

MISSISSIPPI STATE GEOLOGICAL SURVEY

WILLIAM CLIFFORD MORSE, Ph. D.
Director



BULLETIN 32

TISHOMINGO STATE PARK

GEOLOGIC HISTORY

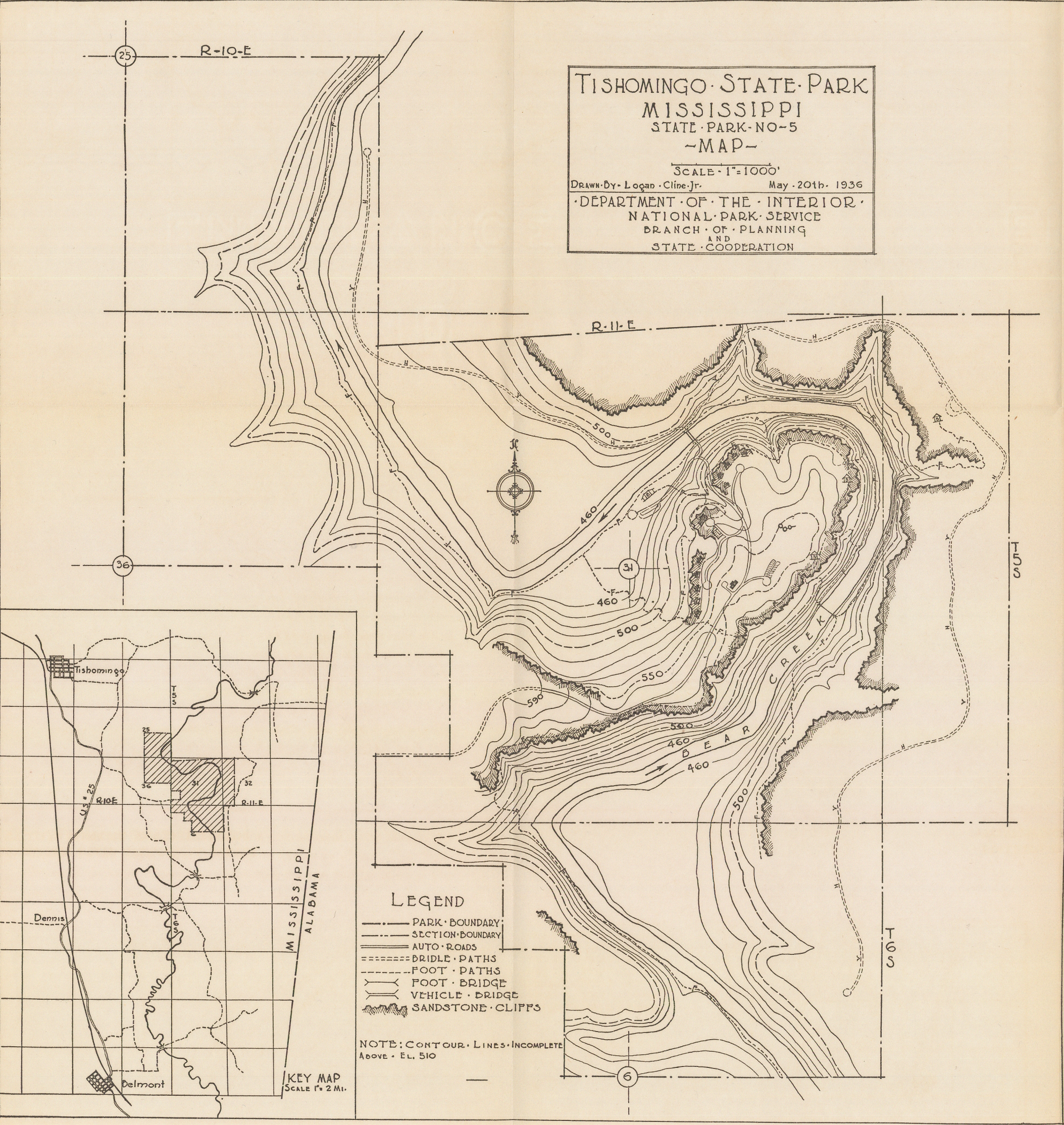
By
WILLIAM CLIFFORD MORSE, Ph. D.

BOTANY

By
CALVIN S. BROWN, D. Sc., Ph. D.

UNIVERSITY, MISSISSIPPI

1936



Frontispiece

Tishomingo State Park topographic map showing the topography by means of contour lines of which each line connects all points of the same elevation above sea level. The vertical interval between two contour lines is 10 feet. Where the contour lines are close to each other, the slope is steep; where they are far apart, the slope is gentle. Accordingly the closely spaced contours on each side of Bear Creek show that the valley is a deep gorge in the form of an enormous bend or meander. The special hatched lines indicate the two walls of Highland Church sandstone cliffs, one on each side of the valley.--By courtesy of Mr. J. H. Fortenberry, National Park Service and Mr. Fred B. Merrill, State Forester, Mississippi State Forestry Commission.

Note

Tishomingo State Park is under the management of the Mississippi Board of Park Supervisors, from whose executive officer, The State Forester, Jackson, information concerning the use and facilities of the park may be obtained.

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ALFRED BENJAMIN BUTTS, Ph. D., LL. B.
CHANCELLOR OF THE UNIVERSITY OF MISSISSIPPI

STAFF

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LETTER OF TRANSMITTAL

Office of the State Geological Survey
University, Mississippi
June 30, 1936

Dr. A. B. Butts, Chancellor
University, Mississippi

Dear Chancellor Butts:

I have the pleasure of submitting herewith the manuscript of a report entitled Tishomingo State Park, a special pleasure because it describes a park that has long been a dream of mine--a park the establishment of which was one of my first official endeavors. In addition to the geologic history the report contains a list of the trees and smaller plants of the area--one closely related to the Appalachian region--by Dr. Calvin S. Brown. The report is the second in the survey's educational series and is to bear the number 32.

