# The Natural Divisions of Arkansas

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by the Arkansas Natural Heritage Commission


This material was originally published in 1978 as:

The Natural Divisions of Arkansas

A Three-Week Unit

Classroom Guide

By Thomas L. Foti

A first and later second printing, in 1979, were both published by the Arkansas Ecology Center in cooperation with the Arkansas Department of Education and funded in part by a grant from the U.S. Office of Education, Department of Health Education and Welfare

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The author, Tom Foti, worked as a consultant to the Arkansas Department of Planning on the first inventory of natural areas in Arkansas, which resulted in the 1974 publication *Arkansas Natural Area Plan* and the creation of the Arkansas Natural Heritage Commission (ANHC). Tom's chapter in that publication was also the first time that the natural divisions of the state were defined and described in print.

Tom joined the ANHC in 1985 as the Plant Community Ecologist, later became Chief of Research, and today serves as a part-time advisor to the Commission and agency staff. He is the author of a second book on Arkansas titled, Arkansas and the Land, published in 1992 and funded in part by the Department of Arkansas Heritage.

When the *Natural Divisions of Arkansas* was first introduced to teachers and students around the state, there was no Internet or World Wide Web and a personal computer might have been a Radio Shack TRS-80, an Apple II, or a Commodore PET. Yet, today, 30 years later, the publication remains one of the most popular downloads from the ANHC website (www.naturalheritage.com).

Therefore, in this third printing of *Natural Divisions of Arkansas,* we have kept as much of the original publication as possible. The wonderful line drawings by David Rose, who also worked at the Arkansas Ecology Center, are still here. The original maps are here too, although they have been reformatted with updated questions. The original text has been updated too, because in the three decades since the first printing, Arkansas and the world have changed. A glossary has been added along with a resource section that includes websites.

The major addition is the use of ANHC's natural community illustrations which include six major types of natural communities that occur in Arkansas, along with representative plant and animal species. These illustrations are also part of an educational poster series developed by ANHC. Here, they supplement the examples of what lives in each natural division.

Finally, we also want to include the original acknowledgements and hope that this edition carries forward their important contributions:

- Mills High School
- Bryant High School
- William Fulton, for work as the environmental education specialist at the Arkansas Department of Education
- Scotta Sheets, for work as a social studies teacher at Mills High School

# Table of Contents



The central viewpoint of this look at Arkansas is that history develops in relation to land. When people arrived in the territory which was to become Arkansas, they found mountains, prairies and lowlands. As they fitted their uses of the land to the unique characteristics of the natural environments, their own lifestyles changed, sometimes dramatically.

Goals of this book

- To get better acquainted with Arkansas.
- To learn what an environment (natural system) is, what its parts are, how they are related to each other and in particular, how people relate to the environment as a whole. There are two important terms we will be using: **natural system** and **natural division.** A natural system is an environment made up of interrelated parts. A natural division is a place (a geographical area) which is occupied by a distinctive natural system.
- To use Arkansas examples in teaching science and social studies. Information in this book can be used in meeting general framework requirements, such as L.S.4.2.2 *Describe characteristics of various habitats*, but it is particularly useful in addressing Arkansas-related requirements, such as ESS.8.4.*1 Locate natural divisions of Arkansas.* Specific framework references are listed in Appendix 3.

# WHAT IS A NATURAL SYSTEM?

"Natural system" is another name for an environment. This name is used because it communicates the important idea that an environment is made up of a system of interrelated parts. A natural system is composed of many things, but the major components we will consider are geology, climate, plants, animals, soil and people.

| Component | Aspect | Example |
|---|---|---|
| geology | rock type<br>topography | sandstone, limestone<br>flat, rolling |
| climate | temperature<br>precipitation | cool, hot<br>wet, dry |
| plants | general plant communities | upland hardwood forest<br>upland pine forest |
| animals | communities/species related to plant communities | lowland pine forest -deer<br>bottomland hardwood forest - alligator<br>upland hardwood forest – Scarlet Tanager |
| soil | pH<br>nutrients<br>texture<br>depth<br>formation | deep, fertile alluvial soils |
| people | land use (the basic way people relate to the natural system)<br>land-use problems<br>culture<br>history | agriculture, where there is deep soil; recreation in the mountains<br>pesticides<br>“Old South” or “hillbilly”<br>Civil War battlefields on open prairies |

## WATER

Even though water is not listed as a "component" of a natural system, it deserves a great deal of attention because it is a part of all the components. For example, water in the ground or in lakes or oceans is a part of geology; water as rainfall or snow is a part of climate. It is also found in the soil and in the tissues of plants and animals.

## TIME

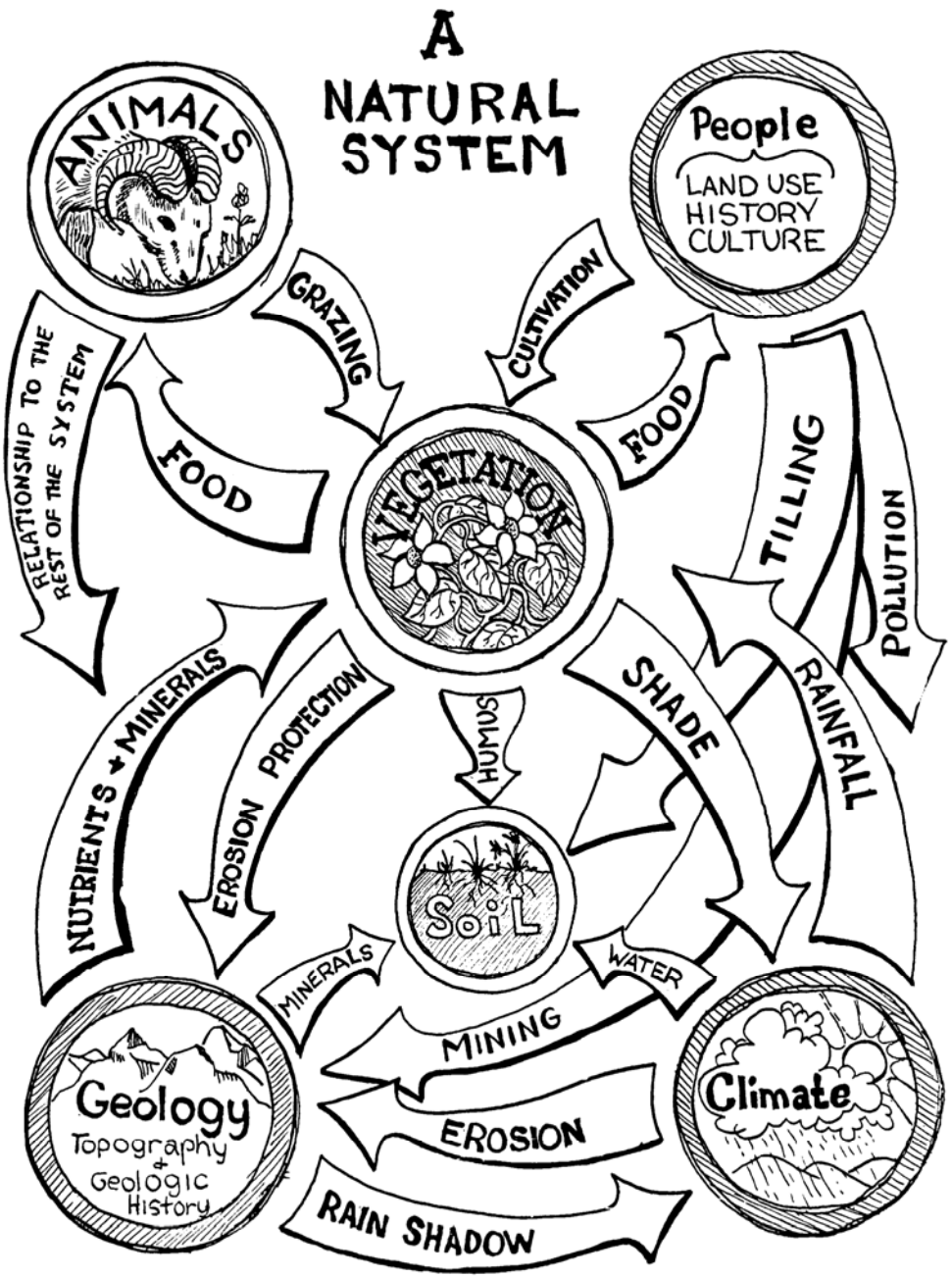
Time is also not a "component" of a natural system, but its importance cannot be overlooked. Given enough time, any natural system will change into a new system. In nature, everything is constantly changing. Time was included in the table in areas such as "geological history", "how soil is formed" and people's "history".

## RELATIONSHIPS BETWEEN THE COMPONENTS

Every place on the earth has a distinctive geology and climate. These are the two basic components of any natural system. These two components affect and change each other. They also, in most places, create habitat for plants. Plants affect geology and climate, and they also provide habitat for people and other animals.

People relate to the rest of the natural system through the way they use the land. Their use of the land in turn affects their culture, their history and sometimes leads to environmental problems.

This diagram shows some of the ways the components of a natural system relate to each other:

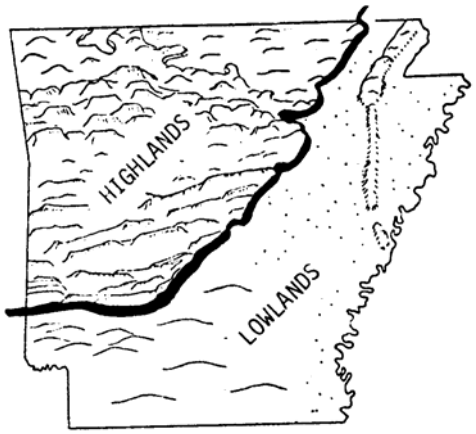


## WHAT IS A NATURAL DIVISION?

The easiest way to learn about natural systems is to compare and contrast two or more. In this discussion, the emphasis will be on general natural systems which extend over large geographical areas or natural divisions.

A natural division is a geographic region which is occupied by a major natural system. The natural systems of any two natural divisions are different.

In Arkansas there are two major regions, the highlands in the northwest and the lowlands to the south and east:




There are obvious differences here in all the basic components, with the highlands having mountainous topography, ancient rock geology, upland oak hickory or oak-pine forest, "hillbilly" culture, etc. The lowlands, on the other hand, have rolling to flat topography, moderately recent to very recent sediment geology, bottomland oak-hickory or oak-pine forest and “Old South" culture.

These regions are obvious and knowledge of them and their differences is very valuable. However, they vary enough in themselves to make further division desirable.

## NATURAL DIVISION, NATURAL REGION OR ECOREGION?

A natural division is a type of geographic region and this study will concentrate on the six major natural divisions in Arkansas. However, it is important to note that none of these natural divisions or “regions” exists exclusively inside Arkansas’s boundaries. We share of each of them with surrounding states. Therefore, Arkansas’s natural divisions are part of a larger framework of ecoregions.

To effectively implement assessment, management, and research on an ecoregional scale, across local, regional and national levels, environmental planners need to have a common hierarchical framework. The US Environmental Protection Agency (EPA) has initiated an ecoregional mapping project which includes some new perspectives on the nature and definition of ecoregions, and some new names for the regions which encompass Arkansas’s natural divisions. See the EPA website listed in Appendix 1 for more details and copies of the ecoregion maps of Arkansas.

The new names do not invalidate the previous ones used in this publication. Instead, they illustrate the continuing growth of scientific knowledge and the need to increase our understanding of the nature of ecoregion boundaries and the variability of characteristics within ecoregions.

# Six Main Natural Divisions of Arkansas


## Main Ecoregions of Arkansas

Ozark Highlands

Boston Mountains

Arkansas Valley

Ouachita Mountains

South Central Plains

Mississippi Alluvial Plain

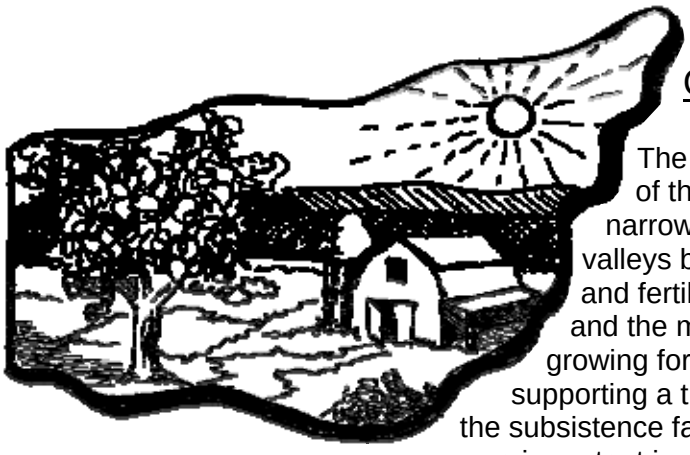
Mississippi Valley Loess Plains

# A Brief Look at the Natural Divisions

## Ozark Mountains

The Ozark Mountain division occupies the northwestern corner of the state. The flat-topped mountains there are the remnants of eroded plateaus whose horizontal layers of ancient sedimentary rock were forced upward millions of years ago. They are covered with an upland forest of oak and hickory. Settlers eked out a bare living from farms in some of the wider valleys and on the level hilltops. In the process, they developed a unique mountaineer lifestyle. Cash-crop agriculture was seldom practical in the rocky soils of the Ozarks, and most of the residents of the mountains moved away when their subsistence economy became unacceptable.

The Ozarks are currently experiencing a recreational-retirement boom which is bringing people back, this time to enjoy perhaps the greatest resource of the Ozarks region, its beauty. But the new residents bring with them new problems, problems created by the demands they place on the limited water supplies of these headwaters streams and the pressure their sewage places on the life systems of those streams.



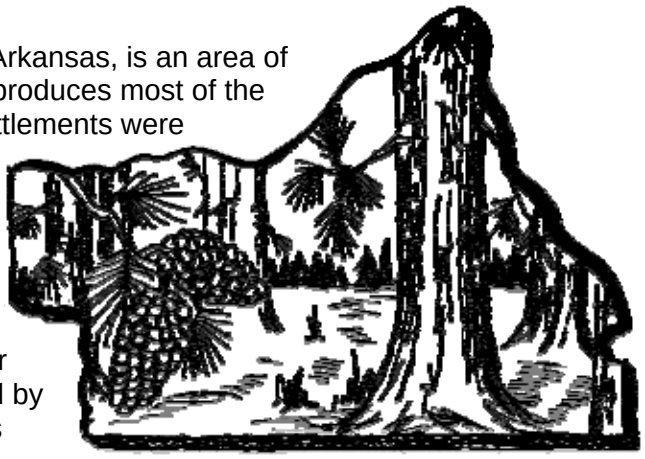
## Ouachita Mountains

The Ouachita Mountain division, south of the Ozarks, is characterized by long, narrow ridges of folded rock. Many of the valleys between the ridges are large enough and fertile enough for large-scale agriculture, and the mountains themselves with their fast-growing forest of oak and pine are capable of supporting a thriving timber industry. Therefore, the subsistence farmsteads and the isolation that were so important in developing the Ozarks culture were never as prevalent in the Ouachitas. The culture which did develop was a varied blend of upland and lowland, poor mountaineer and rich planter. Today, the Ouachitas are used for agriculture, forestry and mining. Each of these uses presents potential problems and each must be done carefully in order to protect the natural system which makes the uses possible.

## Arkansas River Valley

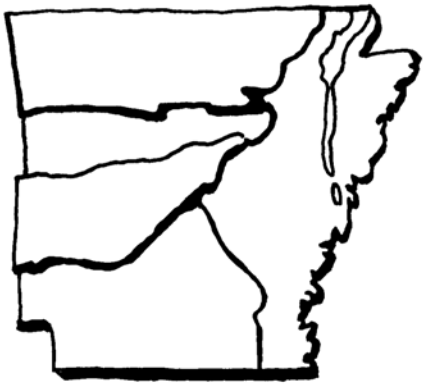
The Arkansas River Valley division lies between the two major mountain systems along the Arkansas River which was an important early path of communications. This division developed quickly as a focus for settlement in the territory. Dardanelle, Cadron and Ft. Smith sprang up here. Cash-crop agriculture soon became important in the valley and has remained so since. Because the valley possesses scenic quality, abundant water, fertile land and good transportation, it has become and will remain one of the major centers of population growth and industrial development in Arkansas. The problems encountered here spring from an abundance of people and progress, such as air and water pollution.

## Coastal Plain

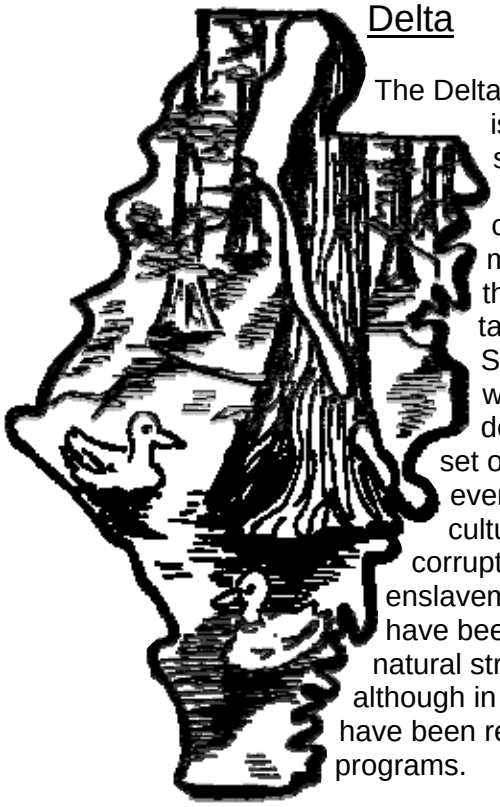


The Coastal Plain division, in southern Arkansas, is an area of rolling, pine- covered hills, which today produces most of the state's forest products. Several early settlements were in this region, in the broad bottomlands along the Red River. Men cleared the forest there for cotton plantations and lived in the grand southern style. The pine forest of the rolling hill-land provided a valuable resource to the northern timber industry. After the timber was cut, much of this land was occupied by small farms, but today most of the farms have been abandoned and most of the people have left or moved to the towns which are sustained by the timber industry. Their farms were bought by the timber companies early in the twentieth century when they began to realize that this land might be better used for growing trees.

Today the Coastal Plain is again almost uninterrupted forest which is intensively managed for timber production. In the future, the people of the Coastal Plain must deal with such controversial issues as clear cutting, herbicides and other tools of modern intensive forest management. They must also deal with the problems associated with mineral production from their land, particularly petroleum



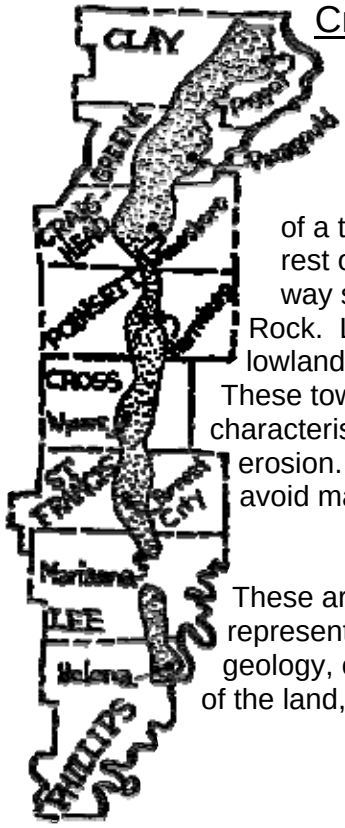
## Delta



The Delta division, occupying the eastern third of the state, is a land created by rivers. The ocean-bottom sands and gravels of the Coastal Plain have here been swept away and in their place sand, silt and clay carried by the rivers have been deposited. A majestic bottomland hardwood forest once covered the land, except for a high terrace occupied by the tall grasses and flowers of the Grand Prairie. Settlers found the Delta a harsh, inhospitable land with its floods, mosquitoes and malaria. But the deep soil made it tremendously fertile, and so men set out to conquer it, first with the labor of slaves, and eventually with huge machines. The antebellum culture which developed here was both romantic and corrupt, a refined culture dependent upon the enslavement of people and the land. Though the people have been freed, the land remains conquered. Hardly a natural stream or a bit of the once majestic forest remains, although in recent decades, substantial areas of farmland have been replanted in trees through several government programs.

The people of the Delta must determine whether the remaining few remaining acres of the bottomland forest will be preserved, whether at least a few streams will remain unditched and clear, or whether all this is to be sacrificed to the ever-expanding demand for food and fiber.

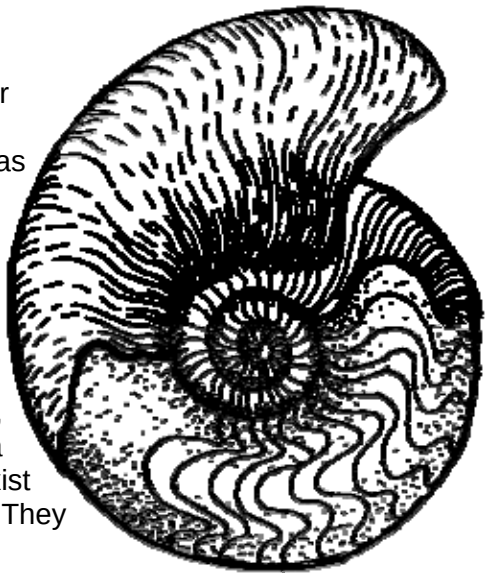
## Crowley's Ridge




The Crowley's Ridge division is the exception to the character of eastern Arkansas. It is a two to three hundred foot high ridge capped by dust (loess) deposited by ancient winds. It does not flood and is covered with an upland forest of a type more similar to that of Tennessee than to the forest of the rest of Arkansas. Because of its elevation, the ridge was the site of way stations on the first road from Memphis to Batesville and Little Rock. Later, many of the towns which derived their income from the lowlands of the Delta were located on the ridge to avoid floods. These towns include: Jonesboro, Forrest City and Helena. A unique characteristic of the dust which creates the ridge is its susceptibility to erosion. Any human activities there must "tread with light feet" to avoid massive destruction of the delicate soil.

These are the major natural divisions of our state. Each division represents a unified system whose representative components are geology, climate, soil, plants and animals. Humans, through their use of the land, also play an important part.

# How Arkansas Got To Be



This look at the story of Arkansas begins after the major continents on the Earth had been formed and started drifting. Arkansas was covered by the sea. The time was the Paleozoic, in Greek, the time of "ancient 1ife."

