mill workers walked to work by crossing the Congaree River Bridge. Note the 'parks' just south of Meeting Street and just east of 'C' Avenue on State Street.

   The Olympia Mill (Pacific Mills Company) is marked by two large buildings on the south side of Heyward Street on Figure 7D-4 "Olympia Mill Village Map, Columbia,

1886" on Page 7D-13. The Olympia Mill Village is located between the State Fair Grounds and the Olympia Mill. Note the 'Olympia School' on the corner of Olympia Avenue and 10th Street and the 'ball park' on Assembly Street just south of Heyward Street across from the Capital City Mills property. Two other mills are shown on the map, the Richland Mill on the southeast corner of Tobacco and Assembly Streets, and the Palmetto Mill on Assembly Street near the Capital City Mills property.

Locate both the Columbia Duck Mill and Village and the Olympia Mill (Pacific Mills) and Village on the topographic map on MAP 7D, COLUMBIA and on the aerial photograph on IMAGE 7D, COLUMBIA. Use the topographic map symbols to identify schools and churches. Are the 'parks' still there? Is the 'Olympia School' still there? Do you notice any major changes over time in either of these mill villages? Explain your answer. Notice that the Olympia Mill (Pacific Mills) is not located along the Columbia River or Columbia Canal, but instead is right next to several railroad tracks. What do you think the Olympia Mill used for power to run its machinery? How do you think the Olympia Mill transported its products to market? Based on this information, which mill (Columbia Duck Mill or Olympia Mill) do you think was built first? Explain your reasoning.

2. **Assess health risks associated with work in cotton mills.** ☼
   Outline a daily workday schedule for a typical cotton mill worker your age from the time you would wake up in the morning until the time you would go to bed at night. Document exactly where you would go and what you would do on an hourly basis. For each different location you mention, assess the health risks associated with that activity. Refer to the background information on pages 7D-12 through 7D-17 [especially the "Maria Van Vorst" item on page 7D-15 and the "Newspaper Article Read at Olympia Mill School" on page 7D-16 and 7D-17] for clues to possible health problems associated with working in a mill.

3. **Calculate changes in cost of living expenses since the 1920s.** 💻
   The company store of another local Columbia Mill, Hampton Mills, advertised its food prices in a printed flyer in the early 1920s. Compare these prices to the prices to the year 2000 prices for the same items and calculate the percentage increase in cost for each of these commonly used foods.

ITEM	1920 COST	2000 COST	% CHANGE
Maxwell House Coffee – per pound	$ .38	$3.40	
Salmon – tall can	$ .10	$1.40	
Carnation Milk – tall can	$ .12	$ .59	
Adluh Self Rising Flower – per pound	$ .04	$ .20	
Sugar – per pound	$ .08	$ .36	
Stew Meat – per pound	$ .10	$1.59	
Good Roast Meat – per pound	$ .15	$1.70	
Good Steak – per pound	$ .20	$4.99	
Pork Hams – per pound	$ .30	$1.38	
Eggs – per dozen	$ .40	$1.00	

Based on the average mill worker's salary of $16 per week (refer to the "Newspaper Article read to Olympia Mill School" on page 7D-16 and 7D-17), estimate the weekly food expenses for a 1920's mill family of two adults and two teenagers, all of whom worked at the mill.

4. **Document that mill workers were 'underpaid' and 'overworked'.** 🕮
   Read the account of Maria Van Vorst on Page 7D-15 and pay close attention to her descriptions of child labor abuses and working conditions in cotton mills. Based on her observations, can you support her contention that mill workers were "underpaid and overworked?" Define what you would consider to be 'fair pay' and 'reasonable work hours' for a job in a cotton mill today. How would you answer the mill owner's statement at the end of the article, "to compete, I must have sixty-six hours a week?"

5. **Why was news article offensive to Olympia School students.** ✍
   Read the "Newspaper Article Read at Olympia Mill School" on Page 7D-16 and 7D-17 and identify at least ten examples of words, phrases, or sentence fragments that you think would have been offensive to these students. Adjectives are particularly important to conveying the writer's opinions of people, places or things. Select the five adjectives in the article that you consider most offensive and explain why you feel that way.

   Persuasive writing is intended to call attention to a condition or situation and rally public support to address the concerns that are raised. Do you think this newspaper letter succeeds in describing the poor conditions of mill families in a way that would get the attention of the general public? Defend your answer.

ENRICHMENT

(Icon Key) Overview = ✈; Science = ☼; Math = 💻; History = 🕮; Language Arts = ✍

1. **Determine if author accurately copies style of Carl Sandburg.** ✍
   The author of the "Newspaper Article 'read at Olympia Mill School" on Page 7D-16 and 7D-17 claimed that his letter had been written in 'free verse and style' in an attempt to copy the writing style of the famous novelist Carl Sandburg. Research the writing style of Carl Sandburg and judge for yourself whether the letter writer was successful in imitating Sandburg's style.

2. **How does mill housing contract differ from modern rent contract.** 🕮
   Locate an example of a modern rental contract commonly signed by families renting a typical house, apartment, or mobile home. Compare this document to the typical mill housing contract described in the chart, "Company Owned Housing Rules" on page 7D-14, written by the mill owners. Do you know where the 'cut-off water valve' is located where you live? Do you turn the lights off as you leave each room? Use the following matrix as a guide for comparing the housing agreement for mill workers with a typical modern rental contract. List any other similarities or differences that you discover.

COMPARE 1920s MILL HOUSING AND MODERN RENTAL CONTRACTS

RULES	MILL HOUSING	MODERN
Who owns the 'lamps' and pays the 'light bill'?		
Who pays for plumbing repairs?		
Who pays for pipes bursting during freeze?		
Who mows the lawn?		
Is sub-renting rooms allowed?		
Who pays for upkeep of house / apt?		
Where are cows, horses, chickens kept?		
What are restrictions on parking wagons or cars?		