Very sincerely yours,

William Clifford Morse, Director.

ACKNOWLEDGMENTS

In the hour of realization of a dream--the establishment of Tishomingo State Park and the completion of a geologic report thereon--the author would be ungrateful if he failed to acknowledge indebtedness to those who gave, during the years of his study in northeastern Mississippi, cheerfully of their time and energies and to those who helped to make, in later years, the park a living reality. The first of these was the late Dr. F. T. Carmack, one of the first citizens of the state, who was never too busy to advance the cause of his home community. Another, Mr. Wiley Leatherwood, veteran proprietor of the Leatherwood Hotel, always extended and still extends a warm hospitality. Still another, the late Mr. J. R. Bickerstaff of Highland Church, perhaps the best posted man on sections and property lines anywhere, accurately located the author's field position on the inadequate maps of those early days. Yet another farmer is Mr. T. H. Grisham representative of that class of citizen which is the very salt of the Earth; namely, the industrious, thrifty, honest, Christian farmer, who craves no other privilege than his God given right to pursue intelligently the tilling of his own soil.

No less helpful was the encouragement of the late director, Dr. E. N. Lowe, and the actual field geologic assistance, during the seasons of 1920, 1921, and 1926, of the late Paul Franklin Morse, and of T. Benton Fatherree, Julian Patrick, Franklin E. Vestal, F. N. Geddus, L. H. Shropshire, and E. H. Toney.

All through the years the Hon. J. C. Jourdan has always advanced the interest of his community. Accordingly it was he, when Mr. Fred B. Merrill, State Forester, kindly sent Mr. H. C. Mitchell, Assistant State Forester, to assist the author in presenting the project to the Board of Supervisors, that called together this board consisting of the Honorables J. B. Stormont, Henry Marler, A. B. Long, and C. C. Stephens. These men voted enthusiastically and unanimously to purchase the land for the park. Finally Dr. Calvin S. Brown consented to study the plants of the park and Dr. Vernon L. Mangun and Mr. N. B. Buchanan respectively Educational Adviser and Superintendent of the Park, have given every assistance possible to the final geologic and botanical study, and Mr. Buchanan has done much to overcome and conceal the ravages of the early military men on the natural stone of the park.

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TISHOMINGO STATE PARK

GEOLOGIC HISTORY

BY
WILLIAM CLIFFORD MORSE, PH. D.

INTRODUCTION

Tishomingo State Park is different; different from any Mississippi area outside of Tishomingo County. It is different because of its geologic structure. Its geologic structure is different because of the nature of its geologic formations. Its geologic formations are different because they belong to the Paleozoic rocks, and the Paleozoic rocks are different because they are the only wholly consolidated rocks in the state.

Tishomingo State Park is a dream; a dream in more than one sense of the word. It was a dream of the present State Geologist long before he became that official; a dream of his ever since his introduction to the area in 1919. It was a dream that he sought to materialize immediately on his appointment to official life; consequently, it is a dream come true.

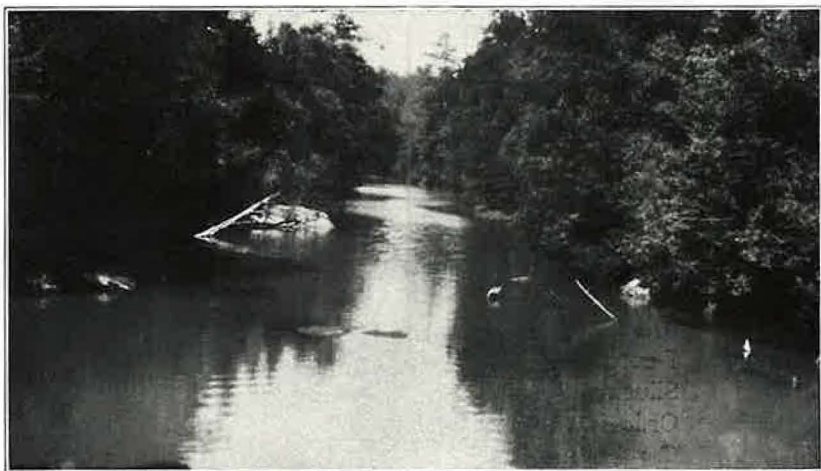


Figure 1.—Beautiful Bear Creek, looking down-stream from the foot bridge in Tishomingo State Park.---Photographed June 20, 1936.

Tishomingo State Park is beautiful, perhaps the most beautiful park in the state (Figure 1). Its beauty is the beauty of ruggedness. Its ruggedness is the ruggedness of cliff-forming rocks carved by streams

(Frontispiece). Herein lies the secret of its beauty, a beauty developed only in the later stages of its geologic history, for its early history goes back into the geologic past.

GEOLOGIC HISTORY OF TISHOMINGO STATE PARK AND RELATED AREAS

Although the geologic history of the area extends far back into the geologic past, as compared with other areas in the state, it does not extend all the way back into the Archeozoic and Proterozoic eras (See time scale and rock scale). The rocks of these eras (groups) crop out in a broad belt surrounding Hudson Bay as the Canadian Shield; in a belt extending from Canada into Georgia and Alabama largely to the east of the present Appalachian Mountains; and in a broken belt stretching from Canada through the United States and into Mexico, partly to the west of the present Cordilleran (Rocky Mountain) section.

Geologic time scale

Cenozoic era

- Recent period
- Pleistocene period
- Pliocene period
- Miocene period
- Oligocene period
- Eocene period

Mesozoic era

- Cretaceous period
- Comanchean period
- Jurassic period
- Triassic period

Paleozoic era

- Permian period
- Pennsylvanian period
- Mississippian period
- Devonian period
- Silurian period
- Ordovician period
- Cambrian period

Proterozoic era

- Keweenawan period
- Late Huronian period
- Middle Huronian period
- Early Huronian period

Archeozoic era

- Archean period

During the third era, the Paleozoic, these areas stood high as the Canadian Shield, as old Appalachia land, and as old Cascadia land. They furnished the sediments that were swept down into the Paleozoic seas. Appalachia land itself furnished those sediments that formed the Paleozoic rocks of Tishomingo State Park.