## ARKANSAS IN PALEOZOIC TIME

At the beginning of the Paleozoic, 500 million years ago, Arkansas was completely covered by the sea, but there were islands nearby. Up in what is now east-centra1 Missouri, there were the St. Francis Mountains, masses of granite which had been formed almost half a billion years before and were destined to continue to exist as a recognizable mountain range even to the present. They would also become the structural center of the Ozark Mountains.

| ERA | PERIOD | EPOCH | TIME |
|---|---|---|---|
| Cenozoic | Quaternary | Holocene | 10,000 years ago to present |
| | | Pleistocene | 1.8 million – 10,000 years ago |
| | Tertiary | Pliocene | 5 – 1.8 million years ago |
| | | Miocene | 24 – 5 million years ago |
| | | Oligocene | 34 – 24 million years ago |
| | | Eocene | 55 – 34 million years ago |
| | | Paleocene | 65 – 55 million years ago |
| Mesozoic | Cretaceous | | 144 – 65 million years ago |
| | Jurassic | | 206 – 144 million years ago |
| | Triassic | | 248 – 206 million years ago |
| Paleozoic | Permian | | 290 – 248 million years ago |
| | Carboniferous (Pennsylvanian Mississippian) | | 354 – 290 million years ago |
| | Devonian | | 417 – 354 million years ago |
| | Silurian | | 443 – 417 million years ago |
| | Ordovician | | 490 – 443 million years ago |
| | Cambrian | | 540 – 490 million years ago |

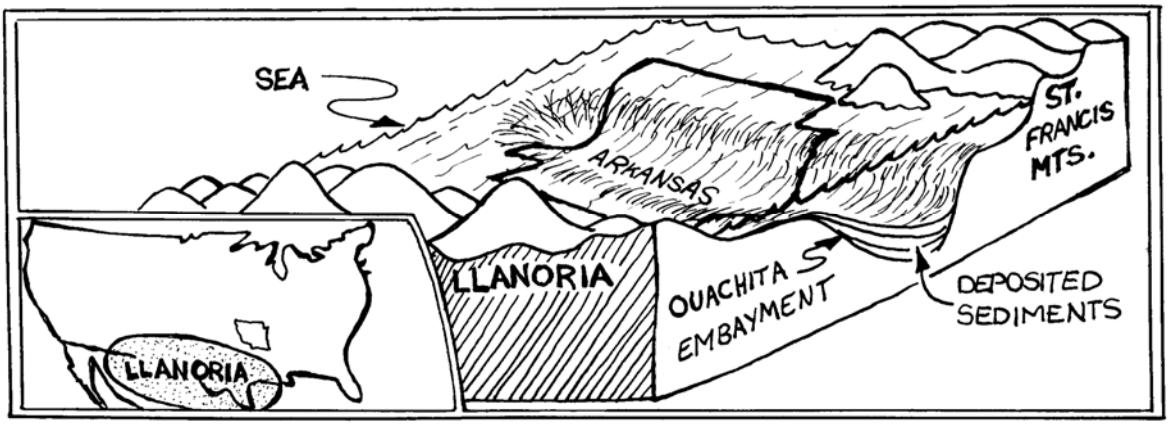
## “LLANORIA"

To the south of the Arkansas sea was another land mass, some geologists call "Llanoria.” This lofty mountain range was fated to erode away completely. The sediments of Llanoria would eventually form the rock of the Ouachita Mountains.

## ROCKS OF THE OUACHITAS

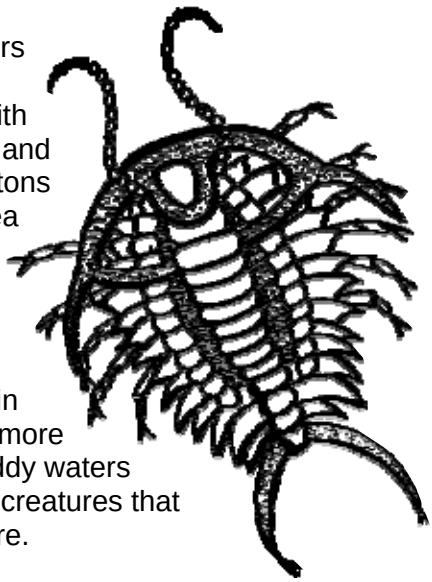
Under the waters of southern Arkansas lay a deep basin called the “Ouachita embayment” or the “Ouachita Basin,” where 30,000 feet of sediments from Llanoria accumulated.

The Arkansas sea varied in character. To the south, the rivers of Llanoria were bringing in sediments at such a great rate that the waters were continually cloudy with sand or mud. Few living things existed there. The sandy sediment of Llanoria accumulated to such great thickness in the Ouachita Basin that the tremendous weight compressed the sediment into the sandstones typical of the Ouachitas today. Muds were compressed into shale, and the rocks were ready tobe formed into mountains.




## ROCKS OF THE OZARKS

To the north of the Ouachitas, just south of the St. Francis Mountains, the sea was very different in character. The waters there were shallow and quiet and the water was as warm as the water around today's Bahamas. Those waters teemed with life, mostly tiny plants and animals, but also sponges, corals and clam-like brachiopods. When those animals died, their skeletons (even the shells of the one-celled animals) dropped to the sea floor where they accumulated to great thickness and were compressed into limestone and dolomite.

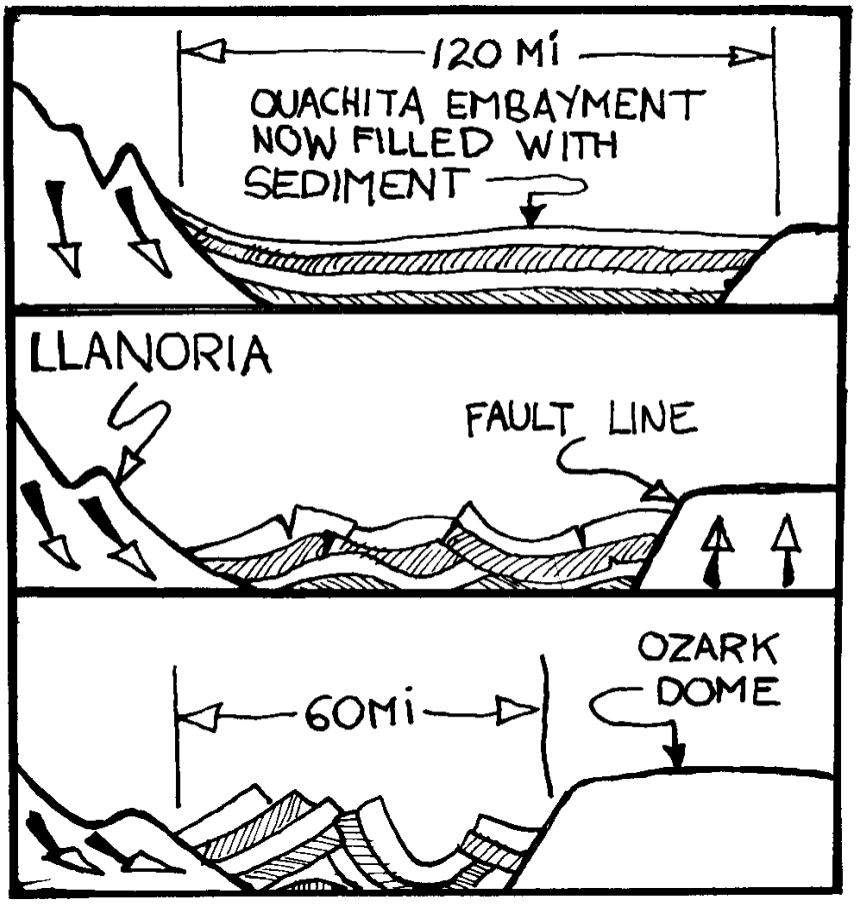


## FOSSILS

Occasionally, a complete shell of one of the creatures living in Ozark area of the Arkansas sea would be preserved. Many more fossils are found in the Ozarks than the Ouachitas. The muddy waters of the Ouachita Embayment did not provide good habitat for creatures that could become fossils, therefore fossils are relatively rare there.

## MOUNTAIN BUILDING

This quiet period of accumulation and consolidation of rocks lasted for a full 150 million years until the middle of the Paleozoic Era. Then, during a period of the Paleozoic known as the Mississipian, or maybe the slightly later Pennsylvanian period, things got more violent. To start it all off, some geologists think that Llanoria sank! Whatever happened, it just dropped out of sight and hasn't been seen since.

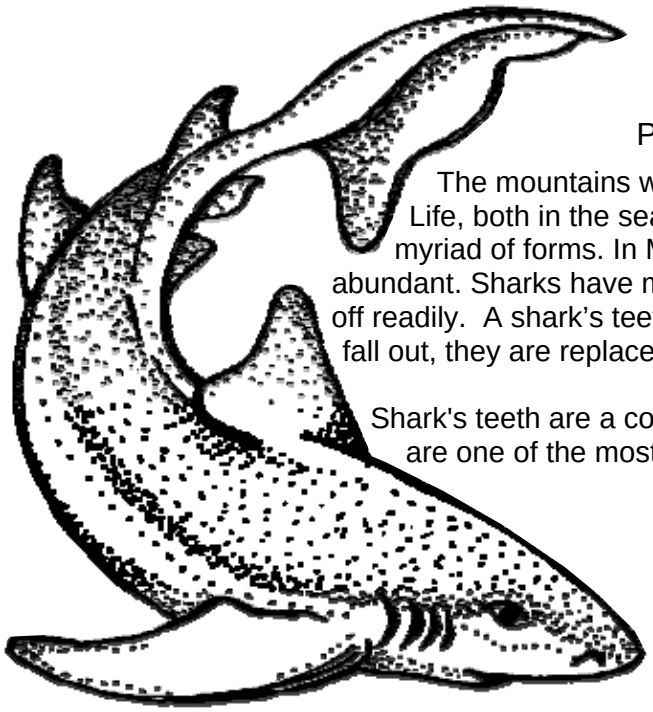



## FORMATION OF THE OUACHITAS

Because of that sinking or other actions of Llanoria, the whole Ouachita embayment was squeezed together until it was only half as wide. The violence of this activity can be seen by looking at road cuts and stream cuts in the Ouachitas today. The rocks are tilted, twisted, torn and wrinkled. The rocks themselves offer silent testimony to the fantastic forces involved. Almost as fast as the mountains were squeezed up, they were eroded down. And after this first burst of violent activity, they settled back, resigned to the effects of the wind and weather, which removed approximately 18,000 feet from their height.

## FORMATION OF THE OZARKS

While the Ouachita Mountains were undergoing periods of active formation and then erosion, activity started to the north. With the St. Francis Mountains as the center, a large area of rock was pushed straight up. There was little folding there, but rather the earth's forces simply lifted the ocean bottom rock from the sea to an elevation of three or four thousand feet.



## PLANTS AND ANIMALS

The mountains were not the only things changing. Life, both in the sea and on the land, was developing a myriad of forms. In Mississippian times, sharks became abundant. Sharks have modified scales for teeth, which fall off readily. A shark's teeth are in rows and as the outer teeth fall out, they are replaced by the teeth of inner rows.

Shark's teeth are a common fossil of Arkansas rock and are one of the most common vertebrate fossil.

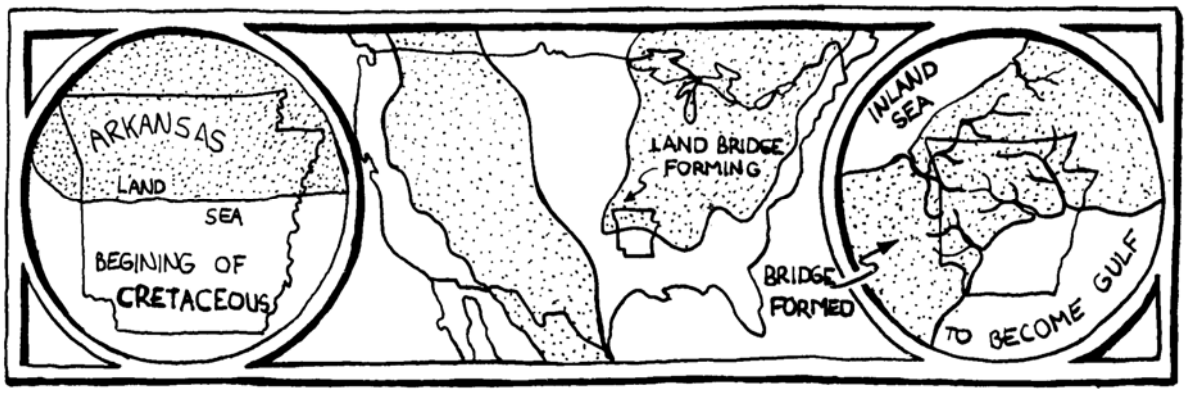
## THE ARKANSAS RIVER VALLEY

In the lowlands between the two mountain ranges, vegetation developed. Hundred-foot high Scale Trees grew on the edges of pools, shallow lakes and swamps. Their remains formed immense beds of peat which were later transformed into coal. Amphibians, reptiles and winged insects made their appearance.

# ARKANSAS IN THE MESOZOIC ERA

During the Mesozoic Era (the time of "Middle Life") life began diversifying rapidly. The dominant animals on both land and sea are reptiles, the most famous of which are the dinosaurs. They were so prominent that the Mesozoic is also called "The Age of Reptiles."

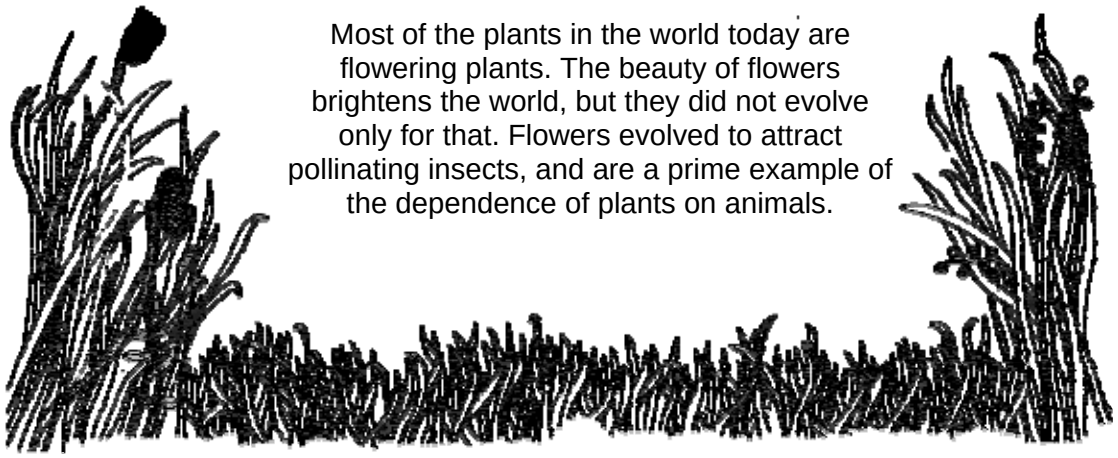
But dinosaurs are not the only life form around: birds and mammals also appear during the Mesozoic, as well as deciduous trees and flowering plants. For most of this period, the climate worldwide was warm and tropical, and shallow seas covered low-lying landmasses




# ARKANSAS IN THE CRETACEOUS PERIOD

During the Cretaceous period of late Mesozoic Era, the northern two-thirds of Arkansas and surrounding states had emerged from the sea. At the beginning of Cretaceous, the edge of the sea in the area of Arkansas ran in a more or less east-west direction across the state at about the latitude of Hot Springs.

Dinosaurs roamed the land during the warm climate of those days and a new development made its appearance, one which was to have profound effects on the character of life to come - the flower.



Most of the plants in the world today are flowering plants. The beauty of flowers brightens the world, but they did not evolve only for that. Flowers evolved to attract pollinating insects, and are a prime example of the dependence of plants on animals.

## SOUTHWESTERN ARKANSAS
(The Coastal Plain)

Tiny animals were abundant in the Gulf of Mexico which covered southern Arkansas during the Cretaceous Period.

Their microscopic remains drifted down in a steady rain to create beds of chalk and to mix with clay to form limey marl. Snails and oyster shells drifted into those deposits to form the heavily laden fossil areas of southwestern Arkansas.

Later in the Cretaceous Period, southwestern Arkansas and nearby areas of Oklahoma and Texas rose from the sea and their limey soils are exposed today as the blacklands.

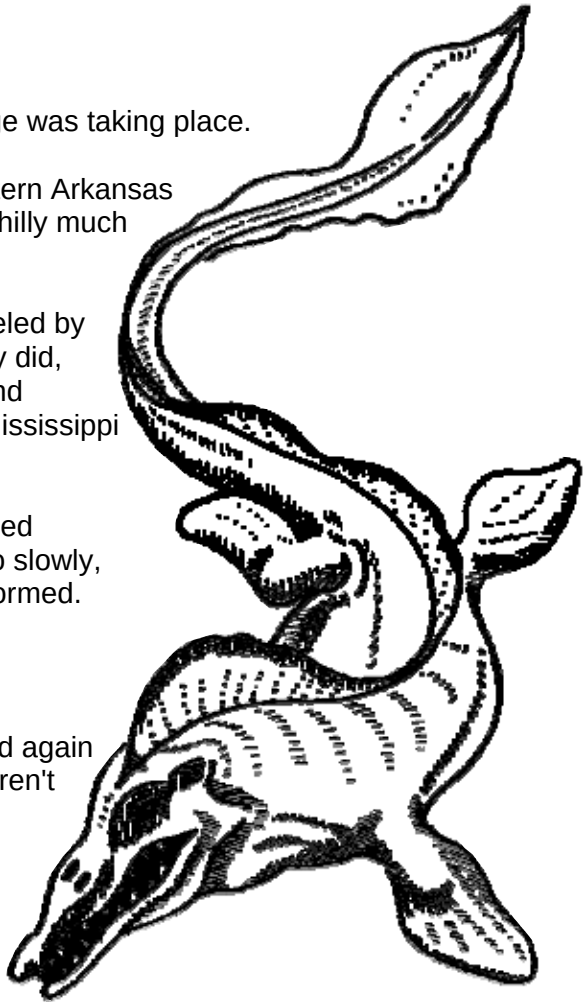
## THE DELTA

Meanwhile in eastern Arkansas another major change was taking place.

At the beginning of the Cretaceous Period, northeastern Arkansas was much different than it is today. It was rocky and hilly much like the mountain areas to the west.

Later in Cretaceous Period, the Paleozoic rocks, leveled by weather and time, began warping downward. As they did, the Gulf of Mexico advanced northward over them and created a bay which geologists would later call the Mississippi Embayment.

Although the base rocks themselves eventually warped downward over 4,000 feet, this process happened so slowly, that sediments filled the bay almost as quickly as it formed.

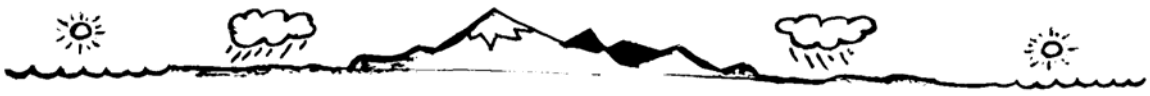


## PLANTS AND ANIMALS

Toward the end of the Cretaceous, the climate cooled again and the age of the giant reptiles ended. Dinosaurs aren't the only things that died out.

About 50 percent of the species on Earth became extinct. This included many other large reptiles, like pterosaurs and plesiosarus, as well as lots of plant species and marine animals.

Other life forms, such as homeothermic mammals and birds, flourished in what became the Cenozoic Era.



# ARKANSAS IN THE CENOZOIC ERA

Cenozoic time began about sixty million years ago and continues today. The first period of the Cenozoic era is known as the Tertiary.

## ARKANSAS IN THE TERTIARY PERIOD

### THE OZARKS

In the mountains, periods of erosion alternated with slight uplifts which helped form the landscape we see today. During this time, the final plateau surfaces of the Ozarks were formed. Both the Ozarks and Ouachitas eroded two or three times during this period into low-lying, relatively flat lands known as “peneplains.” Later, they uplifted again as relatively flat topped mountains all of about the same height. The results of this process are far more apparent in the Ozarks, where three plateau surfaces are apparent: the Boston Mountains, the Springfield Plateau, and the Salem Plateau.

### THE COASTAL PLAIN AND DELTA

During the Tertiary period, the Coastal Plain, along with the Delta, was characterized by the advance and retreat of the Gulf of Mexico. The advancing sea was never very deep and occasionally was so shallow that land plants could thrive there. The remains of these plants formed beds of peat which in turn was later transformed into lignite, a form of coal.

Finally about 50 million years ago, eastern and southern Arkansas rose from the Gulf for good. Today, in the Coastal Plain, the sands and gravels which made up the bottom and beaches of the Gulf can still be seen.

## ARKANSAS IN THE QUATERNARY PERIOD

Time advanced to the next period of the Cenozoic: the Quaternary, beginning about two million years ago. Much of Arkansas would be familiar to us, and we would see plants and animals we know today, but many others which we would consider odd. Primitive horses, camels, saber-tooth tigers, mammoths, and mastodons all lived in Arkansas during this time. The Oak-Hickory forest, which reached its culmination in this area, was well developed.

The mountains had reached the shape they retain today but there were still important changes to come in the lowlands, especially those of eastern Arkansas. The shoreline of the Gulf of Mexico had more or less assumed its present position, but rivers and lakes were to have a significant effect on the lowlands of Arkansas.

## THE DELTA

During the Quaternary, the lowlands of southern and southwestern Arkansas (the Coastal Plain) retained their ocean bottom character with rolling topography and a surface of sand and gravel.

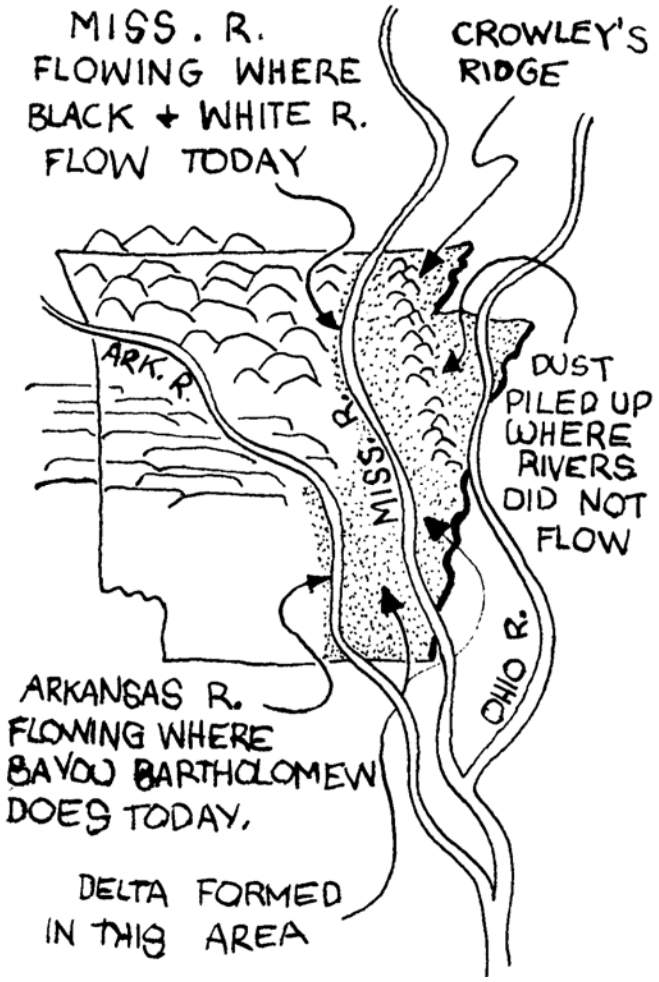
However, as the ocean receded from the Mississippi Embayment in eastern Arkansas, the embayment was traversed by large rivers which completely reworked the land by hauling away the top layers of ocean-bottom sand and replacing them with the sand, silt and clay which those rivers carried.

The rivers meandered over most of the plain of eastern Arkansas. At one time the Ohio River flowed over extreme eastern Arkansas, the Mississippi flowed to the west of it and the Arkansas still further to the west.