Early in the Paleozoic era, at the beginning of the Cambrian period, a trough formed on the west of old Appalachia land where the Appalachian Mountains now are, and another trough formed east of old Cascadia land where the Rocky Mountains now are. Up these troughs the sea slowly crept, and into these two arms sediments from all three of these high land areas were swept. By mid-Cambrian period, these arms of the sea extended themselves somewhat east and west and joined one another at the south to form a shallow U-shaped sea. All the while these arms of the sea were receiving clastic sediments from the old land masses and calcareous sediments from their own shell fish. By late Cambrian times the sea and the streams had worn down the central land area until the sea covered much of the interior of the continent. Since it had been a transgressing sea, its sandy clastic sediments so outranked the calcareous material that these sediments on consolidation formed the famous Potsdam sandstone.

The Ordovician sea quietly followed the Cambrian sea, so quietly in fact that the lowly worn land tracts furnished little clastic sediment for the sea. Limy shells and other calcareous tests thus accumulated unmixed with clastic sediments and formed limestone on consolidation. Later as the sea began its withdrawal, it worked over the finer material in the form of mud and mixed it with the shells and tests and formed limy shales of them.

The Silurian sea was slow in transgressing the continent. Along Appalachia and other old land masses it received clastic sediments in the form of gravel, sand, and mud which, on consolidation, became conglomerate, sandstone, and shale. Away from the land masses and later in the Silurian period, calcareous material accumulated, from which limestone and dolomite were formed. Some of the dolomite, the Niagarian, for example, is so massive that it later became a cliff-forming stone, as did still later the Highland Church sandstone in Tishomingo State Park. As such a bold cliff or escarpment the Niagarian extends westward across central New York into the re-entrant angle at the head of Lake Ontario, and thence bends in a sweeping curve through Bruce Peninsula and Manitoulin Islands between Lake Huron and Georgian Bay and on through the peninsula between Lake Michigan and Green Bay. Across this cliff or escarpment the

Niagara River drops in the great Niagara Falls, and into it the river has cut, as the falls have slowly receded, the equally famous Niagara Gorge, similar to the gorge formed in younger rock in Tishomingo State Park.

Still later in the Silurian period the climate grew arid; the shallow sea shrank to small arms, in which evaporation exceeded sea-water intake, so that thick beds of salt (NaCl) and gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) were precipitated in the form of such deposits, similar to later deposits of Mississippi, Louisiana, and Texas. Later the sea slightly expanded and then withdrew. But all such Silurian, as well as Cambrian and Ordovician beds, that may have been formed within the present area of the State of Mississippi have been swept away by erosion or have been buried by younger beds.

Early in the Devonian period, sediments were deposited which do, however, have surface representation in Mississippi, in Tishomingo County near the park. The first and lowest of these is a series of calcareous sediments that form the New Scotland and Island Hill limestones (See middle geologic rock scale). Somewhat later, these fairly clear early Devonian seas gave way to more swampy conditions, so that much vegetable matter mixed with mud accumulated and on consolidation formed the black carbonaceous shales of the Whetstone Branch formation. Unfortunately much of these Devonian beds will soon be submerged by the Tennessee River waters backed up from Pickwick Dam, so that their written record becomes desirable. Furthermore, these Devonian and overlying Mississippian beds furnish the problem of an adequate water supply within the park.

Middle geologic rock scale*

Mesozoic group

Cretaceous system

Gulf series

Ripley formation

Selma chalk

Eutaw sand

Tuscaloosa formation

Comanchean system (Not represented in Mississippi)

Jurassic system (Not represented in Mississippi)

Triassic system (Not represented in Mississippi)

Paleozoic group

Permian system (Not represented in Mississippi)

Pennsylvanian system (Not represented in Mississippi)

Mississippian system

Chester series

Forest Grove formation

Highland Church sandstone member

Shale and sandstone member

Southward Bridge formation

Limestone, upper

Shale and sandstone

Limestone, lower

Shale

Southward Spring sandstone

Southward Pond formation

Pond limestone C

Shale

Pond limestone B

Shale

Pond limestone A

Shale

Allsboro sandstone

Alsobrook formation

Cripple Deer sandstone or shale member

Hargett sandstone or shale member

Limestone

Lower series

Iuka terrane (chert)

Carmack limestone

Devonian system

Upper series

Whetstone Branch shale

Oriskanian series

Island Hill formation

Helderbergian series

New Scotland limestone

* Lowest rocks at the base.

As the early Mississippian sea slowly transgressed the region, it was furnished only the finer clastic material along with calcareous tests. These formed clay and calcareous shales--the Carmack limestone of Mississippi, named after Carmack Creek, in turn after Dr. Carmack of beloved memory. Later the sea became clearer so that mostly calcareous material accumulated which, on consolidation, formed limestone, but this calcareous material did contain an abundance of

siliceous material which formed the interstratified flints and cherts. Untold ages later when ground water dissolved out the limy material and carried it away, it left behind great quantities of chert, the Iuka chert of Mississippi--a chert like that formerly purchased without the state for road construction in Mississippi.

After a brief interval of fairly clear waters, the later Mississippian sea of the Chester epoch became muddy and sandy except for the briefest intervals of clear waters. More specifically the sea made a series of transgressions and recessions. During transgression it worked over the land material and deposited first sand and then mud; during maximum extension it deposited mostly calcareous material; and during recession it deposited mud and sand--all of which, on consolidation, gave a series of approximately the following sequence: sandstones, shales, limestones, shales, and sandstones--the Alsobrook, the Allsboro, the Southward Pond, the Southward Springs, the Southward Bridge, and the Forest Grove formations of the park environs. The shaly sandstones and sandy shales below and the massive cliff-forming Highland Church sandstone member above, both of the Forest Grove formation, constitute the hard rocks of Tishomingo State Park itself.

During the closing stages of the Mississippian period, or during the early stages of the Pennsylvanian period, or rather during the intervening interval, the sea withdrew, the shallow sea bottom became a land area, and the new land area of newly formed beds underwent erosion. The region adjoining on the north was thus worn down nearly to sea level or settled back almost to sea level, a position known as the critical attitude. In Pennsylvanian times, because of this critical attitude at sea level, any slight movement, either up or down, was recorded by a change in the nature of the sediments being deposited. Continental deposits, swamp beds, and marine formations consequently succeeded one another at short intervals as far south as Mississippi and perhaps into Mississippi itself, as gas and oil well records seem to disclose.

Great swamps, perhaps similar to the great Dismal Swamp of the Atlantic Coast, formed. In them and about them luxuriant forests of giant trees grew in such a manner that when any part of them fell into these waters, the oxygen of the air was largely excluded from them. By thus preventing oxidation or decay this woody material accumulated in great thicknesses. Later successive beds of it were buried by streams carrying other material into these swamps and depositing the newer material upon these beds of vegetable matter. By natural compression and by the weight of these overlying clays and sands this vegetable material was transformed into peat, the peat into lignite, and the lignite

into bituminous coal. Thus was formed the great Appalachian coal fields, extending from northern Pennsylvania into central Alabama and perhaps into marginal Mississippi.

Some of the plant forms were large fern or fern-like trees; some were giant *Lepidodendrons* and *Sigillarians*, a hundred feet in height and two or three feet in diameter, and some were large *Equiseta*. Today these trees are represented mostly by lowly forms: the first by ordinary ferns; the second and third by club mosses and ground pines; the last by horsetails or scouring rushes. Trees that reached the great height of one hundred feet in Pennsylvanian geologic times have declined until today they stand only a few inches in height--a solemn reminder that not all development is upward.

Along with the continental, swamp, and marine gravels, sands, and muds, that later formed conglomerates, sandstones, and shales, thin swampy beds of iron carbonate ores (FeCO_3) were precipitated and thin marine beds of limestone (CaCO_3) accumulated. Not only were the great bituminous coal fields of the Appalachian region formed in Pennsylvanian times, but these thin beds of iron ore and limestone were also formed. Out of these thin iron ores and limestones the great iron industry of western Pennsylvania and eastern Ohio had its origin, even though the iron ores were later supplanted by ores from the rich Lake Superior fields--a fact and a development that has left its influence on the whole of the United States.

In early Permian times the eastern part of the United States remained at the critical sea-level attitude as it had done so long during the Pennsylvanian period, and similar sediments were deposited, out of which principally shales, sandstones, and thin coals were formed; but during most of the Permian the thousands of feet of sediments that had been collecting in the great Appalachian trough during the Paleozoic era were subjected to lateral thrusts from the southeast Atlantic side and thrown into a series of long narrow upfolds and downfolds that constituted the first Appalachian Mountains extending from Canada across the eastern United States to central Alabama, and to the northeastern tip of Mississippi. This great Appalachian upheaval brought the Paleozoic era to a close.

Throughout the long Triassic, Jurassic, and Comanchean periods of the Mesozoic era no known sediments accumulated in this immediate area. Rather, erosion was the chief process, for no sooner had the great Appalachian Mountain folds been pushed high above sea level than the quickened streams began to wear them down to a plane, a peneplane.

By early Cretaceous times they had been brought low, and the master streams at the north flowed southeast across the old plane, and at the south the master streams flowed south and southwest across it. In Cretaceous times this old peneplane was bent up in a huge broad arch at such a slow rate that the master streams cut down at the same rate and thus maintained their courses. The tributary streams soon found the parallel belts of less resistant highly-tilted rocks into which they cut parallel valleys. These tributary streams left the parallel intermediate belts of more resistant highly-tilted rocks as the present Appalachian Mountain ridges--mountain ridges produced by the erosion of intermediate highly-tilted beds rather than by upfolding.

Throughout Triassic, Jurassic, and Comanchean times the sediments that were carried west and southwest must have been deposited upon the lowlands or within the Gulf of Mexico of that date regardless of its boundaries; but of such deposits there are no known surface exposures. Rather, it was erosion that most affected this area during these periods. By early Cretaceous times, however, the Gulf waters were encroaching on the Tishomingo Park area, although at least the earliest of the Tuscaloosa gravels and sands were being laid down as stream deposits across the Highland Church sandstone, much as they exist in the park today. Eventually the Cretaceous sea reached this general region, and the later sands, gravels, and muds of the Eutaw were laid down within it. These have not been cemented into sandstones, conglomerates, and shales but remain in their original unconsolidated condition. Later came the clearer Selma sea, in which the present partly-consolidated chalk accumulated; and then came the sandy and muddy Ripley sea.

Still later came the succession of Eocene, Oligocene, Miocene, Pliocene, and Pleistocene seas of Cenozoic times whose deposits now stretch in successive belts all the way to the present Gulf of Mexico, but these deposits reach far beyond the present bounds of the park--and of the subject of this paper.