These three great rivers didn't join until they were well to the south of Arkansas. Their power to shape the land varied with the advance and retreat of the glaciers.

When the glaciers advanced (never nearer than the middle of Missouri), the rivers would dry to only a trickle.

But when the glaciers began melting, the rivers would swell to torrents which would cover the land with sediments. Occasional minor subsidence, or lowering, of the land would create large swamps where deep beds of clay would be deposited.



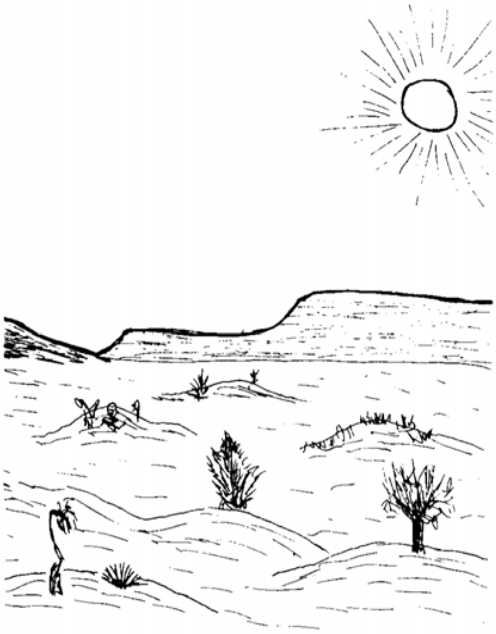

## CROWLEY'S RIDGE

In northeastern Arkansas, a slight divide was left where the Mississippi River and the Ohio river did not meander. During times when the glaciers retreated, these large rivers coated with lowlands with ground-up rock picked up from the north. After the glaciers locked up most of the water and this rocky mud dried up, the winds began to blow. The divide between the two rivers acted like a fence and the dust piled up against it, to a depth of as high as 50 feet.

By late Quaternary, the Mississippi Delta and Crowley’s Ridge were formed and Arkansas had reached its present shape.

# RECENT CLIMATE

Since the last glaciers retreated, about 8,000 years ago, the climate of Arkansas has changed dramatically. Part of the story of those changes is told by areas around the state where the land surface is covered with low mounds two or three feet high and 40 to 50 feet in diameter. These mounds are usually referred to as prairie mounds or more expressively as “prairie pimples,” and the explanations for them are numerous.



For many years, some people thought that the mounds were constructed by Native Americans, but archeological research has not found artifacts or other data to support this theory. Other ideas or explanations that are not supported by any evidence include: the mounds being formed by pockets of gas pushing up the surface, very large ant hill origins, or even very large prairie dog colonies.

A more scientifically acceptable theory is one that looks at the climatic history of the region. During the last 7,000 years, there were periods when the climate of Arkansas was cold and arid. The driest sites were occupied by desert-like shrubs. These sites were flat or gently rolling which allowed the wind to circulate freely and dry out the surface. These sites also had a subsoil of clay or rock that limited the ability of the plants to obtain groundwater, especially during the dry periods. This, in turn, limited any plant growth or groundcover between the scattered shrubs. Winds eroded away exposed soil on these sites and deposited it under the shrubs, leading to the formation of mounds.

The climate has moderated gradually since that time, and prairie vegetation replaced the desert plants. Prairie grasses are adapted to a climate which is too dry for trees and too moist for desert, so when Arkansas’s climate moderated enough for these conditions to exist, the areas which had been desert became grassland.

When settlers arrived, they associated the mounds with prairie, so they called them "prairie" pimples but they might more appropriately be called "desert" pimples instead.

Though the pimples were generally associated with prairie, they are often to be seen in forests as well. The climate of the state has continued to become more moist and as it has done so, trees have gradually overgrown the prairies. People have hurried the process by plowing the prairies and even leveling off the pimples.

The largest prairie in the state at the time of settlement was the 400,000 acre Grand Prairie which extended from Lonoke to Arkansas Post. Now, due to the pressures of rice and soybean cultivation, virtually all evidence of its prairie history has been obliterated. Elsewhere in the state, prairie habitat and the pimples have fared somewhat better.

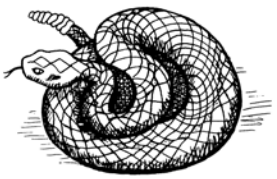
Prairie pimples can still be seen around Fayetteville and along the terrace land in the Arkansas River Valley, especially around Ft. Smith and Conway. Look along the terraces from Jonesboro to Brinkley, from Bald Knob to Searcy and from Monticello to Crossett and look from Arkadelphia to Hope. They occur elsewhere too, but you might have to look closer to find them.

# THE OZARK MOUNTAINS


The Ozarks have a special mountainous topography. Although the mountains are quite rugged in places, the tops tend to be flat and at the same height. An extensive land area having a relatively level surface raised sharply above adjacent land on at least one side is defined as a “plateau”; therefore, this region is more formally called the “Ozark Plateau.”

The Ozarks were formed when the bedrock was uplifted into high plateaus which were then eroded down into the present rugged shape. In a stream or road cut you can get a feeling for the geology of the area. The rocks that make up the Ozarks were deposited at the bottom of an ocean that covered Arkansas 300 million years ago. When certain creatures in the ocean died, their shells fell to the ocean floor and, over time, were compressed into limestone. Limestone is easily dissolved by water, so many caves, including the well-known Blanchard Caverns, have been formed by underground streams flowing through cracks in the limestone. The water flowing in these streams is not purified or filtered by passing through the limestone, so polluted water that enters a cave may very easily appear miles away as a polluted spring. A well drilled into the same underground stream will also be polluted.

The streams of the Ozarks are usually small and quite beautiful. As they carved mountains out of plateaus, they made bluffs, waterfalls, and even a natural dam on Lee Creek. The larger streams, like the Buffalo and White Rivers are well known by outdoor recreation enthusiasts. Some of the larger streams are crossed by man-made dams which form other recreational impoundments such as Beaver, Bull Shoals and Norfork Lakes. It should be remembered though, that under these lakes were rivers that were themselves once scenic and recreational resources.



Two of the chief natural communities found in the Ozark are upland hardwood forests and glades. See Appendix 4 for descriptions and illustrations of these natural communities.

Early residents of the Ozarks were pre-historic Indians known as bluff dwellers, because they often took shelter under overhanging bluffs. Their belongings and decorations can still be seen in many of the bluff shelters.

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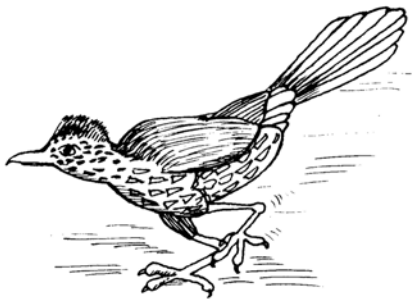
By the time the first Europeans arrived in the Ozarks, the bluff dwellers had been replaced by the Osage Indians. The Osage were warriors and lived a wandering life similar to the bluff dwellers before them. The early Europeans in this area adopted a similar lifestyle, but eventually settled down and became farmers.

The few places in the river valleys and on the flat tops of the mountains where the soil was deep enough for farming were far apart. The resulting isolation helped to develop the unique Ozark mountaineer or “hillbilly” lifestyle. This way of life was characterized by independence, suspicion of strangers and a unique type of mountain music, which is promoted as part of Arkansas’s tourist image today.

Between World War I and World War II, the subsistence lifestyle in the Ozarks became less and less desirable. Growing enough corn to eat (or sometimes maybe drink) was no longer enough. People wanted cash to buy kerosene and canned food. Some tried to grow cotton on the hillsides and when the topsoil eroded away, they left the mountains. Many other simply chose to leave the hard, isolated life.



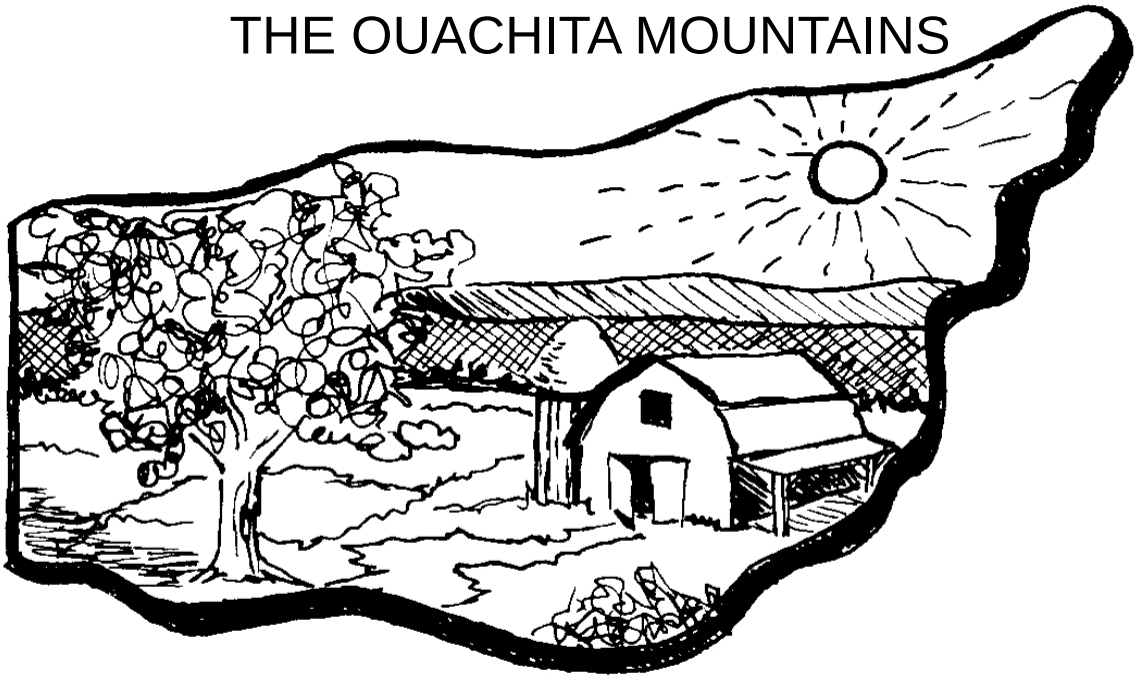
Now people are coming back to the Ozarks to enjoy what may be the area’s greatest natural resource: the scenery. But with more people come more problems. Water supplies for an increasing population are limited and the natural system is delicate. The small, high-quality streams are very limited in the amount of sewage that they can tolerate; therefore, sewage must be treated at additional expense to avoid the destruction of stream quality.

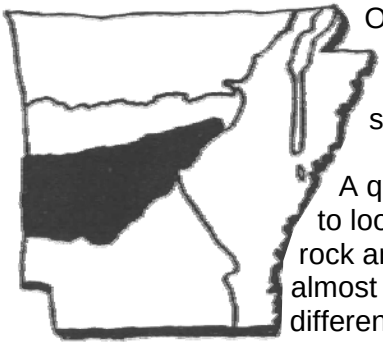
The area now hosts several industries which employ the added residents. The poultry industry is perhaps the largest, and care must be taken to keep chicken litter out of streams and underground channels. With beef prices rising, more land is being cleared for cattle grazing. The land clearing and overgrazing of pasture can lead to erosion and loss of soil. Anything put on the land to help grow pasture, such as chemicals or chicken litter, can run-off into the streams and caves.

The timber industry of the Ozarks is not large but much of it involves public land where intensive timber management practices may interfere with other public uses of the forest. Major population growth has taken place around retail, trucking and educational centers.

The natural system of the Ozarks has seen less degradation than most other natural divisions of Arkansas. Yet this system, particularly the cave-spring-stream water component, is probably more delicate than any other in the state, and needs sensitive, detailed plans for its protection.

# THE OUACHITA MOUNTAINS





One good way to understand the Ouachitas is to compare them to the Ozarks. Many people are surprised to the find that the Ouachitas differ from the Ozarks in several significant ways.

A quick way to visualize the difference in the two systems is to look at road cuts of each: in the Ouachitas, the layers of rock are almost always tilted; in the Ozarks, the rock layers are almost always horizontal. These differences result from the different geological histories of the two systems.

In the Ozarks, bedrock was pushed up into rugged, flat-topped mountains. In the Ouachitas, a belt of land about 120 miles wide was "squeezed together" until it was only half that wide. When that happened, the rock did what might be expected - it wrinkled up.

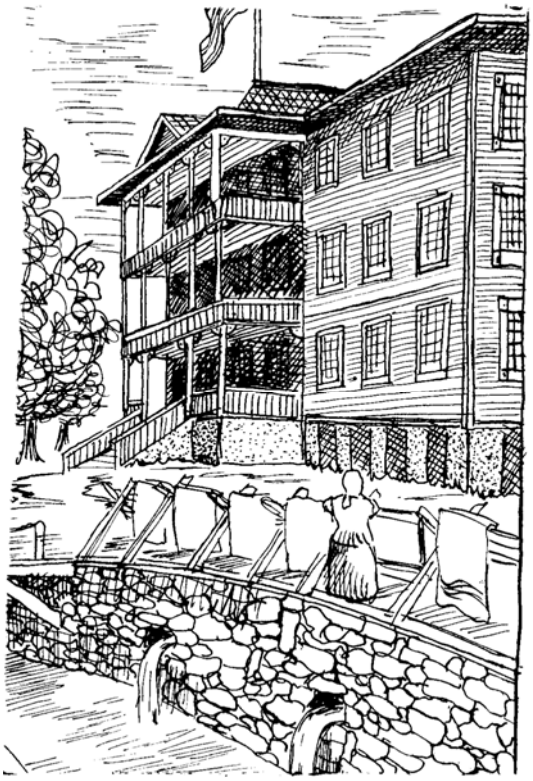
The mountains of the Ouachitas are big wrinkles in the earth's crust: long east-west trending, sharp-pointed ridges that may be a couple of miles wide and over a hundred miles long. The most common rocks of the Ouachitas are sandstone and shale rather than the limestone and dolomite that are so common in the Ozarks. Sandstone weathers into a sandy soil, and sandy soil is favorable to the growth of pine. It's not surprising then that pine forest is more widespread in the Ouachitas than the Ozarks.

The unusual east-west orientation of the mountain range means that the southern slopes of the mountains are warmer and home to pine hardwood natural communities, whereas the northern slopes are cooler and home to upland hardwoods. See Appendix 4 for descriptions and images of these natural communities.

The valleys of the Ouachitas tend to be much wider than the valleys of the Ozarks: up to 20 or 30 miles wide. This topography has influenced lifestyles in the area from the beginning, because there is fairly deep soil in these valleys. The Caddo Indians were some of the first people known to live in the Ouachitas. They wandered the hills, hunting and fishing, but they were also able to live in settled villages made possible by the agricultural crops which thrived in the relatively deep soils of the wide Ouachita valleys.

Early European settlers continued clearing the valleys for farms. Many of them grew into large plantations where the planters lived an elegant "Old South" lifestyle. Up on the ridges, though, folks lived a rugged pioneer life, more similar to that of the Ozark Mountaineer. Therefore, in the Ouachitas, there was a blend of lifestyles, with rich planter and poor mountaineer living close together.

The tremendous forces that wrinkled the Ouachita Mountains also evidenced today in many aspects of the area's tourism: quartz crystals and Hot Springs National Park. Early Native Americans recognized the Hot Springs area as a source of high-grade novaculite for arrowheads and for the healing value of the springs. The hot springs were first described by an exploring party led by Dunbar and Hunter in 1804. They had been sent out to describe the springs by Thomas Jefferson after the Louisiana Purchase.



The value of the springs was officially recognized in 1832 when the United States Congress formally withdrew the land around the springs from homestead or private purchase. This was the first time in history that the U.S. Government had reserved land for public use. The dominant public use of the springs has been therapeutic bathing. Bathhouses were built, and in 1921, government land surrounding the springs was declared a National Park.

Originally, the 45 to 70 hot springs flowed from the lower slopes of Hot Springs Mountain into Hot Springs Creek. The valley through which Hot Springs Creek flowed was not wide. In fact, in the area of the springs, it was too narrow for large bathhouses to be built.

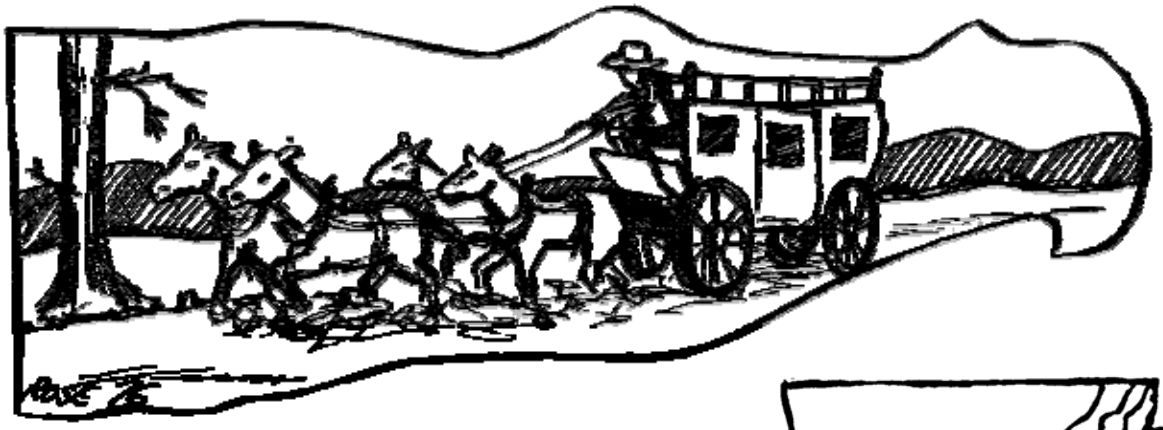
In 1883, a rock vault was built over the stream and the valley was filled to a depth of approximately 20 feet which created a wide enough flat place to build the present bathhouses and private buildings along Central Avenue. Today, the upper and lower ends of the vault are visible. In between, the stream, with riffles and pools intact, is flowing through the vault, under the street or under the porches of the bathhouses. It can be traced by the manholes and drains which lead to it.

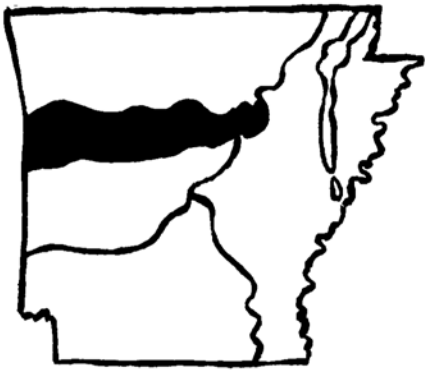
As Hot Springs grew, the vault's design could no longer accommodate flood flows and sometimes water backed up and flooded the streets. All but two of the original springs have been covered over, with pipes now carrying their water to a central distribution center.

Major uses of land in the Ouachitas also differ from the major land-uses of the Ozarks. Much more of the land is managed intensively for timber production, on sites owned by either the National Forest Service or private timber companies. Associated with timber production are a variety of controversial practices, such as clearcutting and large-scale applications of herbicides.

Another major use of land in the Ouachitas is mining: minerals such as barite, novaculite, and quartz, which were formed during mountain-building. Mining can cause several environmental problems, such as destruction of plants and animals by acid water which drains from mines into watersheds. Also, if the mine area is not reclaimed, the productivity of that land is lost. Mining, then, is a land-use which is important to the economy of Arkansas, but must be done carefully.

# THE ARKANSAS (RIVER) VALLEY





The natural division known as the “Arkansas River Valley” is now called simply the “Arkansas Valley” and the name encompasses not just the lowlands along the Arkansas River but also the trough up to forty miles wide between the mountains to the north and south.

Within the Valley are flat-topped mountains, typical of the Ozarks, and folded ridges, similar to those of the Ouachitas. Some of the rocks have flat strata typical of the Ozarks and others have tilted layers like those of the Ouachitas; however, there are also some unique features in this division found nowhere else in the state.

The Arkansas Valley is home to high, isolated, flat-topped mesas, buttes, or monadnocks such as Mount Nebo and Petit Jean Mountain, and the highest point in the state: Mount Magazine. At one time, these monadnocks were connected to the Ozarks and their structure is very similar to the southern Ozarks. They are capped by massive sandstone which helps to keep them from eroding away, and there are layers of shale below the sandstone. Under the sandstone ledges are bluff shelters like those found in the Ozarks. These bluff shelters may have been used by the same ancient bluff dwellers who also lived in the Ozarks. Later, others sought refuge in the bluff shelters. One of these was Belle Starr, a colorful Fort Smith outlaw. According to legend, she walled in the front of a bluff shelter along Rock Creek to make it into a fortress.

The streams of the Valley meander across shale, gradually exposing the soil that formed in the Valley by the weathering of this shale over millions of years. Along the Arkansas River and other major streams that cross the Valley, are deep alluvial soils deposited by the rivers. These soils are the most productive crop lands of the Valley.

The Arkansas River has a tremendous effect on both the wildlife and the people of the Valley. Along the river, in the wintertime, hundreds of thousands of ducks are found. On the river sandbars, eagles come to fish and sometimes prey on sick or crippled ducks. The Arkansas River is a primary migration corridor for many birds. Along the river, "sea gulls," such as the ring-billed gull, are common. These gulls nest in the far north and spend their winters on the gulf coast or further south. As they pass through Arkansas they often fly along the Arkansas River. Large rivers, such as the Arkansas, are recognized as a type of natural community. See Appendix __ for more plants and animals that are adapted to life on large rivers.

The rolling upland nature of the Valley has strongly influenced the lives of the people who live there. The first settlers lived a rugged pioneer life, but the gentle rolling hills of the Valley allowed people to quickly clear large farms. Most of the Valley has remained cleared and in agricultural production since. Today, there are pastures on the rolling hills and row-crops closer to the Arkansas River.

The Valley's landscape and the presence of the Arkansas River helped the area become a communications and transportation corridor through the mountains. The Arkansas River itself was the first major transportation artery, bringing Europeans from the eastern U.S. They traveled up the river into the territory that would become Arkansas on flatboats, keel boats and eventually steam boats. By the second half of the 1800s, overland transportation became more common. The Butterfield stage line ran over the rolling country of the Valley, instead of attempting to cross the rugged mountains on either side. Stage houses were built along the line to provide resting stations for the horses and riders. Around these way-stations, small towns developed which eventually grew into larger cities. Today, a major interstate highway runs through the Valley connecting these cities, including Ft. Smith, Clarksville, Ozark, Russellville, Morrilton, and Conway.