One feature of the Pleistocene history elsewhere needs, however, to be discussed here. While Pleistocene sediments were accumulating in the sea and along the streams of the land of the Gulf Coast, a mighty glacier slowly crept down from the Labradorian center of radiation to Pennsylvania and Ohio, slowly melted, and just as slowly melted back, to be followed by another, then another, and still another. The forward movement of each of these glaciers was sufficiently slow for many trees and smaller plants to advance in front of it by developing seed, growing

new plants, and these in turn repeating the process. Thus many arctic and sub-arctic trees and smaller plants reached far down into the United States. In a similar manner the trees and smaller plants followed at least a part of the way back as each glacier slowly withdrew. When the edge of the Wisconsin, the last of these four glaciers, passed into the lower lands beyond the northern Appalachian Mountains, the climate there became so warm that the arctic or sub-arctic trees and smaller plants could not follow, but became stranded on the higher Appalachian ridges. Consequently, the vegetation of the Appalachian Mountains is extremely rich in the number of plant species, a condition reflected in the richness of plant forms in Tishomingo State Park. In turn this condition led to a request from the Survey for a brief study of the plants by Dr. Calvin S. Brown -- some of whose specimens will be placed on display in the Park Museum.

DESCRIPTIVE GEOLOGY OF TISHOMINGO STATE PARK AND SURROUNDING COUNTY

Now that the broader features of the geologic history of the eastern part of the United States have been traced, the more detailed features of the geologic formations in Tishomingo County require study--a study of them being essential to an understanding of the park. The oldest two of these formations are the Devonian limestones and shales and the Mississippian limestones, shales, cherts, and sandstones, all of Paleozoic age and all confined in Mississippi to Tishomingo County (See middle geologic rock scale and generalized section of Paleozoic rocks). Lying in unconformable relation on these are the Tuscaloosa gravels and sands and the Eutaw sands, clays, and green sand marls, both of Mesozoic age.

DEVONIAN ROCKS

The New Scotland formation is a limestone, the upper 40-foot interval of which, as exposed along Yellow Creek (Figure 1a), is massive, hard, and gray. The lower half of this 40 feet is exceedingly fossiliferous, containing many Brachiopod shells and Trilobite fragments; the upper half is largely barren of fossil forms. Unfortunately most or all of the New Scotland will be submerged by the back waters of the Tennessee River when the Pickwick Dam is completed.

The Island Hill formation is a thin stratum, approximately three feet in thickness, that is mostly an extremely fossiliferous limestone from which much of the lime has been dissolved by ground waters; consequently large siliceous fossil shells stand out prominently from its surface. It is typically exposed in the rounded hill in the great eastward

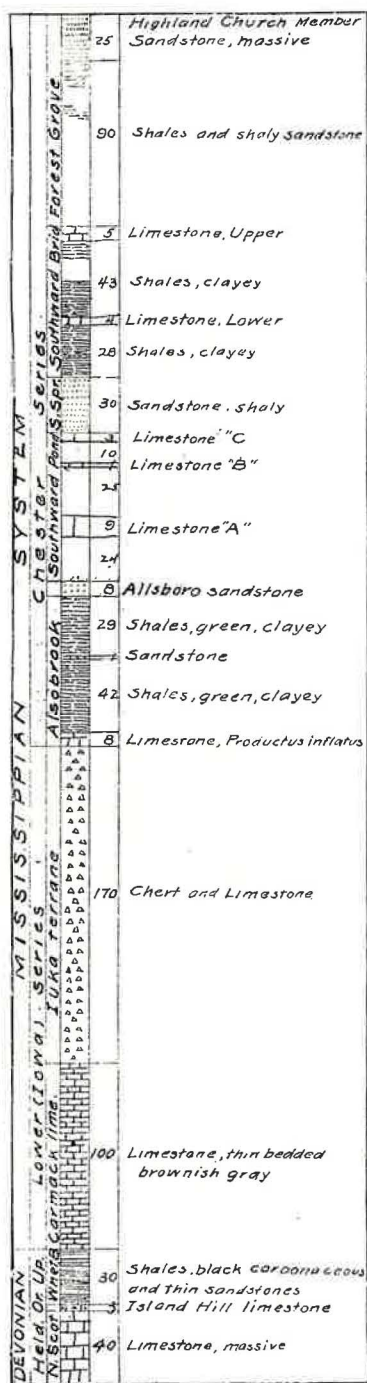


Plate I.—Generalized section of Paleozoic rocks in Mississippi.



Figure 1a.—New Scotland limestone in the bluffs of Yellow Creek at Island Hill where the clearance line indicates that the limestone will be covered by the back waters of Pickwick Dam.---Photographed June 19, 1936.

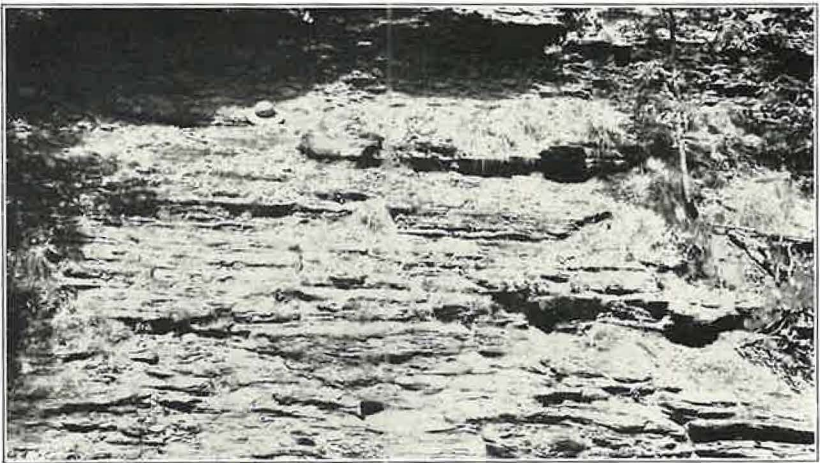


Figure 2.—Whetstone Branch shales in contact (at the hat) with the overlying Carmack limestone near the falls in Whetstone Branch below the common confluence of the numerous branches--type locality of the Whetstone Branch formation.---Photographed June 19, 1936.

bend of Yellow Creek about three miles above its confluence with the Tennessee River at the Mississippi-Tennessee state line. The hill is surrounded on three of its four sides by the waters of Yellow Creek and a tributary; it is almost completely surrounded at flood times; and it will be entirely surrounded by back waters from Pickwick Dam. :

The Whetstone Branch formation consists of a very few thin layers of sandstone and thicker intervals of shale. The sandstones in places are rather thick, and the shales everywhere are thin to laminated, black, and carbonaceous. The Whetstone Branch black shales and the overlying Carmack shaly limestones (Figure 2) form exceedingly beautiful valleys at the common confluence of the numerous branches of the stream.