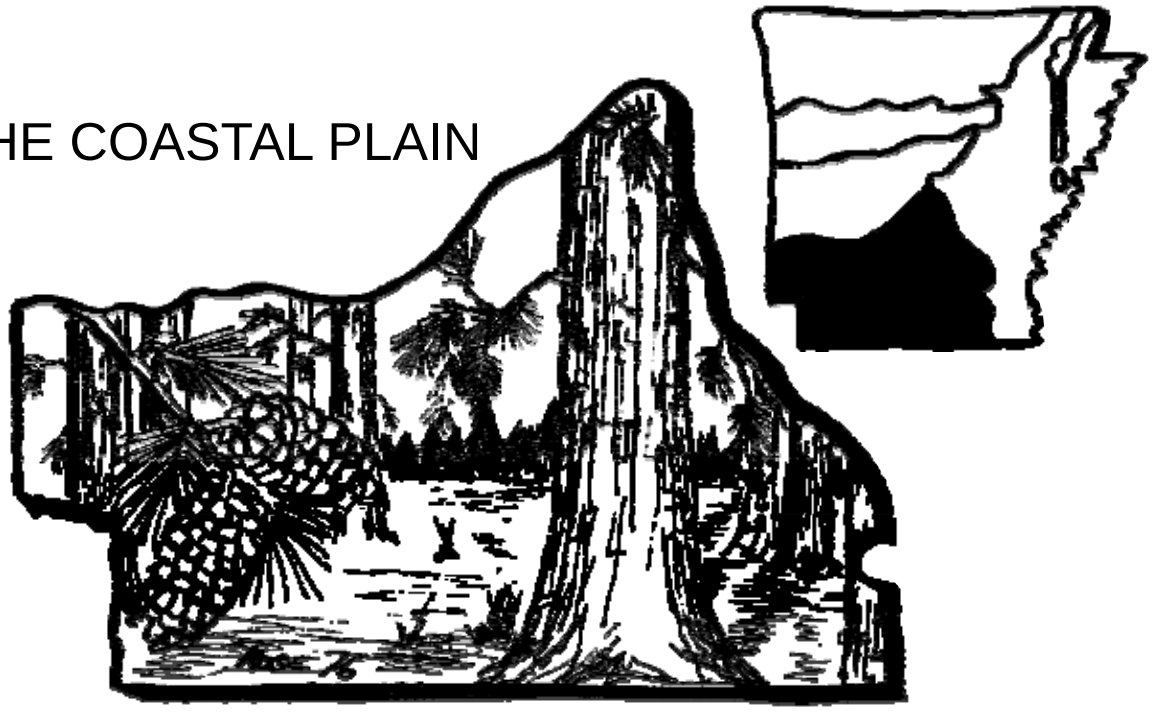
One of the largest of these former way-stations is the city of Fort Smith, which has a rich history. In 1818, Major Stephen Long of the U. S. Army was sent up the Arkansas River to locate the site for a fort to be the last outpost on the western frontier. The fort would also serve to keep peace between the Indians and the settlers who were moving into the territory. As Long neared the site of present-day Fort Smith, he saw the prairies becoming larger and more numerous. He picked out a site, Belle Point, on a hill overlooking the Arkansas River at the mouth of the Poteau River for the site of the first Fort Smith.

Later, Fort Smith was abandoned by the Army when there was no longer a need for an Indian outpost in the area. One of the fort buildings was turned over to Federal Judge Issac Parker who was assigned to Arkansas. Parker served as federal judge for the Federal Court of the Western District of Arkansas. During his first term, his court found eight men guilty of murder and six of them died on the gallows on the same day. During his time as judge, he tried 13,490 cases, with 9,454 of them resulting in guilty pleas or convictions. His court was unique in the fact that he had jurisdiction over all of Indian Territory, covering over 74,000 square miles. He sentenced 160 people to death, including four women. Of those sentenced to death under Parker, seventy-nine men were executed on the gallows.

He is often called the "Hanging Judge." At the time, capital offenses of rape and murder were punished by death. However, it was not for the judge to decide guilt. Determining guilt was left up to the jury. Parker actually had no say in whether a person was to be hung; in fact he was quoted as being against capital punishment. His court did, however, sentence some of the most notorious outlaws to hang. Outlaws such as Cherokee Bill, Colorado Bill, and the Rufus Buck Gang are some of the well known who were sentenced to death and executed during Parker's tenure. His courtroom is now the Fort Smith National Historic Site.

Today the Arkansas Valley is still a major transportation and communications corridor, including the McClellan-Kerr Arkansas River Navigation System, Interstate 40, a major railroad, and many other highways, pipelines, and power lines. The Valley also hosts several scenic tourist destinations and offers easy access to additional areas in the mountains to the north and south. With transportation comes population growth and industrial development, which in turn, present new problems with pollution and increased water supply needs.

# THE COASTAL PLAIN



The Coastal Plain covers the southern quarter of Arkansas. Its principal cities include Texarkana, Hope, El Dorado, Magnolia, Monticello, Pine Bluff and Little Rock.

It is a rolling lowland, and, along with the rest of southern and eastern Arkansas, was once covered by the waters of the Gulf of Mexico. When the Gulf retreated to its present position, it left the sands and gravels that made up its bottom and beaches exposed in the Coastal Plain. With sandy soil and abundant water, the forest of the Coastal Plain is dominated by pine trees. These pine forests are home to typical pine-land bird species such as the Pine Warbler and the endangered Red-cockaded Woodpecker. There are also several large rivers in the Coastal Plain and along these rivers are typical bottomland hardwood forests. Images and descriptions of all these natural communities can be found in Appendix 4.

One of the most interesting portions of the Coastal Plain is extreme southwestern Arkansas.

Southwestern Arkansas has wide river bottoms with deep soil along the Red River and the Ouachita River. Also in this area are the blackland prairies, very special prairies that were found in a belt from Arkadelphia down to Texarkana and then extending on into Texas. These blackland prairies, along with the Red River bottomland, were thought, in the early days, to be the most fertile lands in Arkansas.

If you look beneath the surface of the blackland prairies, you will see that only the top foot or so is black. Beneath this black top layer is a second, deeper white layer of chalk. The black color of the surface comes from the richness of the soil which has allowed an abundance of organic material to accumulate. The white chalk layer is made up of the shells of marine animals that that accumulated when this area was the bottom of the Gulf of Mexico.

In some places, this chalk has accumulated to depths of over a hundred feet thick. Some of the thick chalk layer is exposed along the Little River in a place called White Cliffs. White Cliffs is the same sort of formation as the White Cliffs of Dover in Great Britain and was formed at the same time. The White Cliffs in Arkansas are now protected as a natural area.

Native Americans were drawn to the fertile soils of the Red River bottoms and the blackland prairies in southwestern Arkansas. The Caddo Indians had their major population centers there even though they roamed up into the Ouachitas. With rich agricultural resources, larger villages were able to support more people. Often these villages had mounds that were used in their religious ceremonies. The Caddo also gathered salt at salt springs along the Ouachita River (one of the earliest industries in Arkansas was the production of salt at Arkadelphia).

As European settlers moved into Arkansas, they were also attracted to the fertile lands in the Red River bottoms and the blackland prairies. One of the earliest cities in this area was Washington, founded in 1824 on the legendary Southwest Trail that connected St. Louis, Missouri, to the nearby Fulton Landing on the Red River. This route was one of the eight major trails that pioneers traveled on their way to Texas and the Great Southwest.

Washington was a thriving community and a major service center for area farmers and plantation owners. Washington was the cultural, political and economic center of Southwest Arkansas. Sam Houston, Davy Crockett and Jim Bowie each traveled separately through Washington on their way to the Alamo to fight for Texas independence from Mexico. Here too, James Black made a weapon for Jim Bowie that would become famous as the "Bowie Knife."

The colorful history of the Coastal Plain continued through the Civil War, with the Camden Expedition. Part of the Red River Campaign, the Camden Expedition resulted from Union brigadier general Frederick Steele's orders to strike south from Little Rock and converge with Major General Nathaniel P. Banks's column in northwest Louisiana before marching to Texas. Because of poor logistical planning, horrible roads, and strong

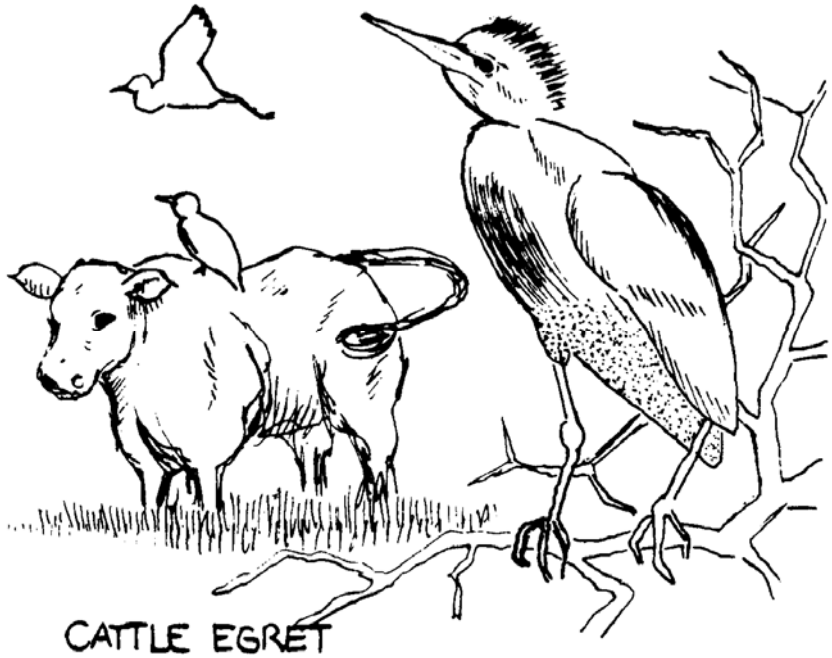
Confederate resistance, Steele abandoned this plan to occupy Camden. Losing battles at Poison Spring (Ouachita County) and Marks' Mills (Cleveland County), Steele became unable to supply his army and retreated toward Little Rock. The Confederates caught Steele while he was crossing the Saline River engaging in the last battle of the campaign at Jenkins' Ferry (Grant County).

The pine forests of the Coastal Plain have shaped its history and its present industry. During the latter part of the 19th century, large population centers in the eastern U.S., such as Chicago, began looking for new sources of timber for expansion of their cities and the railroads. Companies invested in building railroads to the area began to cut timber over the Coastal Plain and across the entire state. These early logging practices were often referred to as "cut and run" because a company would buy the land, cut it over and then abandon the land and let it go back to the state for failure to pay taxes.

Settlers tried to move into these cutover lands and turn those sandy hillsides into productive farmlands; however, they found out that the land would not produce cotton or any other cash crop. Eventually, the timber companies realized that there was no longer any "virgin" forest nearby for them to cut over. Some companies began to buy the land and hold on to it permanently. They harvested the trees, let the trees grow again, harvested them again and began using what is termed "sustained yield" timber management.

Much of the Coastal Plain today is owned by the timber industry which carries on intensive timber management of that land. Some of the timber management practices have been very controversial, such as spraying herbicides and clear-cutting forests.

A major use of land today in the Coastal Plain is for pasture. This has lead to the appearance in Arkansas of a new species of bird in these pastures - the cattle egret. Cattle egrets are African birds which are typically found on the plains of East Africa. More recently they have expanded their range into North and South America, including the southern United States. They can sometimes be seen in the pastures around cattle and occasionally even perched on their backs.



Another important use of land in the Coastal Plain today is mining, for minerals such as nepheline syenite in central Arkansas, and perhaps someday lignite in the southern part of the state. Bauxite was an economic mainstay for Arkansas through much of the twentieth century. The first attempts to mine Arkansas bauxite commercially began around 1898, inspiring the founding of a town, Bauxite (Saline County). The industry remained centered in a 275 square mile area in Pulaski and Saline counties throughout its history.

Arkansas's bauxite deposits proved to be the largest commercially exploitable deposits in the nation. Throughout most of the twentieth century, Arkansas remained the nation's major bauxite producer, providing about ninety percent of all domestic tonnage mined. Because of changing domestic and world economic market conditions, demand for Arkansas bauxite fell in the last decades of the twentieth century. Small tonnages continued to be mined and used in the production of alumina-based materials, including chemicals and abrasives.

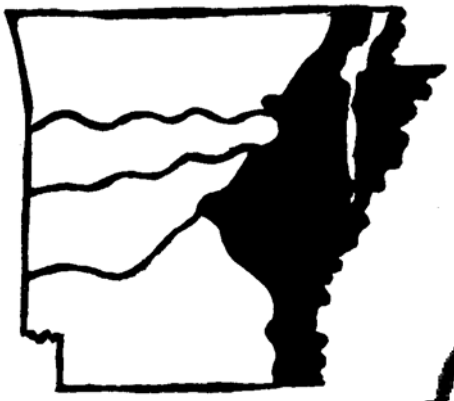
Lignite is a form of coal, often called brown coal, with a high content of volatile matter that makes it more convertible into gas and liquid petroleum products than the higher ranking coals. Lignite was mined in south Arkansas by underground methods and used before the Civil War. It was first used for steam-boiler fuel and later as fuel for small locomotives near the mines in Ouachita County.

In 1907, two small oil-distilling plants were operating in Ouachita County. The plants produced oils from lignite mined by open pit methods in the Camden field in Ouachita County. In 1913, lignite from the Camden area was yielding up to 38 gallons of oil per ton, although the average oil recovery was about 25 gallons per ton. Even though large quantities of lignite remain in the Coastal Plain, it has not been mined extensively because of its relativity low heat content. As we look for answers to the energy crisis and new sources of fuel, lignite mining could return to south Arkansas.

Most of the mining in the Coastal Plain is done as "surface mining", including strip mining and open pit mining. Surface mining is a type of mining in which soil and rock, overlying the mineral deposit, are removed. In most forms of surface mining, heavy equipment, such as earthmovers, first remove the soil and rock above the deposit. Next, huge machines, such as dragline excavators, extract the mineral.

The large impact of surface mining on the topography, vegetation, and water resources has made it highly controversial. Surface mining is subject to state and federal reclamation requirements, but adequacy of the requirements is a constant source of contention. Unless reclaimed, surface mining can leave behind large areas of infertile waste rock.

# THE DELTA



The Mississippi Alluvial Plain, or Delta, covers the eastern third of Arkansas. It is a unique part of the state which has made major contributions to our heritage and economy. Its major cities include Stuttgart, Lake Village, Blytheville and Helena.

The area once was covered by the Gulf of Mexico. When the Gulf receded, it left behind the sands and gravels that had made up the ocean bottom and beaches, just as it did in the Coastal Plain.

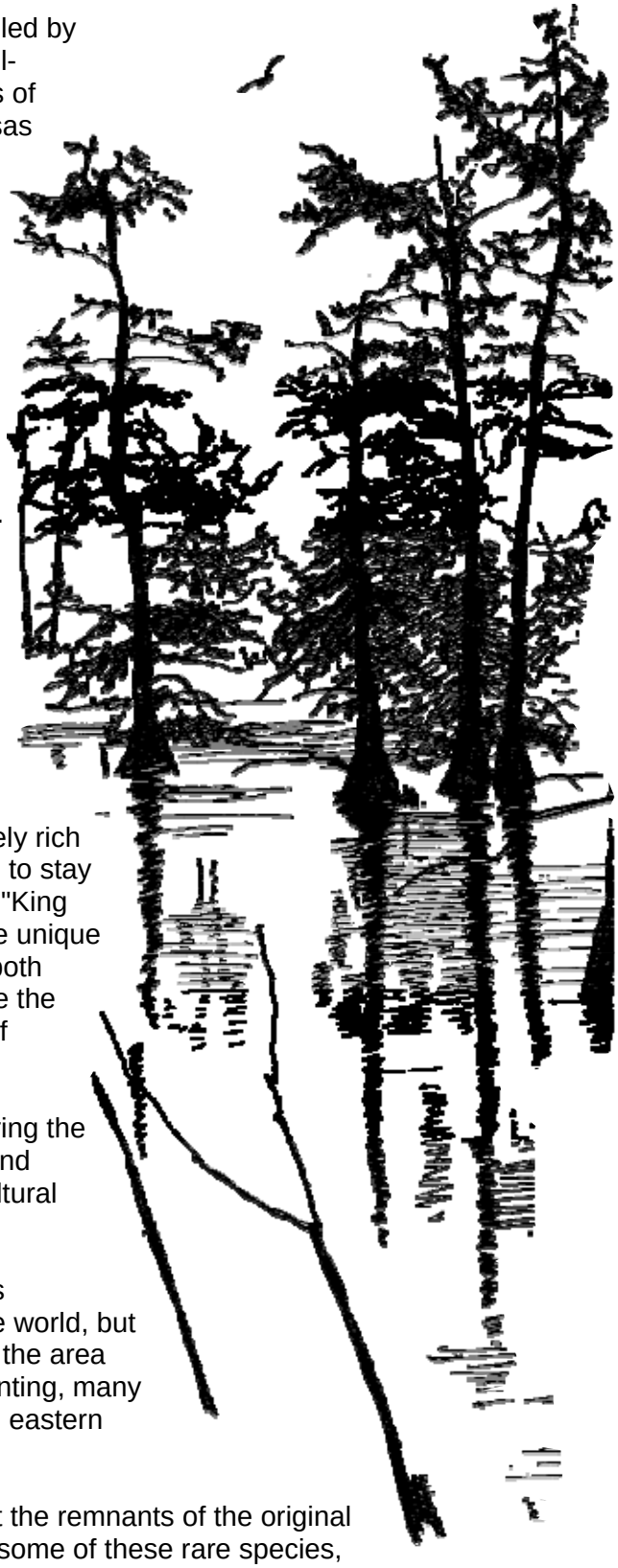
But then rivers - the White River, the Mississippi River, the Arkansas River and even the Ohio River - flowed through the Delta, sweeping away the old ocean-bottom sands and gravels, replacing them with sand, silt and clay that the rivers themselves carried.

Oxbow lakes have played an important role in the character of the Delta, too. They are formed when a river abandons its channel and leaves its old course isolated as still water. Sometimes the lakes are very shallow and cypress trees grow across them to form beautiful swamps which are a notable feature of eastern Arkansas. These rivers have also been responsible for depositing the deep, rich soil of the Delta.

With abundant water and deep soil, the forest trees of the Delta grow to enormous size. Forests and timber have played an important role in the economy of the area. Oak is harvested for railroad ties and barrel staves. Persimmon trees are turned into golf club heads. Pecan trees are native to the Delta and are now cultivated in orchards.

However, not all of the Delta was covered by forest. As least a half-million acres from Arkansas Post to Lonoke were covered by six-foot tall prairie grasses and flowers. Even though most of this prairie has been plowed or converted to agricultural fields, it is still called the “Grand Prairie,” and today is the center of rice production in the state. Details about tallgrass prairie natural communities, as well as the bottomland hardwood forests and the large rivers of the Delta can be found in Appendix 4.

The first European explorers in Arkansas, led by de Soto in 1541, described numerous, well-populated villages supported by vast fields of maize. The Spaniards had entered Arkansas during what archeologists refer to as the “Mississippian Period.” The residents here were noted for their mound-building and hierarchical political systems.



By the time of the first French expeditions 130 years later, Arkansas was sparsely populated with isolated villages and tribes but with an abundance of wild game and other natural resources. Water provided transportation by canoe or later flatboat in a land that could support only a few roads. The residents hunted, fished, and practiced subsistence farming, making little impact on the land. This was wild territory, with cane-brakes, swamps, and bayous making travel difficult. The people adjusted their lifestyles to the dramatic fluctuations in the rivers and to the impenetrable virgin forests.

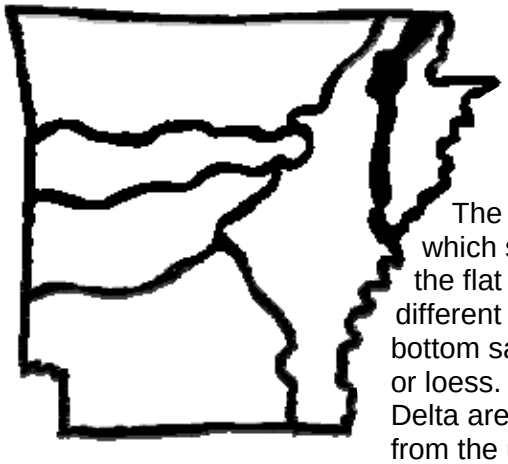
The river floods also deposited an extremely rich and deep soil offering settlers an incentive to stay and grow cotton. They built an empire on "King Cotton” and created an "Old South" culture unique to this country's history. This culture was both romantic and corrupt in that the elegant life the planters led was dependent on the labor of slaves.

After the Civil War, people continued clearing the forests of the Delta, channeling its rivers and draining its swamps to create more agricultural land.

Today, the Delta is the heart of Arkansas's agricultural economy and helps to feed the world, but 90% of its forest has been cleared. While the area sees the tourism benefits from ducking hunting, many other plants and animals that once lived in eastern Arkansas are gone.

The public lands which remain and protect the remnants of the original landscape may provide a last foothold for some of these rare species, as evidenced by the excitement in 2004 with sightings of the Ivory-billed Woodpecker, long believed to be extinct.

# Crowley’s Ridge



The smallest of Arkansas's Natural Divisions is Crowley's Ridge. It extends from southeastern Missouri to Helena-West Helena (about 150 miles) and is half a mile to twenty miles wide, except for one break just north of Marianna.

The ridge stands about 200 feet higher than the Delta which surrounds it and the steep slopes contrast with the flat Delta topography. The Ridge geology is also different from the Delta. The Ridge is composed of ocean-bottom sand, gravel and clay capped with wind-blown dust or loess. The river-deposited soils which make up the Delta are not found on the Ridge. These differences result from the unique geological history of the Ridge.

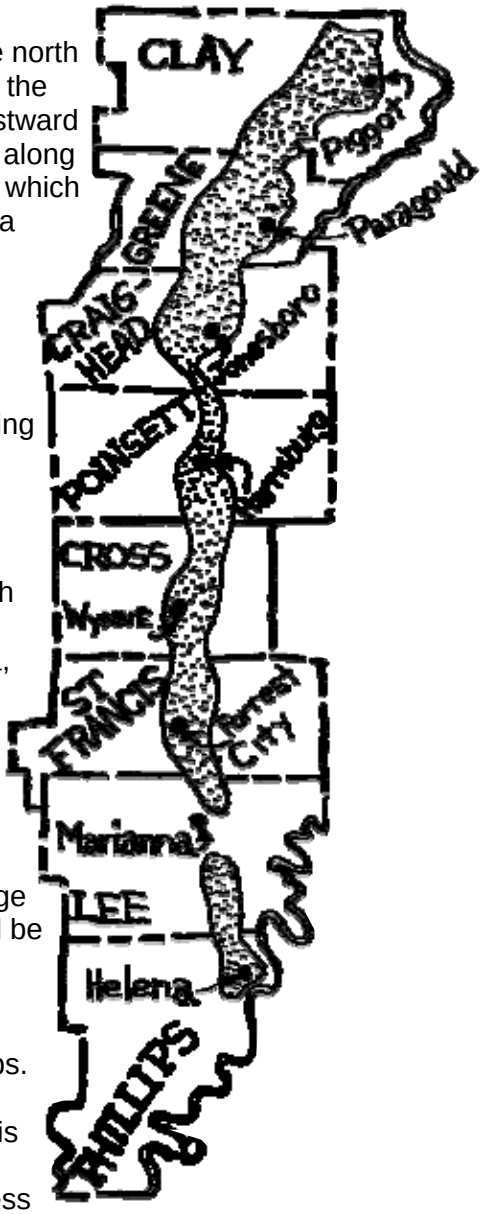
Like all of eastern and southern Arkansas, the Ridge was covered by the waters of the Gulf of Mexico until about 50 million years ago. When the shore of the Gulf retreated to its present position, it left exposed ocean bottom and beaches which make up the sandy rolling hills of the Coastal Plain today. In the Delta, the rolling hills were carved away by large rivers, primarily the Mississippi and Ohio, which deposited a deep alluvial soil of sand, silt and clay.