Figure 3.—Thick layers of the basal 60 feet of the Carmack limestone below the falls on Carmack Creek, the type locality.---Photographed October 5, 1921.

LOWER MISSISSIPPIAN ROCKS

The Carmack constitutes the lowest formation of the lower Mississippian rocks. Where fresh, it is in fairly thick layers, dark bluish-gray in color (Figure 3). Wherever weathered, it has broken into thin, almost shaly layers and has turned to a dull brownish color (Figure 4). It was named after Carmack Creek, which heads toward the former village of Short (See Iuka Quadrangle, U. S. Geological Survey), flows one mile northeast, and empties into the Tennessee River in the southwest corner of Section 19.

The Iuka terrane consists almost exclusively of great masses of broken chert about 170 feet in thickness. A few artificial exposures,

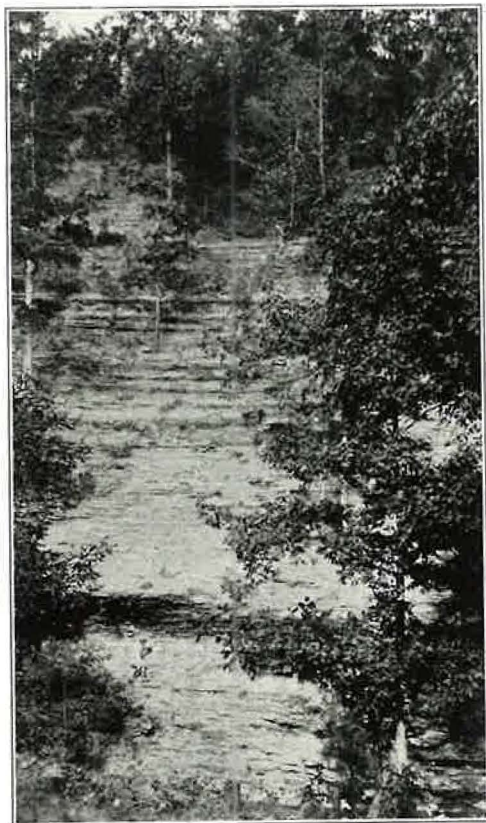


Figure 4.—Entire thickness of 78 feet (between the two men) of the Carmack limestone, in thin layers, resting on the upper 15 feet of the Whetstone Branch shale near the falls in Whetstone Branch.
---Photographed October 7, 1921.



Figure 5.—Iuka chert and silica in the railway cut at Free Bridge over Bear Creek, Alabama.---Photographed August 27, 1926.

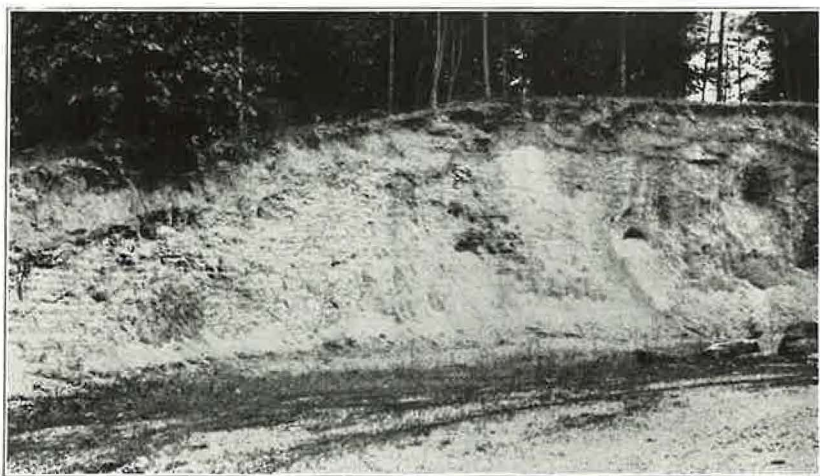


Figure 6.—Iuka chert in layers in the road pit at the confluence of the tributaries of Whetstone Branch.---Photographed June 19, 1936.

such as the old railroad cut at Frec Bridge over Bear Creek in Alabama (Figure 5) and the new road pit at the confluences of the branches of Whetstone Branch (Figure 6), reveal the fact that it is bedded, that originally it formed the siliceous material from around which the layers of limestone have been dissolved. These great masses of chert are similar to those of the Ozark region, and the few fossils found therein indicate that the chert probably represents the Burlington, Keokuk, Warsaw, Salem, St. Louis, and Ste. Genevieve formations of that area. It was named for Iuka, the county seat.



Figure 7.—Alsobrook formation, a part of the basal limestone member and a part of the overlying shale member at the Alsobrook homestead, the type locality.---Photographed August 26, 1926.

CHESTER SERIES OF MISSISSIPPIAN ROCKS

The Alsobrook constitutes the lowest formation in the Chester series. Strangely enough, its basal part, only eight feet in thickness, is a fairly pure hard limestone (Figure 7) that is filled with large Brachiopod shells (*Productus inflatus* -- Plate II). Near the type locality, the Alsobrook homestead north of Allsboro, the remaining interval of 72 feet is a green clayey shale except for a thin foot-layer of sandstone near the middle. On Cripple Deer Creek the upper part of this shale is a thin bedded sandstone impregnated with asphalt (Figure 8); and at Cherokee, Alabama, the lower part of the shale is a sandstone highly impregnated with asphalt. From both of these sandstone members the rich volatile petroleum escaped when the streams cut these beds and opened the reservoir.