At one time the Ohio River was flowing where the St. Francis and Mississippi now flow along the eastern border of Arkansas, and the Mississippi was flowing far to the west, about where the Black and White Rivers now flow. As they carved out their valleys, they left a narrow strip of ocean-bottom material between them which became the base of Crowley's Ridge. Then, about 20,000 years ago, as the last glaciers began to retreat, the rivers deposited glacier-ground rock in their floodplains.

When the silt dried out and was picked up by the wind, Crowley's Ridge was tall enough to act 1ike a “drift fence” and caused dust to pile up 50 feet deep on the southern half, and the ridge took on its final shape.

As a result of this geological history, marine fossils such as shark's teeth may be found in the clays at the base of the ridge. Gravel is also common in these marine sediments. Since the rivers that formed the Delta did not deposit much gravel, it is one of the most valuable mineral resources on the Ridge. The top of the Ridge, especially at the southern end, is covered with a blanket of loess up to 50 feet thick. This loess forms a deep soil that has helped to give the area several of its unique features.

One of these distinctive features of the Ridge is the forest. It is an upland hardwood forest but contains species which are rare or absent elsewhere in the state, such as white walnut and tulip tree. Streams are typically small and have high water quality. Because the water quality has been maintained, some support aquatic life found nowhere else in eastern Arkansas. As they cut through the marine deposits, the streams sometimes form pure sand beaches. The deep valleys of these streams provide the best impoundment sites in eastern Arkansas, but sometimes the loess and underlying sand fail to hold water well.




A road from Memphis to Little Rock, which crosses the Ridge north of Forrest City, was one of the earliest in the state. In places, the roadbed has been eroded 50 feet or more into the ridge. Westward bound travelers from Memphis first had to cross the swamps along the St. Francis River. Next, they climbed onto the drier ridge, which was a logical place to rest before crossing the additional Delta swamps ahead.

This natural elevation above the swamps set the stage for much of the later history of the Ridge. First a man named Strong built a way-station which became one of the state's earliest settlements. Later, others who made their living farming the nearby Delta land chose to live on the ridge. It offered house sites which were above the floods and on scenic hills.

That pattern has continued today. Seven counties straddle Crowley's Ridge and the largest town and county seat of each one is located directly on or next to the Ridge. Cities like Paragould, Jonesboro, Forrest City and Helena-West Helena, which most people think of as Delta towns, are actually Crowley's Ridge towns. Residential and municipal development is an important land use for Crowley's Ridge.

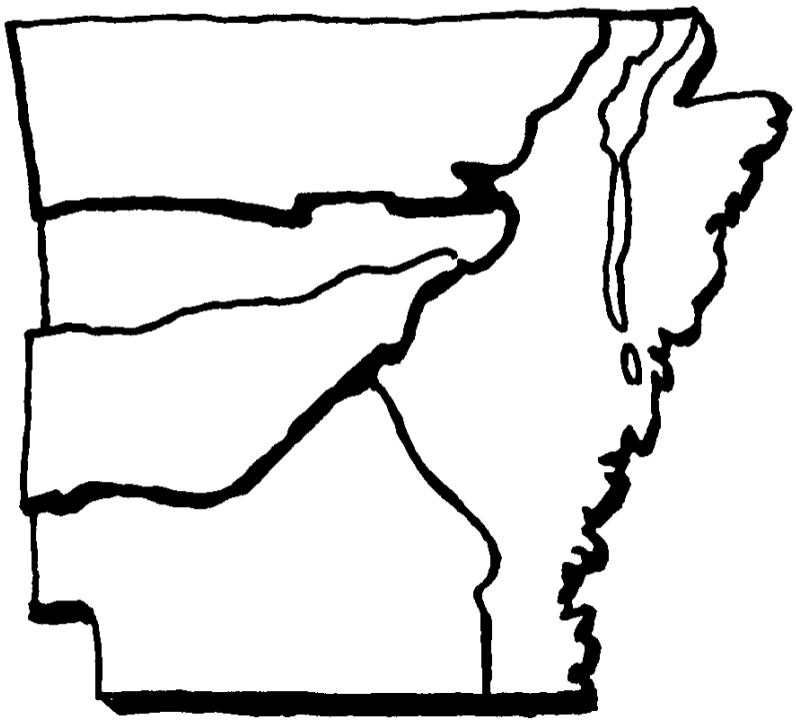
The Ridge also played a part in the Civil War in Arkansas. At Helena, Federal troops placed cannon on the Ridge, which commanded a view of the Mississippi River. From that vantage point, any Rebel boat trying to move upstream or down could be destroyed.

Other uses of land on Crowley's Ridge today are varied, including timber forests, mines, peach orchards and row-crops. Any land modification on the Ridge must beware of one potential problem - erosion. The loess which caps the Ridge is uniquely susceptible to erosion, because its physical and chemical structure causes it to maintain a vertical slope. Loess grains are angular, with little polishing or rounding, composed of crystals of quartz, feldspar, mica and other minerals. Because the grains are angular, loess will often stand in banks for many years without slumping. This soil has a characteristic called "vertical cleavage", which makes it easily excavated but it is also highly erodible by water or wind,

The slope literally melts when it gets wet and can cause disastrous land-slides. In many cases, people have attempted to stabilize slopes with what became a well-known invasive plant species - kudzu. A climbing, semi-woody perennial vine, kudzu (*Pueraria montana)* was widely planted to combat soil erosion. Unfortunately, it grows out of control, smothers native plants and even uproots entire trees by the sheer force of its weight. Kudzu kills or damages other plants by smothering them under a solid blanket of leaves, encircling woody stems and tree trunks, and breaking branches or uprooting entire trees and shrubs. Once established, kudzu grows at a rate of one foot per day; mature vines can be 100 feet long.

Because of the unusual geology, forest and land-use problems of Crowley's Ridge it is often considered the most unique of Arkansas' natural divisions.

# APPENDICES



# Appendix 1
# Website resources

**http://www.naturalheritage.com**
*Arkansas Natural Heritage Commission—look for the “learn” button*

**http://www.arkansasheritage.com**
*Department of Arkansas Heritage*

**http://encyclopediaofarkansas.net**
*The Encyclopedia of Arkansas History and Culture*

**http://www.cals.lib.ar.us/butlercenter/lesson_plans/index.html**
*Butler Center for Arkansas Studies—Arkansas lesson plans, including natural divisions*

**http://www.arkansashabitat.org/index.html**
*Arkansas Habitat.org*

**http://www.mawpt.org/default.asp**
*Ark Multi Agency Wetlands Planning Team—special teacher’s section*

**http://educators.fws.gov**
*U.S. Fish & Wildlife Service—federal lists of endangered species, information for educators*

**http://www.natureserve.org/explorer**
*Nature Serve*

**http://www.epa.gov/wed/pages/ecoregions/ar_eco.htm#Ecoregions**
*Eco Regions maps*

**http://www.epa.gov/owow/wetlands**
*EPA wetlands site –special teacher and student sections*

**http://www.nwf.org/education**
*National Wildlife Federation—information for educators*

**http://www.birds.cornell.edu**
*Cornell Lab of Ornithology—education information & citizen science*

# Appendix 2
# Glossary

**bauxite** the principal ore of aluminum, composed mainly of hydrous aluminum oxides and aluminum hydroxides.

**brachiopod** any of various marine invertebrates of the phylum Brachiopoda, having bivalve dorsal and ventral shells enclosing a pair of tentacled, arm-like structures that are used to sweep minute food particles into the mouth. Also called lampshell.

**butte** a hill that rises abruptly from the surrounding area, has sloping sides and a flat top.

**clear cutting** the removal of all trees and most, if not all, vegetation from an area, leaving all growing space and resources available for the next generation.

**Cretaceous** of or belonging to the geologic time, system of rocks, and sedimentary deposits of the third and last period of the Mesozoic Era, characterized by the development of flowering plants and ending with the sudden extinction of the dinosaurs and many other forms of life.

**deciduous** shedding or losing foliage at the end of the growing season.

**degradation** a decline to a lower condition, quality, or level.

**dolomite** a magnesia-rich sedimentary rock resembling limestone.

**erosion** the act of causing to deteriorate or disappear as if by wearing away.

**fossil** the remains, usually the bones, shell, or shape of a living thing that is preserved in rock.

**lignite** soft, brownish-black coal in which the alteration of vegetable matter has proceeded further than in peat but not as far as in bituminous coal. Also called brown coal.

**limestone** common sedimentary rock consisting mostly of calcium carbonate, CaCO3, used as a building stone and in the manufacture of lime, carbon dioxide, and cement.

**loess** wind-blown silt, often pronounced “luss.”

**marl** a crumbly mixture of clays, calcium and magnesium carbonates, and remnants of shells that is sometimes found under desert sands and used as fertilizer for lime-deficient soils.

**mesa** a broad, flat-topped elevation with one or more cliff-like sides, common in the southwest United States.

Appendix 2
Glossary
continued

**Mesozoic** of, belonging to, or designating the era of geologic time that includes the Triassic, Jurassic, and Cretaceous periods and is characterized by the development of flying reptiles, birds, and flowering plants and by the appearance and extinction of dinosaurs.

**monadnock** a mountain or rocky mass that has resisted erosion and stands isolated in an essentially level area; also called inselberg.

**natural division** a place (a geographical area) that is occupied by a distinctive natural system.

**natural system** an environment made up of interrelated parts, such as geology, climate, plants, animals, soils, and people.

**Paleozoic** of, belonging to, or designating the era of geologic time that includes the Cambrian, Ordovician, Silurian, Devonian, Mississippian, Pennsylvanian, and Permian periods and is characterized by the appearance of marine invertebrates, primitive fishes, land plants, and primitive reptiles.

**peat** partially carbonized vegetable matter, usually mosses, found in bogs and used as fertilizer and fuel.

**peneplain** a nearly flat land surface representing an advanced stage of erosion

**petroleum** a thick, flammable, yellow-to-black mixture of gaseous, liquid, and solid hydrocarbons that occurs naturally beneath the earth's surface, can be separated into fractions including natural gas, gasoline, naphtha, kerosene, fuel and lubricating oils, paraffin wax, and asphalt and is used as raw material for a wide variety of derivative products.

**plateau** a usually extensive land area having a relatively level surface raised sharply above adjacent land on at least one side.

**sedimentary rock** a rock formed by consolidated sediment deposited in layers.

**subsistence lifestyle** a way of living in which people grow, gather, or hunt the things they need to survive.

**topography** the surface features of a place or region.

# Appendix 3
# Arkansas Department of Education Frameworks

Science grades K—8 Revised 2005

**LS.4.1.1** Identify some endangered species in Arkansas

LS.4.2.2; LS.4.4.1; LS.4.4.2, LS.4.5.16

**ESS.8.3.5** Indentify areas in Arkansas that are the main sources of the following minerals (bauxite, novaculite, quartz crystal, diamond, bromine)

**ESS.8.4.1** Locate natural divisions of Arkansas

ESS.8.4.2;

**ESS.8.4.5** Evaluate the impact of Arkansas's natural resources on the economy

**ESS.8.4.6** Evaluate human uses of Arkansas's natural resources on the environment

ESS.8.8.3; ESS.8.8.4

**ESS.8.5.6** Identify minerals found in Arkansas

**ESS8.6.9** Research local, regional and state landforms created by internal forces in the earth

**ESS.8.8.6** Research local, regional and state landforms created by external forces in the earth

ESS.9.5.1; ESS.9.6.1; ESS.9.6.3

Social Studies grades K—8 Revised 2006 Amended November 2007

**G.1.4.2** Locate and describe physical characteristics of the six natural regions of Arkansas

**G.1.3.8** Locate mountain ranges in Arkansas

**G.2.3.4** Compare and contrast the human characteristics of early settlements and contemporary communities in Arkansas

G.3.1.3; G.3.2.3; G.3.4.4

**H.6.4.3** Examine historical settlements in Arkansas

**H.6.4.9** Evaluate data presented on a timeline of Arkansas history

**H.6.4.12** Analyze changes in Arkansas from past to present

E.8.K.4; E.8.1.4; E.8.2.3

**G.1.6.2** Examine the location, place, and region of Arkansas and determine the characteristics of each

**G.3.5.7** Discuss ways in which Arkansans adapted to and modified the environment

**G.3.6.7** Analyze the consequences of environmental modification on Arkansas

Appendix 3
Arkansas Department of Education Frameworks
continued

Environmental Science grades 9—12 Revised 2005

**PD.1.ES.10** Describe the characteristics of each of the natural divisions of Arkansas

Arkansas History grades 7—8 Revised 2006

**G.1.AH.7-8.1** Compare and contrast the six geographical land regions of Arkansas

**G.1.AH.7-8.3** Describe factors contributing to the settlement of Arkansas

**G.1.AH.7-8.5** Examine the economic effect of Arkansas's natural resources

Arkansas History grade 9—12 Revised 2006

**G.1.AH-9-12.1** Investigate the six geographic land regions of Arkansas

**G.1.AH.9-12.3** Analyze factors contributing to the settlement of Arkansas

**G.1.AH.9-12.5** Examine the economic effect of Arkansas's natural resources

# Appendix 4
# Natural Communities

## Bottomland Hardwood Forest

Bottomland hardwood forests are a type of wetland community found along the floodplains of rivers and streams. The timing, duration, and frequency of flooding play important roles in determining the type of vegetation present in these forests. Bottomland hardwood swamp communities have soils saturated with water much of the time and may have water present 10-12 months of the year. These areas are dominated by flood-tolerant tree species such as bald cypress and water tupelo. Areas with drier soils support additional hardwood trees such as cherrybark oak, sweet pecan, and winged elm, which are adapted to less frequent flooding.

Only 20-25% of the bottomland hardwood forests that occurred across Arkansas prior to European settlement remain today. Most of these forests were cleared for agriculture. As the bottomland hardwood forests disappeared, so did the ivory-billed woodpecker, Carolina parakeet, and Bachman's warbler. Even now, wetlands provide critical habitat for one third of the endangered plants and animals in the U.S. Bottomland hardwood forests are also important for flood protection and groundwater recharge. Federal and state agencies are working together with private landowners to restore these forested bottomlands in Arkansas.

River floodwaters deposit rich alluvial soils in the "bottom lands" that support many types of plants, including 70 different trees. These plants, in turn, support a diverse array of wildlife. Most of the plants and animals in bottomland hardwood forests have some adaptations related to water. Bald cypress and water tupelo have swollen bases that provide increased support in soft, water-logged soil. Water-tolerant plants, such as arrow arum and American lotus, provide food for small mammals and birds , which are hunted by predators like the mink and the cottonmouth. The great blue heron and the black bear come to the margins of the forest to feed on fish adapted to live in the slow moving waters. During the summer months, over 30 different bird species can be found nesting in bottomland hardwood forests. Some, like the prothonotary warbler, are migrants from Central and South America that fly north every spring to breed. Still others are found here year round, like the wood duck and barred owl, roosting and nesting in the cavities of hollow trees.

# Bottomland Hardwood Forest


## Species Key

1. White Crappie - *Pomoxis annularis*
2. American Lotus - *Nelumbo lutea*
3. Mink - *Mustela vison*
4. Woolly Bulrush - *Scirpus cyperinus*
5. Royal Fern - *Osmunda regalis*
6. Water Hickory - *Carya aquatica*
7. Wood Duck - *Aix sponsa*
8. Water Tupelo - *Nyssa aquatica*
9. Overcup Oak - *Quercus lyrata*
10. Bald Cypress - *Taxodium distichum*
11. Pileated Woodpecker - *Dryocopus pileatus*
12. Barred Owl - *Strix varia*
13. Prothonotary Warbler - *Protonotaria citrea*
14. Nuttall Oak - *Quercus nuttalii*
15. Giant Cane - *Arundinaria gigantea*
16. Black Bear - *Ursus americanus*
17. Great Blue Heron - *Ardea herodias*
18. Arrow Arum - *Peltandra virginica*
19. Common Cattail - *Typha latifolia*
20. Cottonmouth - *Agkistrodon piscivorus*
21. Blunt Spikerush - *Eleocharis obtusa*
22. Muskrat - *Ondatra zibethicus*
23. Channel Catfish - *Ictalurus punctatus*
24. Bluegill - *Lepomis macrochirus*

# Bottomland Hardwood Forest

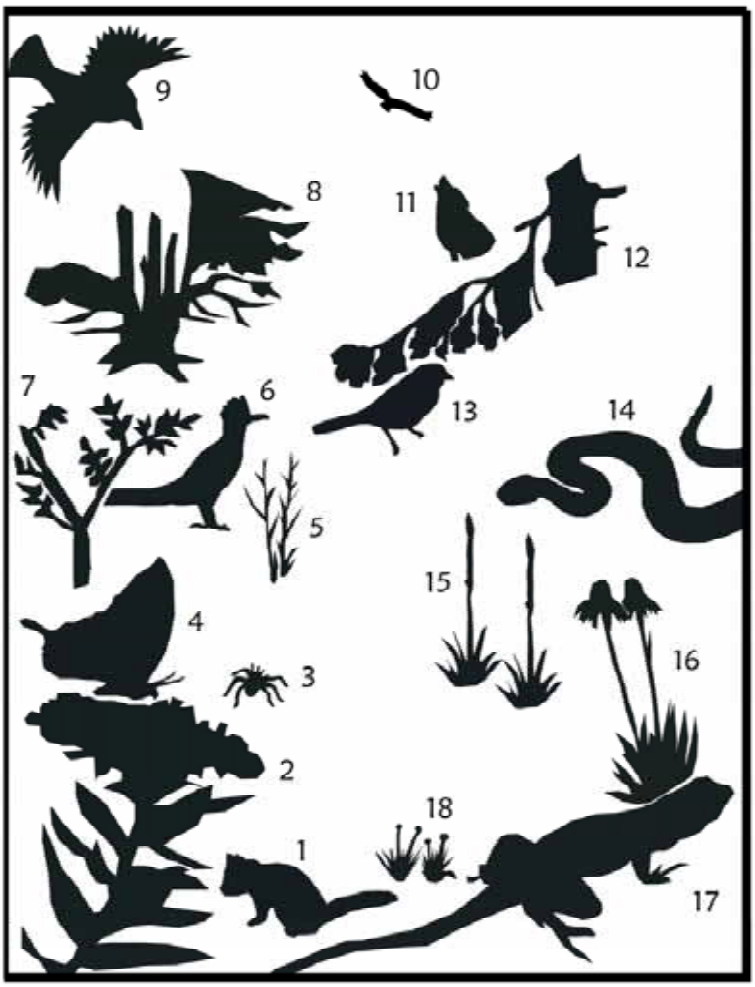
# Glade

Glades are very dry, open areas characterized by thin soils and exposed bedrock. The vegetation of glades typically consists of grasses and other herbaceous plants that tolerate dry conditions. The thin, poor soils, along with fires that would burn through glades, historically limited the presence of trees in these areas. Arkansas possesses a number of different glade types, all differentiated from one another based upon the type of rock (sandstone, limestone, dolomite, shale) that underlies the area. This habitat is most common in upland areas of Arkansas, such as the Ouachita and Ozark Mountains. Some glade habitat can also be found in the West Gulf Coastal Plain.

Undisturbed glades are no longer as common as they once were. Glades have been subjected to mining, overgrazing, and have been destroyed outright through development. Fire suppression has also lead to the degradation of large areas of glade habitat. Without fire, glades can be invaded by woody plants, most notably eastern red cedar. As cedar moves in, the area of useable habitat for glade-associated species is reduced, or in some cases even eliminated. Loss of glade habitat has played an important role in the decline of associated plant and animal species, some of which are now threatened or endangered, such as the Missouri bladderpod (found only in Arkansas and Missouri).

Due to the dry conditions often found in glades, plants present in this natural community consist of several species adapted to arid conditions. In particular, many glade plants are more typical of Midwestern tallgrass prairies and include such prairie grasses as little bluestem and side-oats grama. A rich variety of wildflowers can also be found here such as butterfly milkweed, yellow coneflower, and black-eyed susan. Woody plants adapted to dry conditions occur in and along the margins of glades, and include post oak, winged elm, and eastern red cedar. Yucca, a plant more associated with deserts, can also be found in some Arkansas glades. The open, dry conditions of glades provide ideal habitat for several animal species characteristic of the American southwest such as the collared lizard, roadrunner, and Texas brown tarantula. Butterflies, such as the tiger swallowtail, can be found here as well, nectaring on wildflowers. When eastern red cedars set fruit, flocks of cedar waxwings swoop in to gorge themselves on the small berries.

# Glade




## Species Key

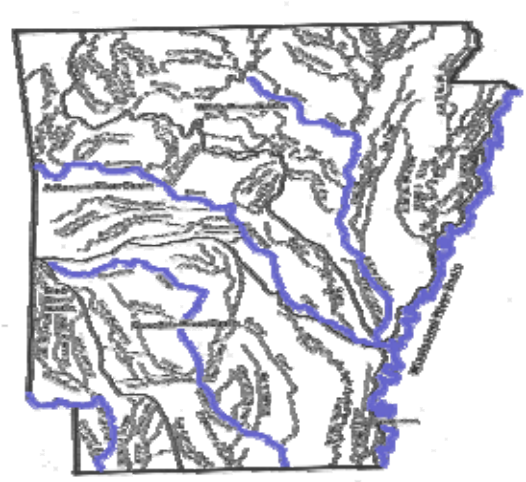
1. Eastern Chipmunk - *Tamias striatus*
2. Butterfly Milkweed - *Asclepias tuberosa*
3. Texas Brown Tarantula - *Aphonopelma hentzi*
4. Eastern Tiger Swallowtail - *Papilio glaucus*
5. Little Bluestem - *Schizachyrium scoparium*
6. Roadrunner - *Geococcyx californicus*
7. Winged Elm - *Ulmus alata*
8. Eastern Red Cedar - *Juniperus virginiana*
9. Cedar Waxwing - *Bombycilla cedrorum*
10. Turkey Vulture - *Cathartes aura*
11. Coyote - *Canis latran*
12. Post Oak - *Quercus stellata*
13. Bachman's Sparrow - *Aimophila aestivalis*
14. Timber Rattlesnake - *Crotalus horridus*
15. Arkansas Yucca - *Yucca arkansana*
16. Yellow Coneflower - *Echinacea paradoxa*
17. Eastern Collared Lizard - *Crotaphytus collaris*
18. Small-headed Pipewort - *Eriocaulon kornickianum*

# Glade

# Large River

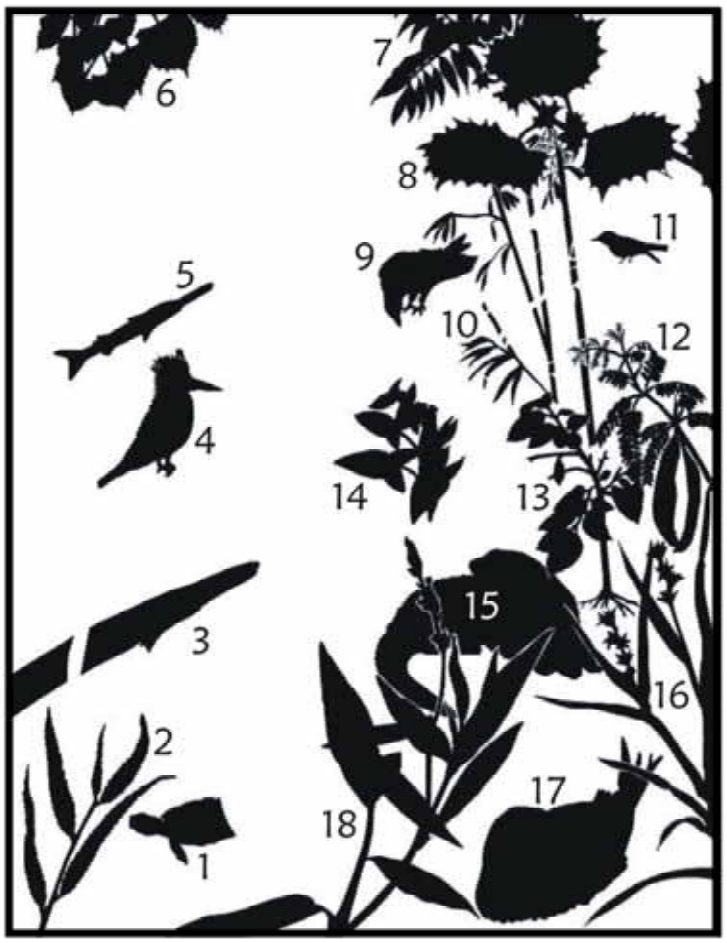
A river is a natural body of running water that flows into a lake, another river, or the ocean. Arkansas has almost 12,000 miles of rivers. Smaller water courses, such as creeks, streams, and brooks, form tributaries which come together in the main channel of a large rivers. The area of land which drains all of these tributaries into one main river is called a "watershed." Five large rivers, with watersheds of several thousand square miles, flow through Arkansas. Free-flowing large rivers were once dynamic forces in the natural landscape, creating islands, sloughs, marshes, and oxbows. Today, man-made dams and other alterations have changed the natural flow of most large rivers. The "riparian zone" (area around the river) provides rich habitat for a variety of plants and animals that are adapted to spending at least part of their lives in the water. Vegetation helps to stabilize the river bank and reduce erosion.