Plate II.—Fossil shells of *Productus inflatus*, a Brachiopod shell so abundant in the basal limestone and in the basal part of the overlying shale member of the Alsobrook formation that specimens can be collected by the hundreds. Figures 1, 2, and 3 show different views of three different specimens; Figures 4, 5, and 6, the pedicle view of three other specimens. All six were collected at Pride, Alabama.



1



2



3



4



5



6

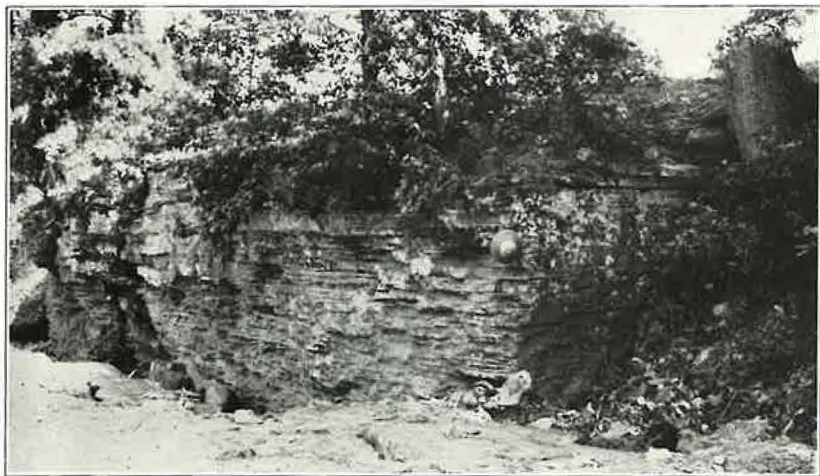


Figure 8.—At the mouth of Cripple Deer Creek, the type locality of the Cripple Deer member of the Alsobrook formation, the upper half of the typical shale division is a thin bedded sandstone impregnated with a petroleum residue.---Photographed June 19, 1936.

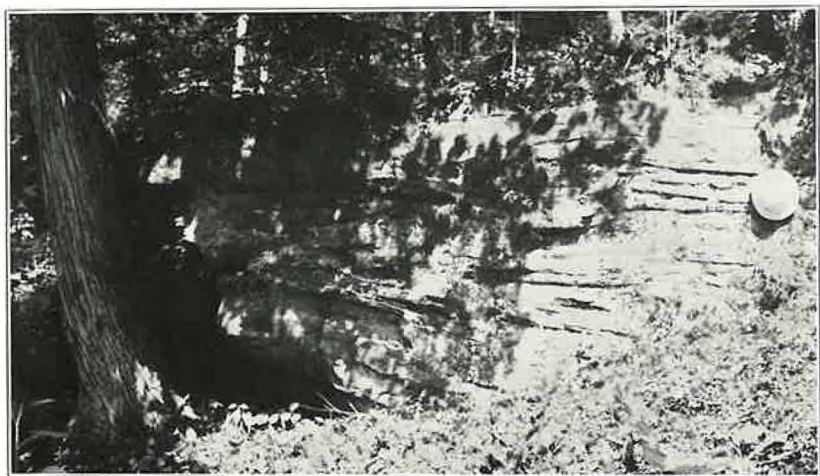


Figure 9.—Allsboro sandstone at Bishop Bridge over Bear Creek south of Allsboro, Alabama, the type locality.----Photographed June 19, 1936.

The Allsboro formation was named after the small village across the line in Alabama south of which at Bishop Bridge over Bear Creek it is well exposed (Figure 9). It is a stratum of sandstone only eight feet in thickness, coarse in texture, and irregular in bedding.

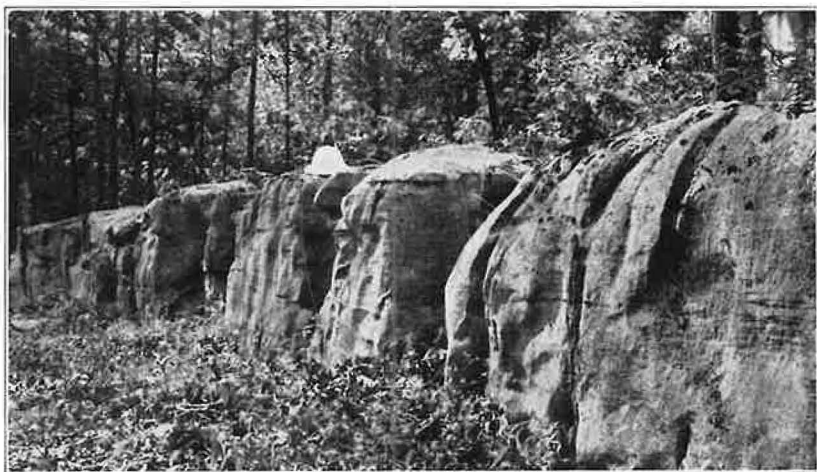


Figure 10.—Southward Pond Limestone A at the northern edge of Southward Pond, the type locality.---Photographed June 18, 1936.

The next three formations, the Southward Pond, the Southward Springs, and the Southward Bridge, are named from these respective features grouped about the old Southward homestead. The Southward Pond consists of three limestones, A (Figure 10), B, and C, respectively 9, 1, and 3 feet in thickness, which are underlain by shales, respectively 24, 25, and 10 feet in thickness. The whole formation, 72 feet in thickness, is exceedingly fossiliferous. The Southward Springs formation is perhaps 30 feet in thickness and consists mostly of thin impure sandstones that contain more or less petroleum residue (Figure 11). The Southward Bridge consists of a Lower limestone and an Upper limestone, respectively 4 and 5 feet in thickness, each underlain by an interval of shales, respectively 28 and 43 feet in thickness, its total thickness being 80 feet. The limestones are fossiliferous, and an additional thin lens of limestone (Figure 12) near the base is simply a mass of small Brachiopod shells (Plate III).