The map at the right shows the five large river systems in Arkansas: the Mississippi River, the Arkansas River, the White River, the Ouachita River, and the Red River. They all have some type of man-made structure or modification, ranging from channel improvements and pumping stations to major locks and dams. These rivers are used for transportation (moving tons of products); irrigation for crops; industrial water supplies (cooling processes and diluting wastes); municipal water supplies; electrical energy production; and recreation. We are facing critical decisions about how to balance the many human needs and uses of these rivers and the natural communities that depend on the aquatic habitat.



Large rivers support diverse and productive natural communities with readily available water and rich soils in the floodplains. Most of the dominant woody plants are adapted to periodic flooding. Some have deep root systems that serve as anchors, such as the cottonwood. Some have flexible stems, like the black willow, that allow them to bend with changing water flows. Many animal species feed, rest, and reproduce in the sheltered environment of large rivers. Much of the world's freshwater fish production occurs in large rivers, including two of the biggest fish in Arkansas: the alligator gar and the paddlefish, which utilize the backwaters of deep, wide, low-gradient rivers. Many fish-eating predators live and hunt in riparian corridors. The sleek body of the river otter makes it the fastest aquatic mammal in North America. The belted kingfisher uses its strong beak for catching small fish just below the water's surface, while the bald eagle will thrust its large talons deep in the river for fish over a foot long. The federally endangered interior least tern prefers wide river channels dotted with sand and gravel bars for nesting. Channelizing and dredging on these areas, along with locks and dams have greatly reduced such habitat

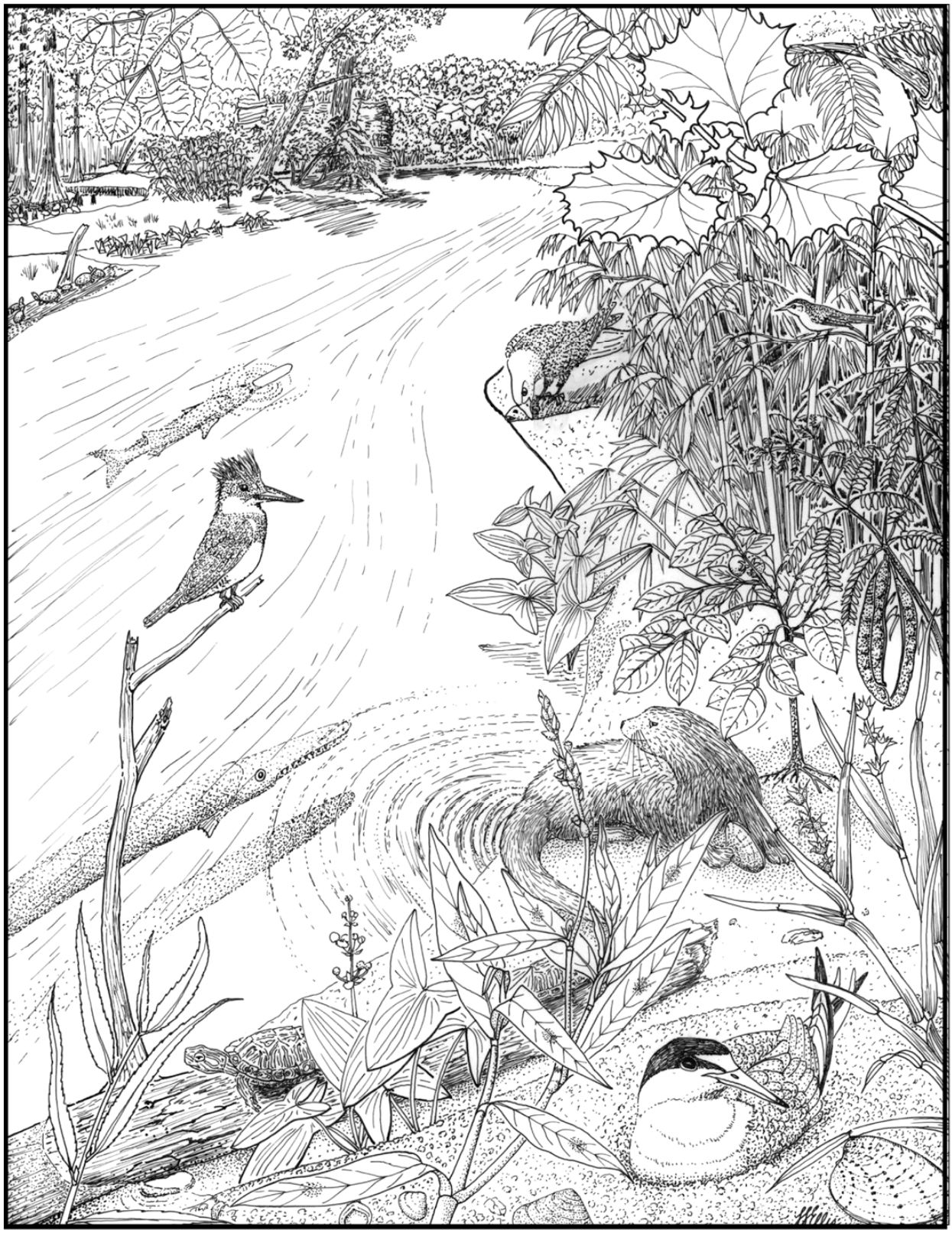
# Large Rivers




## Species Key

1. Red-eared Slider - *Trachemys scripta elegans*
2. Black Willow - *Salix nigra*
3. Alligator Gar - *Atractosteus spatula*
4. Belted Kingfisher - *Ceryle alcyon*
5. American Paddlefish - *Polyodon spathula*
6. Eastern Cottonwood - *Populus deltoides*
7. Sweet Pecan - *Carya illinoensis*
8. Sycamore - *Platanus occidentalis*
9. Bald Eagle - *Haliaeetus leucocephalus*
10. Giant Cane - *Arundinaria gigantea*
11. Swainson's Warbler - *Limnothlypis swainsonii*
12. Honeylocust - *Gleditsia triacanthos*
13. Persimmon - *Diospyros virginiana*
14. Broad-leaved Arrowhead - *Sagittaria latifolia*
15. North American River Otter - *Lontra canadensis*
16. Sand Bur - *Cenchrus incertus*
17. Interior Least Tern - *Sterna antillarum athalassos*
18. Smart Weed - *Polygonum coccineum*

# Large River



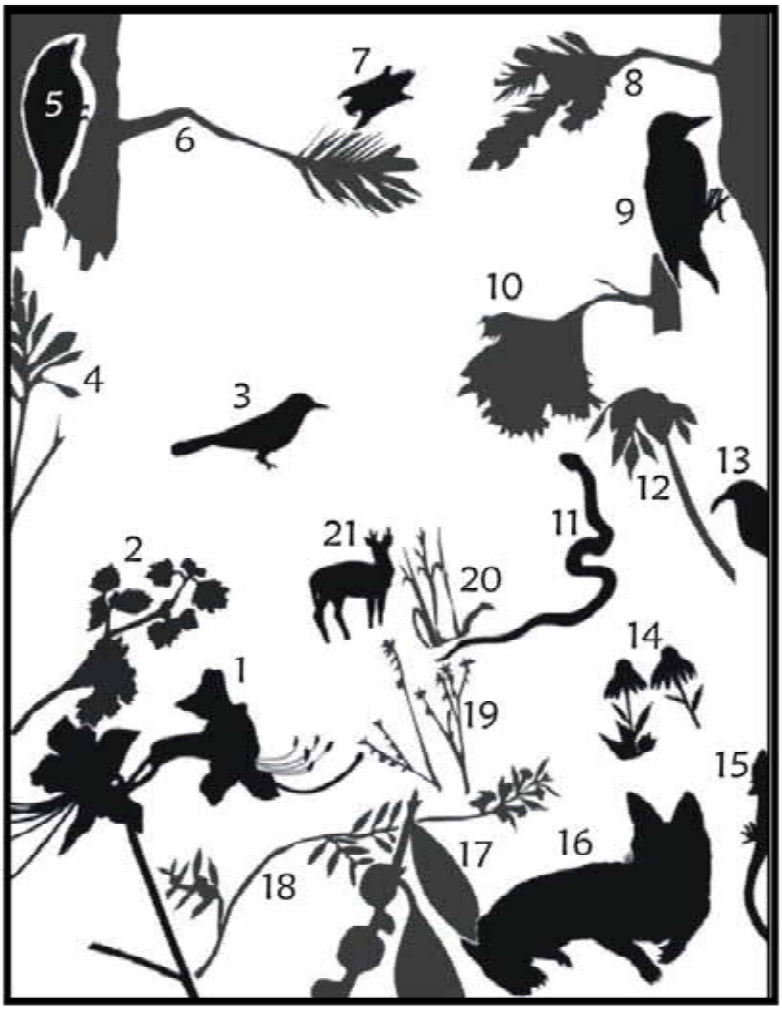
# Pine/Hardwood Woodland

Pine/Hardwood woodlands are characterized by low, rolling hills with sandy, well-drained soils. Original pine woodlands contained an open, two-layered structure of canopy and diverse groundcover. They were dominated by loblolly pine in the wetter lowlands and short leaf pine on the dry slopes and ridges. The density of trees affects the types of plants that grow since openings in the canopy allow sunlight to penetrate to the forest floor. A partially open canopy, such as the one illustrated in this woodland, allows some sunlight for the growth of shrubs and understory plants. These plants are adapted to acid soils and frequent fires. Pine woodland diversity increases with fire. Without regular burning, the herbaceous ground cover will be crowded out by larger, woody shrubs and oaks will crowd out the pines.

Virtually no Arkansas pine woodland has escaped changes in natural fire regime. Much of today's forest is young, dense and dominated by loblolly pine with a substantial hardwood component and little or no ground cover. Many plant species have been lost from these forests because they are fire-dependent. Loblolly pine is the primary species used by the pulpwood and paper industries. More than half of the U.S. pulpwood supplies come from southern pine forests. Throughout the south there is more timberland than cropland and pasture combined. Almost half of that timberland is planted pine stands. Exciting new management practices on timberland in Arkansas include assessing multiple economic and environmental factors in the forest and developing plans to balance growth for the future.

Pine/hardwood woodlands provide habitat for a diverse array of plants and animals. Plants such as the wax myrtle, big blue stem, and purple coneflower are adapted to thrive after fire by re-sprouting from large, underground root systems. The understory plants, such as the blueberry, sweet leaf, and native hoary azalea, are adapted to sandy soils with high acid content from the pine needles. These plants also provide important forage for animals, such as the white-tailed deer. The federally-endangered red-cockaded woodpecker, in the upper right hand corner, is the only North American woodpecker that excavates nesting and roosting cavities exclusively in living pine trees. Cavity trees that are actively used have small resin wells that exude sap which serves as a deterrent to predators such as the tree-climbing black rat snake. Other animals use the cavities excavated by red-cockaded woodpeckers, such as the downy woodpecker and the flying squirrel.

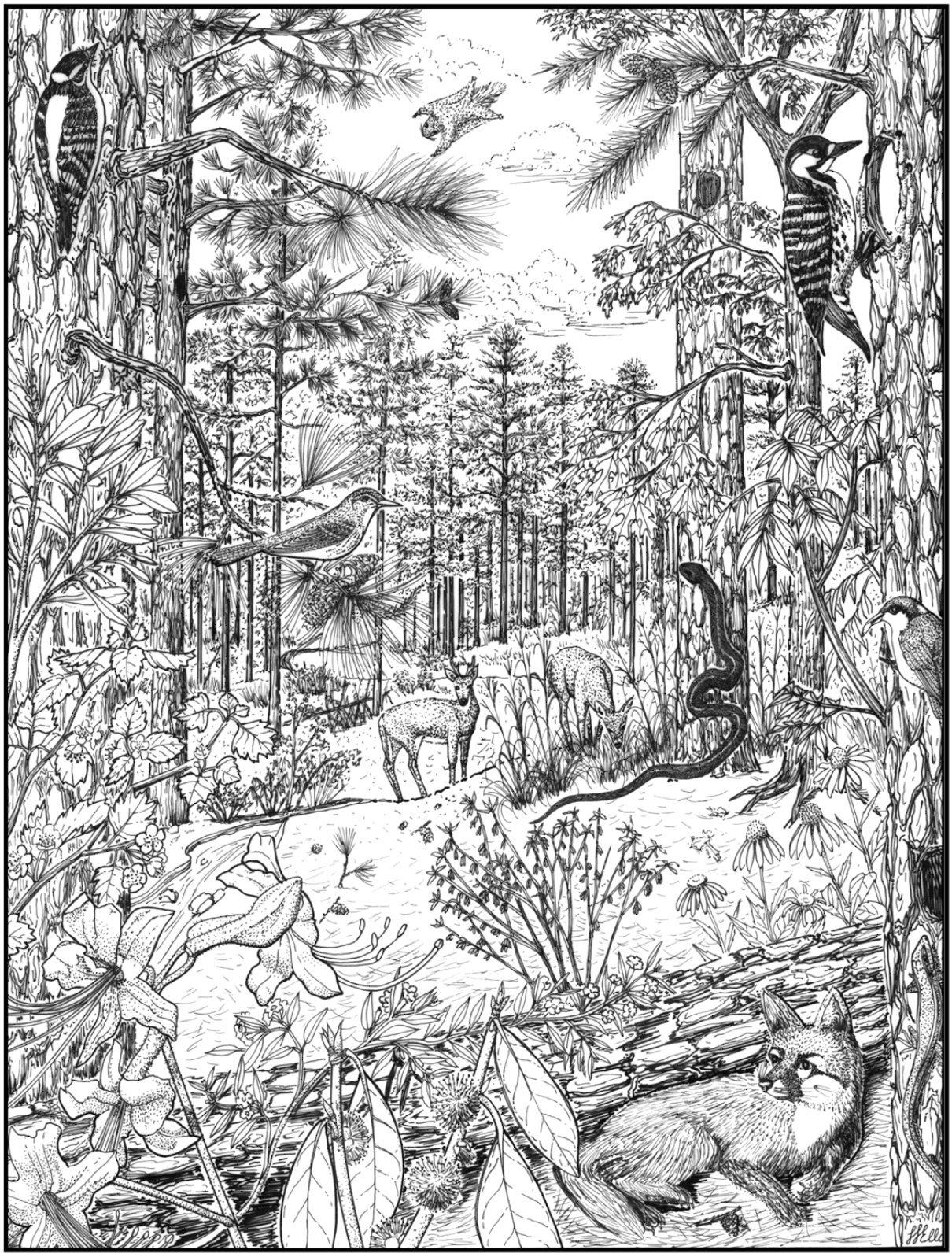
# Pine/Hardwood Woodland




## Species Key

1. Hoary Azalea - *Rhododendron canescens*
2. Parsley Hawthorn - *Crataegus marshallii*
3. Pine Warbler - *Dendroica pinus*
4. Wax Myrtle - *Myrica cerifera*
5. Downy Woodpecker - *Picoides pubescens*
6. Shortleaf Pine - *Pinus echinata*
7. Southern Flying Squirrel - *Glaucomys volans*
8. Loblolly Pine - *Pinus taeda*
9. Red-cockaded Woodpecker - *Picoides borealis*
10. Southern Red Oak - *Quercus falcata*
11. Black Rat Snake - *Elaphe obsoleta*
12. Black Hickory - *Carya texana*
13. Brown-headed Nuthatch - *Sitta pusilla*
14. Purple Coneflower - *Echinacea purpurea*
15. Broad-headed Skink - *Eumeces laticeps*
16. Gray Fox - *Urocyon cinereoargenteus*
17. Sweet Leaf - *Symplocos tinctoria*
18. Carolina Jasmine - *Gelsemium sempervirens*
19. Elliott's Blueberry - *Vaccinium elliottii*
20. Big Bluestem - *Andropogon gerardii*
21. White-tailed Deer - *Odocoileus virginianus*

# Pine/Hardwood Woodland



# Tallgrass Prairie

Tallgrass prairies are dominated by grasses growing 8 feet tall or more, such as big bluestem, little bluestem, Indian grass and switchgrass. Historically, the community was shaped by climate, grazing, and fire. These factors limited the encroachment of trees and shrubs. Fire also increased the productivity of the prairie by returning nutrients to the soil. Some trees and shrubs grow in savannas which are transition zones between the prairie and surrounding forests. Seasonal wetlands may form in low areas. Blooming plants called forbs add brilliant colors to the landscape. To survive the extreme conditions on the surface, much of the prairie community is underground. Plants have complex root systems reaching as deep as 15 feet.

The tallgrass prairies in Arkansas have almost disappeared. Only 1% of the original grasslands remain today, making the tallgrass prairie one of the most rare and threatened ecosystems in the state. With the loss of habitat came the loss of prairie species such as the greater prairie chicken and the snowy orchid which are no longer found here. Agriculture, overgrazing and development have reduced the once extensive prairies to small, isolated fragments. One key to prairie restoration includes strategically locating new efforts next to the these remnant areas to allow birds, insects, pollen, and seeds to move between restored sections and remnant lands so they can develop into a functional prairie landscape.

Plants and animals have developed unique adaptations for prairie life. Many plants, such as big bluestem, have thin leaves which reduce moisture loss. This grass gets its name from the blue tinge at the base of the stem and is often called “turkey foot” because the flowers resemble the feet of wild turkey. Switchgrass and Indian grass are examples of prairie perennials (persisting for several years) with deep root systems that help them survive fire and drought. Prairie animals have developed tawny coloration, plant-eating and burrowing habits, and drought tolerance to survive in the flat, almost treeless environment of the prairie. Many, such as the prairie vole and prairie mole cricket, escape underground. The eastern cottontail avoids hazards with speed and camouflage. Birds, such as the eastern meadowlark, Henslow’s sparrow and dickcissel, make their nests of grass on or near the ground. The northern harrier hunts small animals by flying low, back and forth flights (coursing) in transects over the grass. The king rail takes advantage of a low, wet area and finds a crayfish meal.

# Tallgrass Prairie


## Species Key

1. Prairie Vole - *Microtus ochrogaster*
2. Prairie Mole Cricket - *Gryllotalpa major*
3. Eastern Cottontail - *Sylvilagus floridanus*
4. Pale Purple Coneflower - *Echinacea pallida*
5. Big Bluestem - *Andropogon gerardii*
6. Henslow's Sparrow - *Ammodramus henslowii*
7. Compass Plant - *Silphium laciniatum*
8. Indian Grass - *Sorghastrum nutans*
9. Eastern Meadowlark - *Sturnella magna*
10. Smooth Sumac - *Rhus glabra*
11. Red-tailed Hawk - *Buteo jamaicensis*
12. Dickcissel - *Spiza americana*
13. Post Oak - *Quercus stellata*
14. Northern Harrier - *Circus cyaneus*
15. Red-winged Blackbird - *Agelaius phoeniceus*
16. Prairie Cordgrass - *Spartina pectinata*
17. Switchgrass - *Panicum virgatum*
18. King Rail - *Rallus elegans*
19. Prairie Evening Primrose - *Oenothera pilosella*
20. Ornate Box Turtle - *Terrapene ornata*
21. Downy Phlox - *Phlox pilosa*

# Tallgrass Prairie

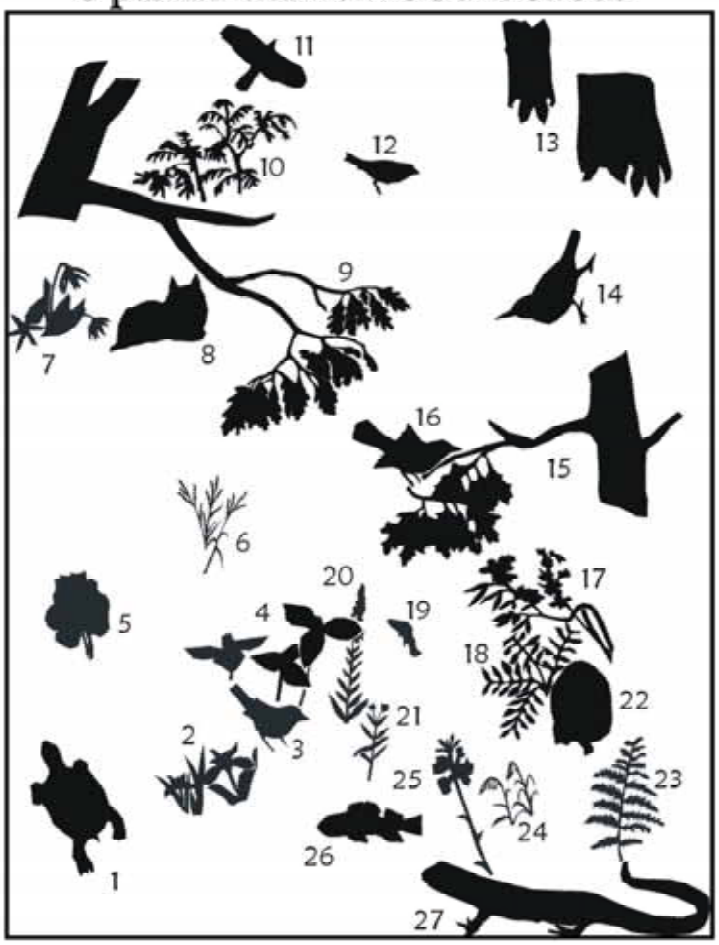
# Upland Hardwood Forest

The chief tree species in an upland hardwood forest include white oak, black oak, and southern red oak together with mockernut hickory and shagbark hickory. Factors such as soils, moisture, elevation, sunlight, wind and fire determine which species will make up the community. For example, if wind and fire open the canopy (uppermost forest layer) and reduce competing vegetation in the understory, oak and hickory seedlings can develop into the dominant trees. Since these trees are deciduous (seasonally shed their leaves), many plants in the understory have growth cycles adapted to bloom in early spring before new canopy tree leaves block the sunlight.

Although relatively large areas of upland hardwood forest still remain in Arkansas, years of fire suppression and other forest management practices have changed their composition and appearance. Without periodic fires, competing tree species such as red maple have “shaded out” young oak seedlings and greatly reduced the regeneration of oaks. The lack of fire has also enabled more tree species to survive, resulting in a denser forest than existed 150-200 years ago. The use of fire as a management tool could play an important role in preserving oak dominance and ensuring the long-term integrity of the upland hardwood forest system.

The oaks and hickories of upland hardwood forests produce mast (acorns, nuts) that is a major food source for many animals. Understory trees, such as the flowering dogwood, take advantage of available sunlight by blooming before the canopy leafs out. Predators, such as the bobcat and the Cooper’s hawk, are adapted to hunt by darting between the trees. On the forest floor, spring ephemerals (lasting only a few days) such as trillium, bloodroot, and trout lily, are also early bloomers, seeking out the light before it is blocked by overgrowing vegetation. Spring is also the time neotropical migrant birds, such as the American redstart and scarlet tanager arrive from their wintering grounds in Central and South America. Upland hardwood forests often have caves, springs, and clear-flowing streams. These clean, cool, rocky streams support game fish, such as the smallmouth bass, as well as rare darters. Ferns, orchids, water willow and riveroats thrive in these wetter areas. The caves are home to more rare species, such as the Ozark big-eared bat and cave salamander.

# Upland Hardwood Forest



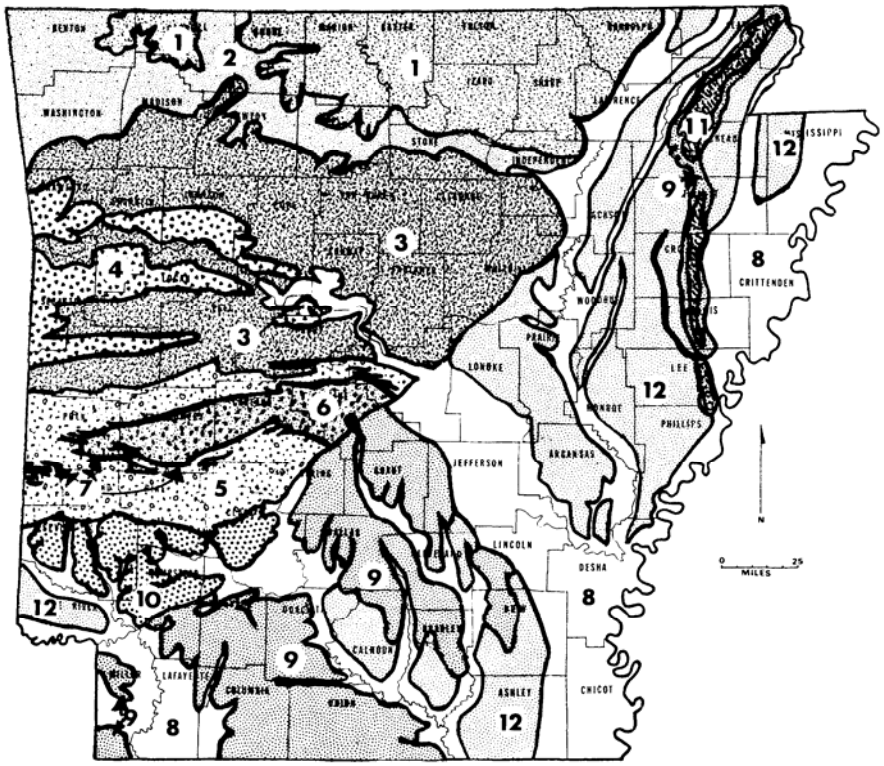

## Species Key

1. Three-toed Box Turtle - *Terrapene carolina triunguis*
2. Crested Iris - *Iris cristata*
3. Ovenbird - *Seiurus aurocapillus*
4. Purple Trillium - *Trillium recurvatum*
5. Bloodroot - *Sanguinaria canadensis*
6. Sessile Woodoats - *Chasmanthium sessiliflorum*
7. Trout Lily - *Erythronium rostratum*
8. Bobcat - *Felis rufus*
9. White Oak - *Quercus alba*
10. Mockernut Hickory - *Carya tomentosa*
11. Cooper's Hawk - *Accipiter cooperii*
12. Scarlet Tanager - *Piranga olivacea*
13. Ozark Big-eared Bat - *Plecotus townsendi ingens*
14. White-breasted Nuthatch - *Sitta carolinensis*
15. Black Oak - *Quercus velutina*
16. American Redstart - *Setophaga ruticilla*
17. Flowering Dogwood - *Cornus florida*
18. Beauty Berry - *Callicarpa americana*
19. Smallmouth Bass - *Micropterus dolomieui*
20. Cardinal Flower - *Lobelia cardinalis*
21. Water Willow - *Justicia americana*
22. Raccoon - *Procyon lotor*
23. Southern Lady Fern - *Athyrium filix-femina*
24. Inland Riveroats - *Chasmanthium latifolium*
25. Yellow-fringed Orchid - *Platanthera ciliaris*
26. Yellowcheek Darter - *Etheostoma moorei*
27. Cave Salamander - *Eurycea lucifuga*

# Upland Hardwood Forest

# Arkansas Maps

# SURFACE GEOLOGY—figure 1




**Area 1**
The surface rocks of the Salem Plateau are the oldest of the Ozark Highlands, younger ones having been removed by erosion. They are largely Ordovician in age, and predominantly dolomite and limestone with some sandstone and shale.

**Area 2**
Here, limestone and chert of Lower Mississippian age, make up the surface rock. Weathering more easily reduces the limestone, leaving large pieces of chert which are especially prominent on hillsides where the finer materials have been eroded away. The limestone is quarried in many localities. Outliers of the Boston Mountains are especially common in the western part of the region.

**Area 3**
The Boston Mountains and the eastern part of the Arkansas Valley are surfaced in sandstone and shale of Pennsylvanian age. The massive Atoka formation, over 1,500 feet thick, is the most prominent. The Atoka sandstone forms the rimrock at the top of the Boston Mountains.

**Area 4**
The western part of the Arkansas Valley is surfaced in Upper Pennsylvanian sandstone and shale. Coal is important in the shales, and much of it has been accessible by strip-mining. There are numerous natural gas fields in this region.

**Area 5**
Mississippian sandstone and shale surface most of the Fourche Mountains and the Athens Plateau of the Ouachitas.

**Area 6**
The central Ouachitas are closely folded ridges and valleys of Ordovician and Silurian sandstone and shale.

**Area 7**
Arkansas novaculite is exposed along the outer edge of the Central Ouachitas, sometimes referred to as the Novaculite Uplift. The novaculite is very hard, fine-grained rock of silica, used as an abrasive stone and as a silica source in manufacturing.

**Area 8**
Recent alluvium and terrace deposits cover much of the lowlands in the southeastern half of the state. Particularly, they provide the surface materials in the Mississippi Alluvial Valley and along the rivers of the Gulf Coastal Plain. The recent alluvium has been deposited by flood waters of the streams and consists of a variety of water-washed material such as silt.

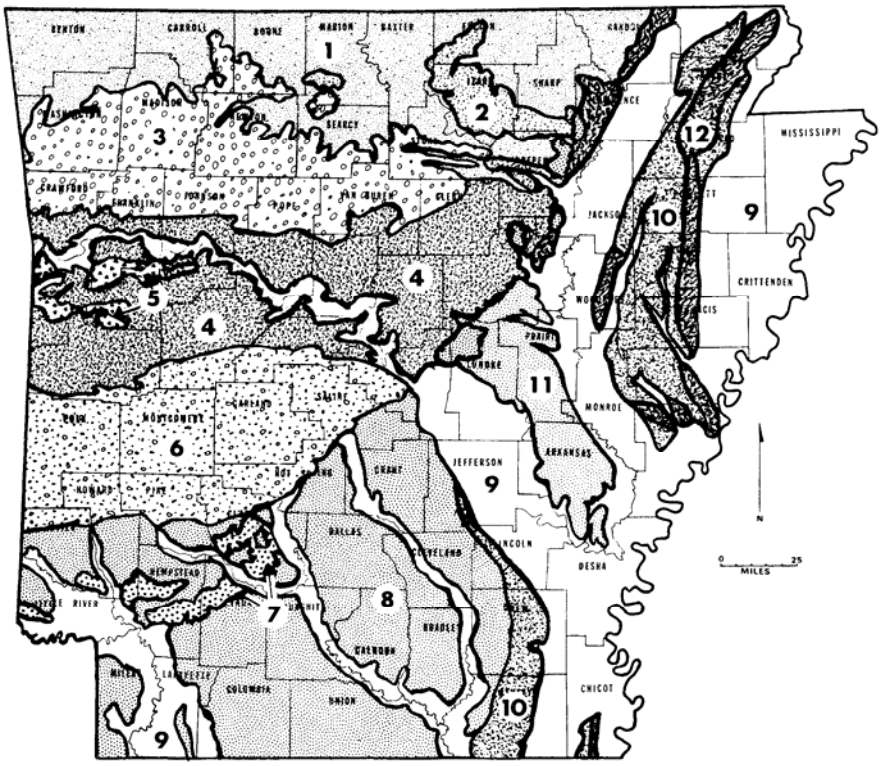
**Area 9**
The edge of Crowley's Ridge and a large area of the Gulf Coastal Plain are surfaced with formations of Eocene age. The Coastal Plain is interrupted by the more recent alluvial deposits of the major rivers, the Saline, Ouachita, and Red. Generally, the surface materials are sand and clay. There are scattered deposits of lignite.

**Area 10**
Scattered Cretaceous formations occupy the inner edge of the Gulf Coastal Plain from the Oklahoma line to Clark County. Most of the beds are coarse sand, clay, or gravel.

**Area 11**
Loess caps the higher portions of Crowley's Ridge. This is a fine, windblown silt derived from the alluvial deposits around the ridge. The winds picked up the dried alluvium which was deposited mainly during the Pleistocene. The bluffs on the east side of the Mississippi Valley, from Cairo, Illinois, southward are a1so capped with loess.

**Area 12**
Alluvial terraces of Quaternary age occur in the northern Delta and in the Coastal Plain along the Red, Ouachita and Saline rivers. They are higher than the adjacent Recent floodplains. They are former floodplains below which streams have now cut. The terraces in the Delta and on the eastern edge of the Coastal Plain are capped by thin layers of loess.

# SOIL ASSOCIATIONS—figure 2




**Area 1**
Ozark Highland Limestone Soils. These soils have developed chiefly on the limestones of the Springfield and Salem plateaus. Elevations range between 500 and 1,500 feet and most of the land is sloped. Terrain varies from the relatively flat areas in parts of Washington and Benton counties to the rugged hills of Carroll County. Subsoils are slowly to moderately permeable clays. Soils are mainly silty loam, relatively deep in the valleys and on flatter areas but very thin on the steeper hillsides.

**Area 2**
Ozark Highland Sandstone-Limestone Soils. This small area is found mainly in Izard, Fulton and Sharp counties. The hills and valleys are eroded from sandstone and limestone on the Salem Plateau. Clay and sandy loam subsoils are overlain by loamy soils.

**Area 3**
Boston Mountain Soils. The Boston Mountains range generally from 1,500 to 2,300 feet elevation. Much of the area is very rugged and several sections have over 1,000 feet local relief. Relatively level land is confined to ridge tops that are remnants of the old plateau surface and the valley floors. The soils are sandy loams and clay loams, medium textured, and generally well-drained.

**Area 4**
Arkansas Valley Soils. Sandstone and shale are the parent materials for soils found on the narrow ridges and in the wide valleys of the Arkansas Valley section of the Ouachitas. The valleys stand at 300 to 500 feet and ridges rise 1,000 to 2,000 feet above them. Soil conditions vary considerably from valley floor to hillside but most soils are slowly to moderately permeable and of medium texture: sandy, silty, and clay loams.

**Area 5**
Cherokee Prairie Soils. These occupy scattered areas in the western Arkansas Valley, developing over sandstone and shale and under prairie. The soils are deep and of medium texture.

**Area 6**
Ouachita Mountain Soils. The soils are of medium texture and are of moderate permeability formed from shale, sandstone, novaculite, and quartzite. Soils are mainly silty clay and silty loam, deep in the valleys and very stony on the ridge tops.

**Area 7**
**Blackland Prairie Soils**. In southwestern Arkansas, scattered prairies occupied areas of chalk and calcareous marls. Gray clay subsoils are overlain by deep, dark clay and silt loam soils.

**Area 8**
Forested Coastal Plain Soils. Central southern Arkansas consists of a sandy coastal plain of rolling terrain broken by stream valleys. Most subsoils are sandy or silty clay loams, relatively deep. Soils are largely sandy loams with some silt and clay loams.

**Area 9**
Bottomland and Terrace Soils. This soil association is found along all major streams. The deep alluvial material varies from coarse to fine texture and thus from rapid to slow permeability. The land is level to gently undulating and there is much wet land.

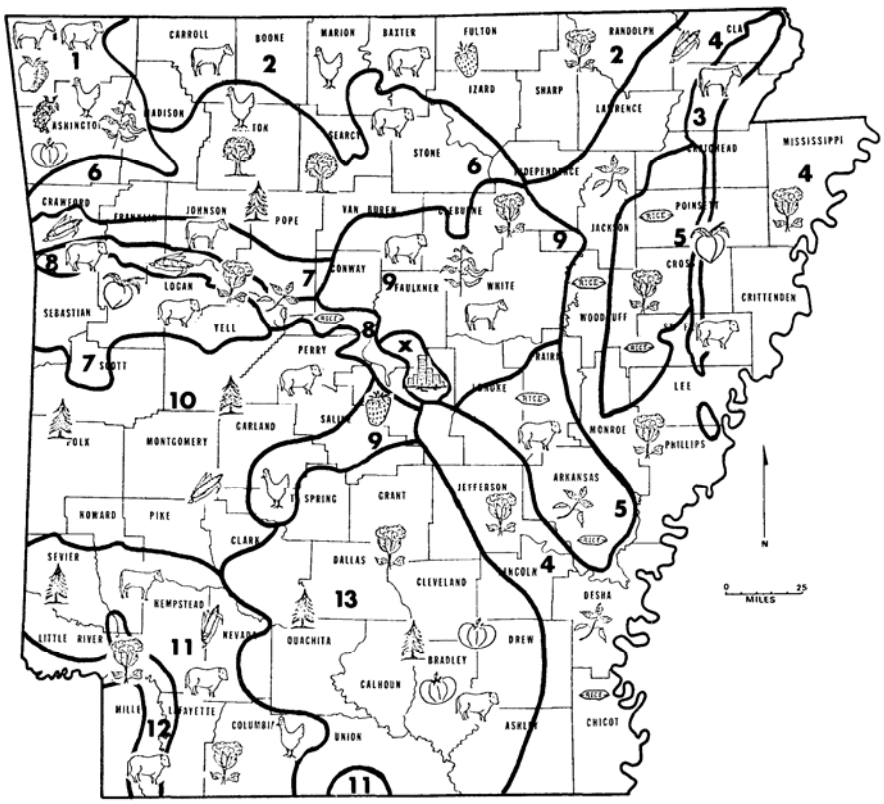
**Area 10**
Loessal Plain Soils. In some areas of eastern Arkansas, especially on the west side of Crowley's Ridge, are broad alluvial plains capped with wind-deposited silt. Most of the soils are deep, medium textured, and slowly permeable. The subsoils are mainly clay and often compact.

**Area 11**
Eastern Prairie Soils. The prairies of eastern Arkansas are mainly in Arkansas and Prairie counties; the largest is called the Grand Prairie. The terrain is nearly level. The clay subsoils are generally compact.

**Area 12**
Loessal Hill Soils. Crowley's Ridge and smaller ridges of eastern Arkansas are capped with wind-blown silt varying in depth from a few to as much as seventy feet. The area is in moderate slope and with much soil erosion. The largely silt loam soils are deep, of medium texture, and are moderately permeable.

# TYPE-OF-FARMING REGIONS—figure 3

Type-of-farming regions are the result of many complex natural and human factors interacting. Basically, the natural factors offer certain possibilities for the use of the land; they may also present obstacles to other uses. Terrain, with respect to slope and relief as they affect drainage, erosion, and the use of machinery, is a major influence. The most rugged parts of the Ozarks and Ouachitas are ill-suited for cropping. Along the major streams in eastern Arkansas there are extensive wet lands. The soils generally are low in natural fertility but respond well to commercial fertilization and other scientific farming practices. The compact subsoil in some areas favors irrigated rice and the sandy coastal plain soils favor the growth of pines. Climate throughout the state makes possible a wide variety of agricultural activities. People, working with elements of the natural world and occasionally improving upon them, are influenced in their decisions on land use by capital, market, tradition, availability of land, and government aids and controls.




**Region 1**
This area is primarily on the Springfield Plateau, extending into the Boston Mountains. Poultry, dairy cattle, and beef cattle are the major agricultural interests. Fruits, particularly grapes and apples, and vegetables, dominated by tomatoes and green beans, are important. Pasture acreage exceeds cropland, which is greater than the woodland.

**Region 2**
The Salem Plateau and eastern area of the Springfield Plateau comprise this region. Woodland, cropland, and pasture are nearly balanced in acreage. Beef cattle and dairying predominate. Variations exist within such a large area, especially in the importance of poultry and various crops. Cotton is significant in the eastern part of the region, vegetables and strawberries in the center and poultry in the west.

**Region 3**
Crowley's Ridge is the location of this region and many of the farm units include significant acreage on the Alluvial Plain. General farming predominates, with cotton and fruit declining and beef cattle and dairying increasing in importance.

**Region 4**
Much of the Mississippi Alluvial Plain is in this region. Cotton and cash grain, especially soybeans, corn, and rice dominate the agriculture. Livestock are increasing in importance but are generally less significant than in other parts of the state. This area has the highest tenancy rate within the state and the size of farm unit is smaller here than elsewhere (but growing), emphasizing the commercial nature of the agriculture and the land values.

**Region 5**
Certain areas within the Mississippi Alluvial Plain emphasize rice production to such a degree that they comprise a distinct region. The rice area just north of the Arkansas River is the older, with soybeans, cotton, and beef cattle also important. The rice area to the west of Crowley's Ridge is newer and has greater emphasis upon cotton. Subsoil and available irrigation water are significant factors.

**Region 6**
The Boston Mountains constitute most of this region. Rough terrain and the large acreage in the Ozark National Forest limit the extent of agriculture. General farming prevails, with emphasis upon livestock, especially beef cattle, hogs, and chickens. Non-commercial farms are common. The hardwood forest covers much of the area but produces limited cash income.

**Region 7**
The western half of the Arkansas Valley, excluding the bottomlands, has a varied agriculture. Diversified agriculture prevails, featuring beef and dairy cattle, corn, pasture, and a wide variety of vegetable and fruit crops. Cotton has decreased in importance in recent years, especially in the western part of this region.

**Region 8**
The very narrow alluvial lands along the Arkansas River comprise this region. Part of the original floodplain is now under the waters of the Arkansas River Navigation Project. Most of the land here is part of farms in Region 7. Cattle occupy the terrace lands while the lower lands are used mainly for crops. Soybeans, corn, and oats are major grains. There is considerable emphasis upon commercial vegetables in the western portion of the region and rice is of increasing importance in the eastern part where cotton also is found.

**Region 9**
The central agricultural region is situated largely in the highlands but extends into the lowlands. The metropolitan population is a major influence not generally felt elsewhere in the state. Dairying and general farming predominate, with cotton, beef cattle, poultry, and a variety of vegetables and small fruits in significant proportions.

**Region 10**
The bulk of the Ouachita Mountain area is quite similar in economic development to the Boston Mountains, Region 6. Rough terrain and the large acreage of the Ouachita National Forest emphasize the extent of woodland and the limited cropland. Much land is in pasture and hay is the major crop, followed by corn. General farming concentrates on livestock production.

**Region 11**
This region is on the Coastal Plain in the southwestern part of the state. Cotton is the outstanding crop and corn is widely grown but the trend is away from row crops and to more pasture. Beef cattle usually rank high, but dairying and broilers are significant in certain areas. Vegetables and fruit are locally quite important.

**Region 12**
This is another of the narrow bottomland areas, along the Red and Little Rivers. Cotton is very important, with beef cattle the other major source of farm income.

**Region 13**
Central southern Arkansas is also on the Coastal Plain which is heavily forested. General farming is the most widespread with beef cattle and cotton the major commercial products. Locally, vegetables and forest products from the farm are commercially important. There are many non-farm forest holdings in this area.

**Region X**
This is a non-agricultural region, devoted to the Little Rock-North Little Rock metropolitan area.

**Make A Map Legend**

The Farming Regions Map on page 68 uses the pictures in the boxes below to illustrate different farm products. Use the information for each of the farm regions to label the pictures below and complete a legend for the map.

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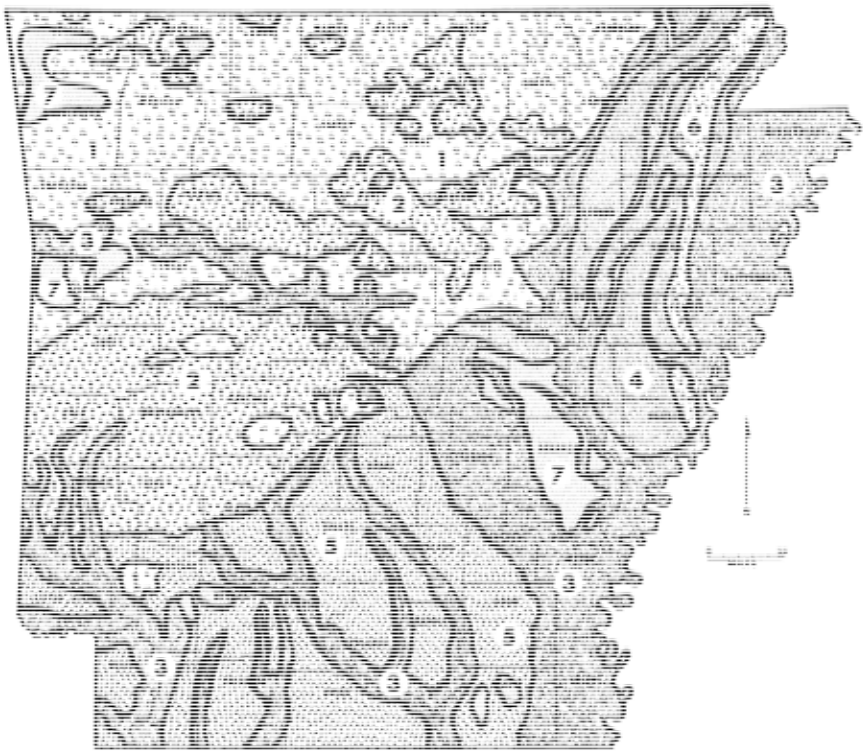
# PLANT COMMUNITIES—figure 4



**Area 1**
Upland Hardwood Forest. The dominant species are oaks and hickories which are adapted to the relatively thin, dry soils of the mountains. Typical species include:

- very dry sites - blackjack oak, post oak
- dry sites - black oak, black hickory
- moist sites - southern red oak, white oak, mockernut hickory
- very moist sites - northern red oak, beech, sugar maple

**Area 2**
Upland Pine Forest. The characteristic species is the shortleaf pine. The soils of this forest are formed in chert, novaculite or sandstone; therefore they are more acid than equivalent sites occupied only by upland hardwoods. The sites may be "very dry", "dry" or "moist" and upland hardwoods appropriate to those conditions will be present. Within the area mapped as Upland Pine Type, pine does not usually occur on "very moist" sites.

**Area 3**
Bottomland Hardwood Forest. The dominant species are oaks and hickories which are adapted to intervals of flooding. Typical species include:

- permanently or usually flooded - bald cypress, tupelo
- very frequently flooded - overcup oak, water hickory
- frequently flooded - sweetgum, Nuttall oak, willow oak, sugarberry
- sometimes flooded - water oak, pecan, cherrybark oak

**Area 4**
Terrace Hardwood Forest. This forest type occurs on sites which seldom flood but may be poorly drained because they are flat and their soils are clayey. Typical associations of species include those of the "sometimes flooded" bottomland hardwood forest, along with those communities of the upland hardwood forest which occur on "moist", "dry" or "very dry" sites.

**Area 5**
Lowland Pine Forest. The characteristic species is the loblolly pine. It occurs on sites similar to the Terrace Hardwood Forest and with terrace hardwood species appropriate to those sites. Lowland Pine sites are usually more rolling. sandier and better drained than Terrace Hardwood sites. Shortleaf pine is found along with, or instead of, loblolly pine in some areas mapped as Lowland Pine Forest, particularly on the quaternary terrace along the eastern edge of the Coastal Plain, and dry, steep areas elsewhere.

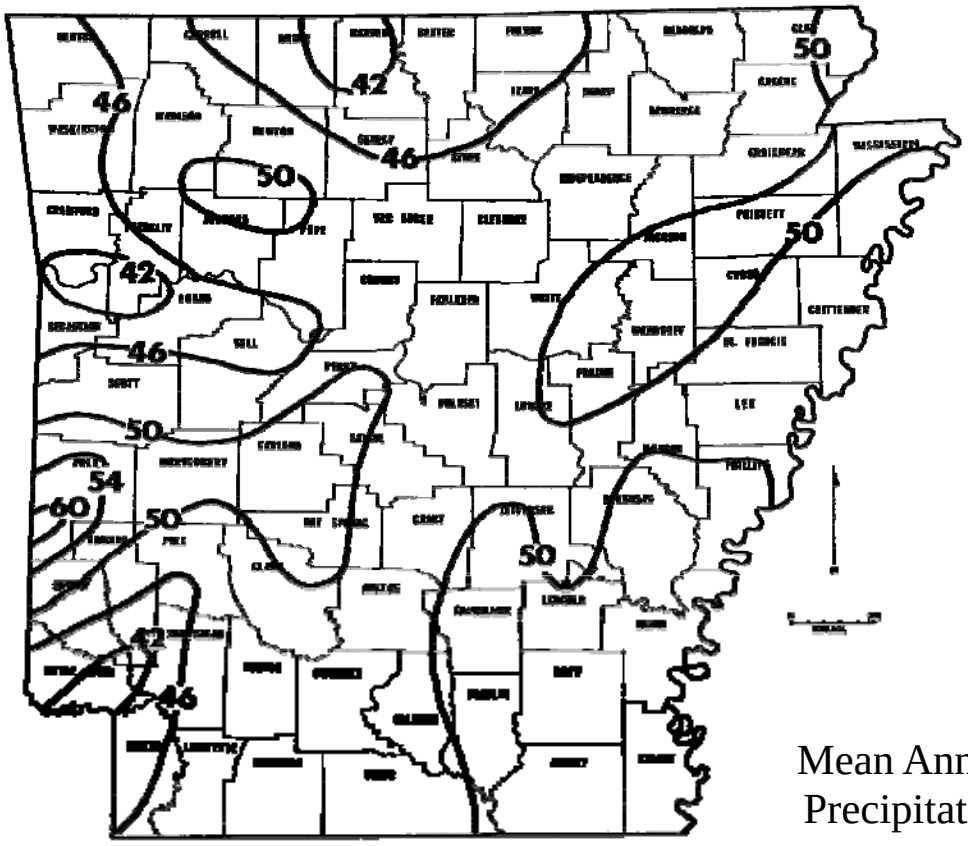
**Area 6**
Crowley's Ridge Upland Hardwood Forest. This type is similar to the Upland Hardwood type except that “very moist" and "moist" sites are far more common on Crowley's Ridge than in the Ozarks and Ouachitas. Also, some species such as the tulip tree are found in Arkansas only in the Crowley's Ridge type and others, such as the white walnut, are found most commonly in this forest. Shortleaf pine is found on the northern half of the ridge.

**Area 7**
Prairie. This is the one major plant community of Arkansas which is not dominated by trees, but rather by native grasses. Dominant species include big bluestem, indiangrass and switchgrass on moister sites and little bluestem on drier sites. There are four major kinds of prairie in Arkansas:

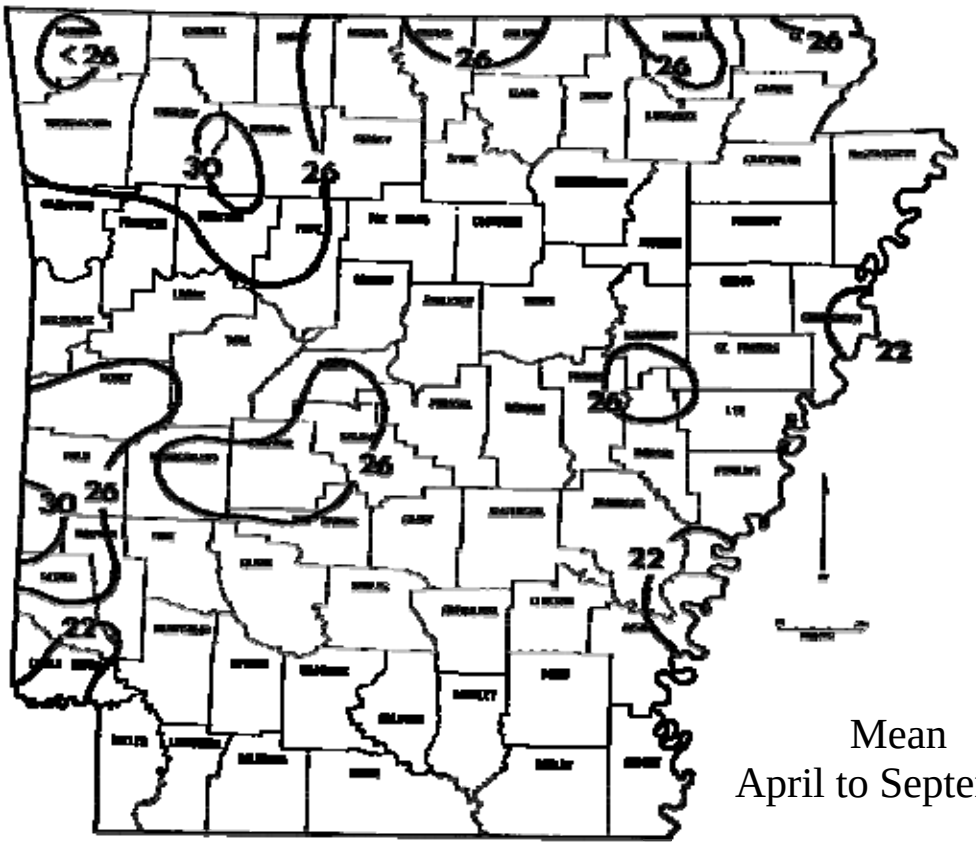
- The "Grand Prairie" type of the Delta and eastern Coastal Plain,
- The Blackland Prairie type of the Coastal Plain,
- The Cherokee Prairie type of the western Arkansas River Valley, and
- The Osage Prairie type of the Ozarks.

These differ from each other in minor, but recognizable ways such as the presence of unique species and different relative abundance of common species. The Prairie community type merges with the “very dry" and "dry” upland forest communities to form savanna, where oaks and pines are scattered among the native grasses.

## Precipitation Maps—figure 5

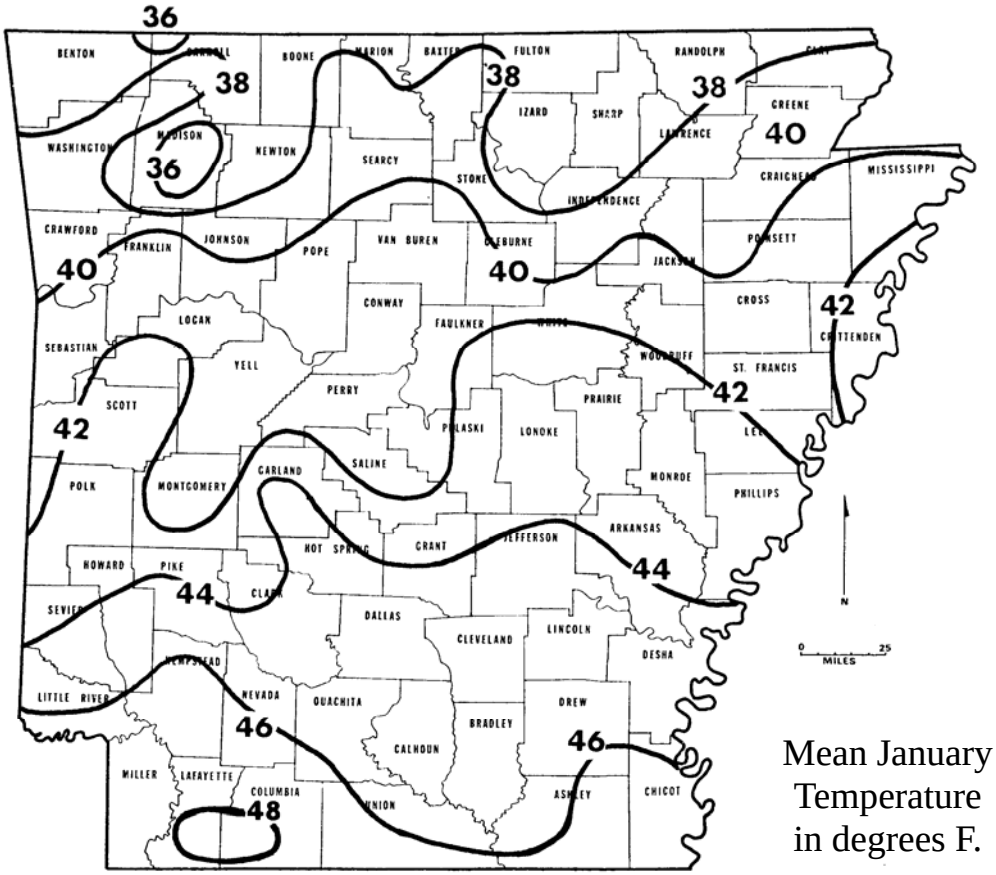



Mean Annual Precipitation

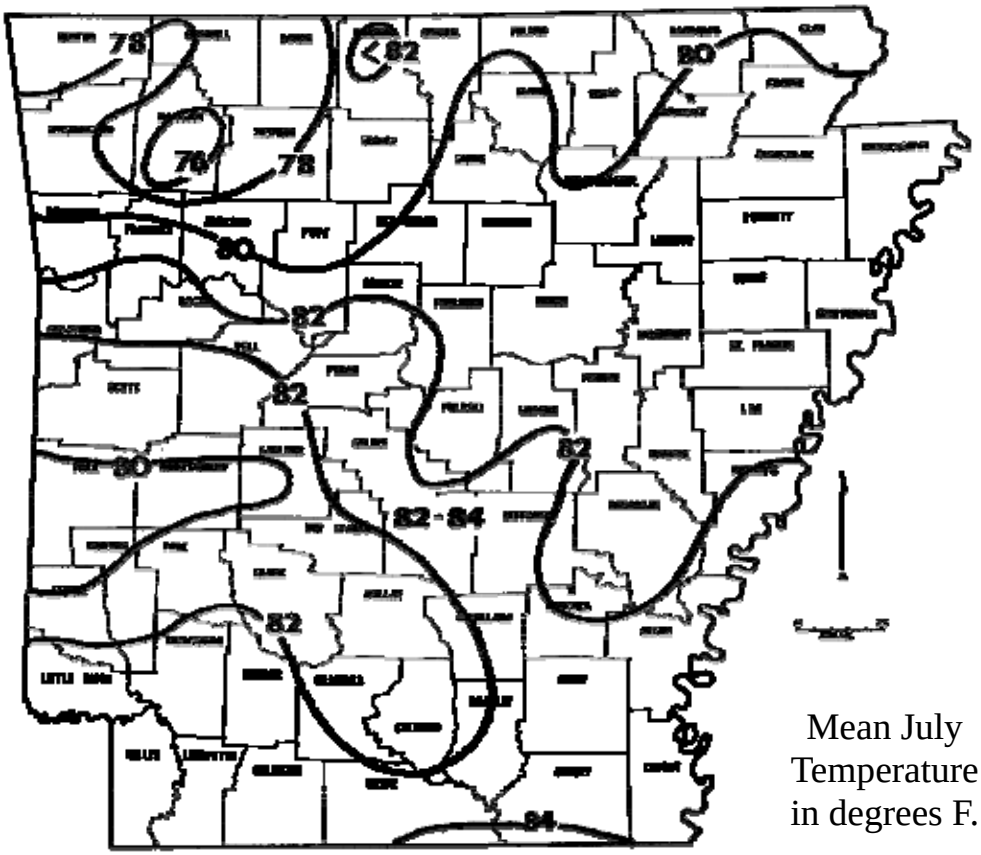



Mean April to September

# Temperature Maps—figure 6



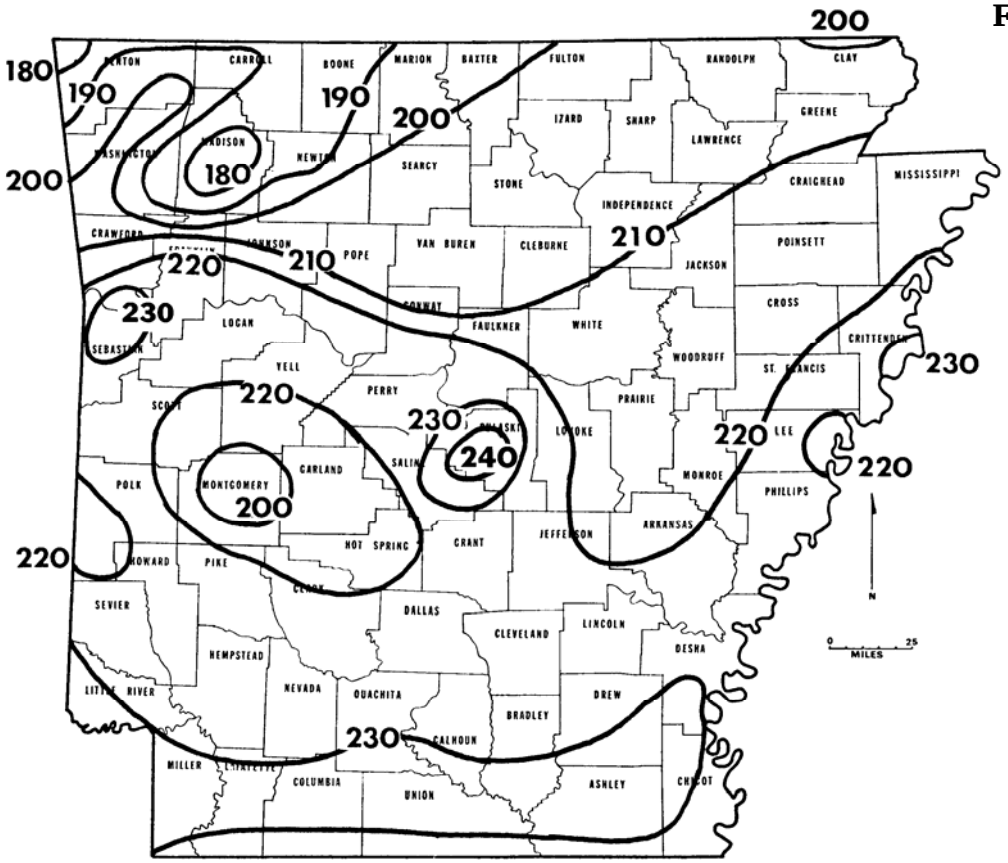

Mean January Temperature in degrees F.




Mean July Temperature in degrees F.

Mean Duration of Growing Season in Days

**Figure 7**

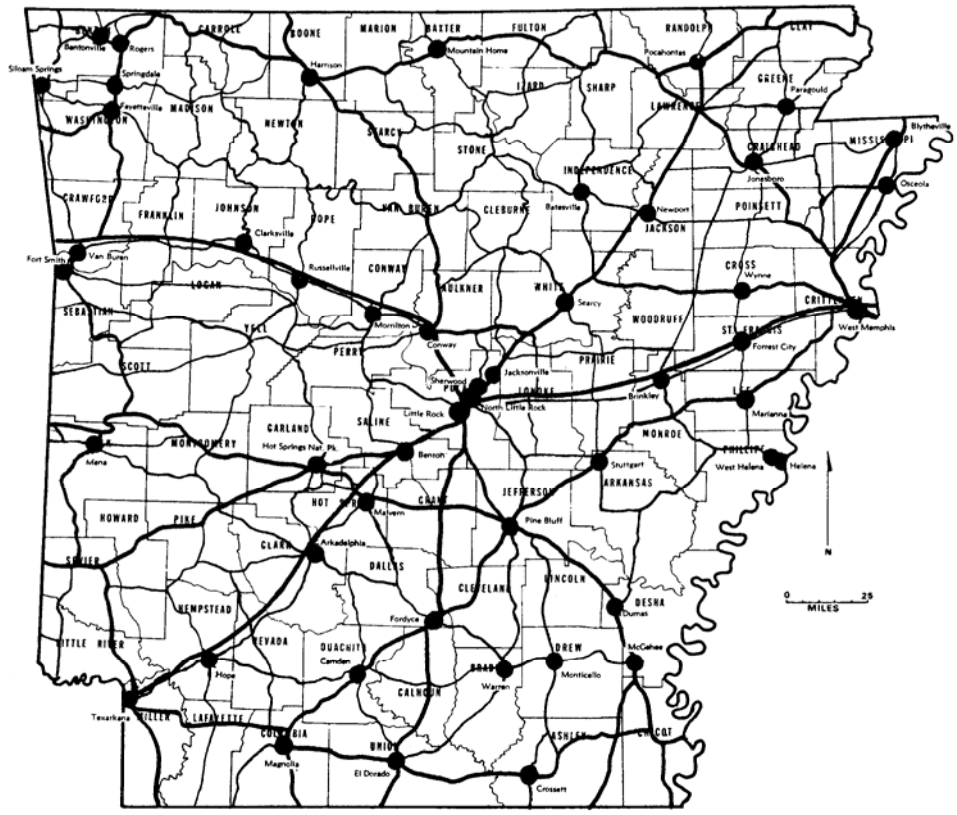



Major Highways & Roads

Arkansas Geography - 1978

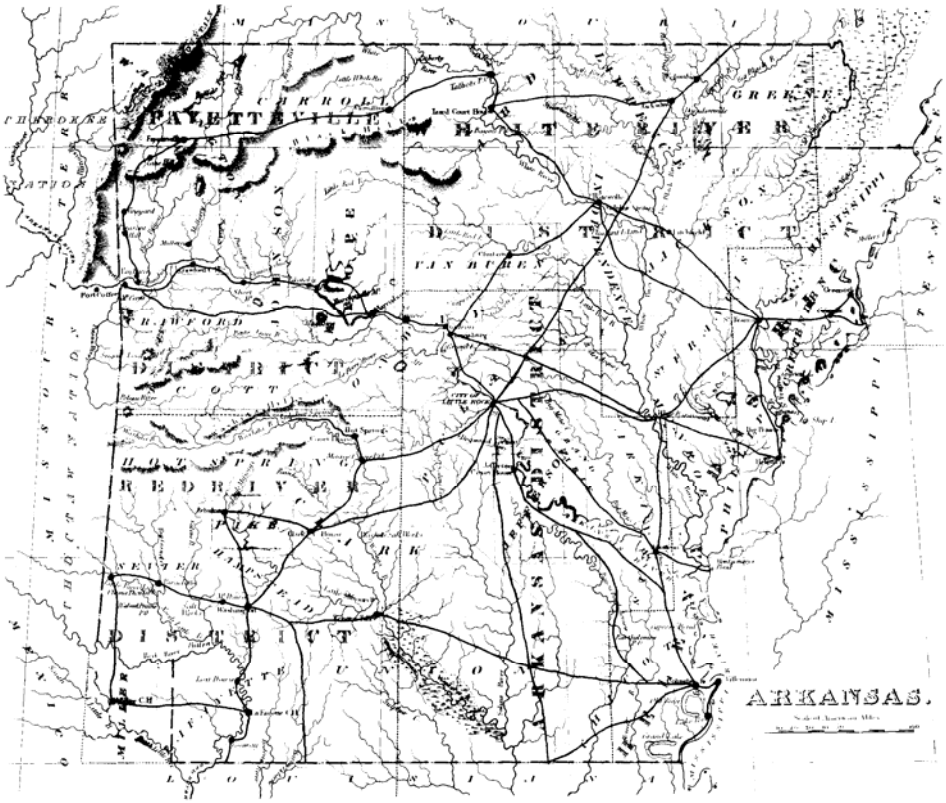
Highways, counties, and cities with populations over 4500

**Figure 8**




Arkansas Circa 1834

present state boundaries shown



# Appendix 6
# Test Your Natural Division Knowledge

1. Where are the two places in Arkansas with the oldest rocks, and how old are they? (*To answer this question, find the geological periods in the descriptions with the Surface Geology Map and then find the corresponding age in the chart on page 11.)*

2. Using the precipitation maps, answering the following questions:

   What is the average annual precipitation for the entire state of Arkansas?

   Which county has the greatest annual precipitation?

   Which counties have the least annual precipitation?

   In general, does northern or southern Arkansas have greater annual precipitation?

   Why do you think the precipitation from April to September might be important?

   Which counties have the greatest precipitation during this period?

   In general, does northern or southern Arkansas have greater annual precipitation during this period?

3. How many degrees is northern Arkansas cooler than southern Arkansas during July? During January?

4. Name the division or divisions where there is no upland hardwood forest.

5. Which three divisions have the most bottomland hardwood forest?

6. Looking at the map of major highways and roads, note how you can distinguish the following: where the rivers run; rugged hills, densely populated areas.

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