The highest formation of the Chester series, of the Mississippian system, and of the Paleozoic group, is the Forest Grove, of which the uppermost member is the Highland Church sandstone—named respec-

Plate III.—Fossil forms of two Brachiopod shells. Figures 1 and 2 are different views of two specimens of *Camarotoechia purduei*; Figures 3 and 4 are the same views of two different specimens and figures 5 and 6 are different views of still two other specimens of *Liorhynchus carboniferum*. These two species of Brachiopod shells and yet another species are preserved by the hundreds of thousands in this limestone lens of the basal shales of the Southward Bridge formation. All are from Southward Bridge, Mississippi (Illustrations are twice natural size).



1



2



3



4



5



6

All X 2

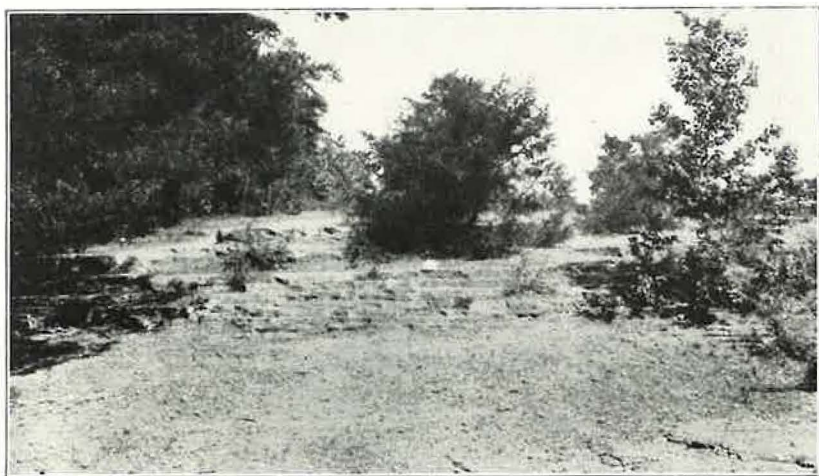


Figure 11.—Southward Springs sandstone at Southward Springs, the type locality.---Photographed June 18, 1936.



Figure 12.—Southward Bridge limestone lens in the basal shale at Southward Bridge, the type locality.---Photographed June 18, 1936.

tively after Forest Grove School, located on the hill south of Southward Bridge over Bear Creek and about one mile northeast of the park, and after Highland Church, about one mile northwest of the park. Although only thin intervals of a few feet of the lower 90-foot member are exposed here and there, the whole member probably consists of thin sandstones, shaly sandstones, and sandy shales. The Highland Church member, ranging in thickness from 20 to 30 feet, is a sandstone coarse in texture and massive in bedding, that is broken by two systems of vertical joints approximately at right angles to each other. Because of its massive character and its two systems of vertical joints, the stratum stands in vertical cliffs or scarps and is consequently a typical cliff-forming bed (Figure 13).

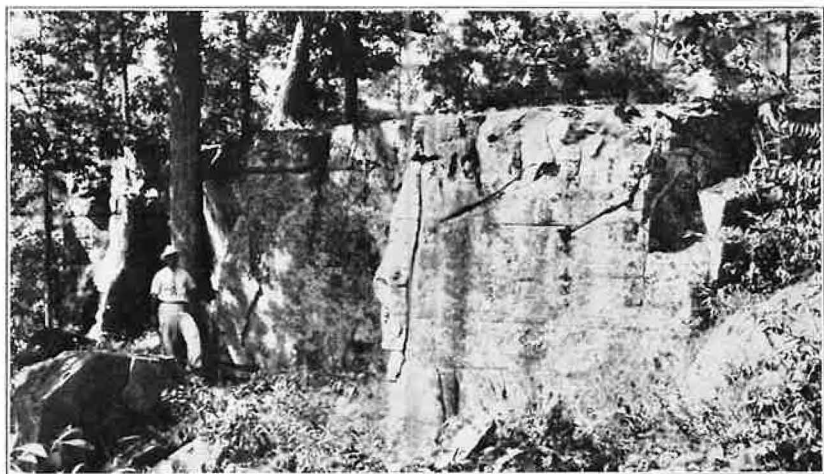


Figure 13.—Highland Church sandstone on the east side of Bear Creek at foot bridge, Tishomingo State Park.---Photographed June 20, 1936.

CRETACEOUS ROCKS

The Tuscaloosa consists of thick beds of gravel (Figure 14) and sand for the most part, although it does contain some clay and a little lignite. It rests in unconformable relation on beds of various Paleozoic age. The Eutaw formation consists of sand, of clay, and especially of glauconitic green-sand marl. The Selma is a massive slightly compacted limestone or rather a chalk. The Ripley is mostly a sand or a sandy marl. The first three are named after towns in Alabama; the last, after one in Mississippi.



Figure 14.—Tuscaloosa gravel pit of partly cemented gravel above and of uncemented gravel below. Blunt Pit near Tishomingo State Park.---Photographed June 21, 1936.

DETAILED DESCRIPTIVE GEOLOGY OF TISHOMINGO STATE PARK

Within the present boundaries of Tishomingo State Park or at its immediate borders, four formations lie at the surface: the Southward Bridge, the Forest Grove, the Tuscaloosa, and the Eutaw. The Southward Bridge has a lower and an upper limestone bed each underlain by shales. The Forest Grove has a lower unnamed member and an upper member, the Highland Church. A composite section of the Southward Bridge and of the Forest Grove formations and of the overlying Tuscaloosa formation as they exist in the right wall of Bear Creek valley just beyond the northern edge of the park and a shorter section of them in the left wall of the valley at the spring and foot bridge within the park follow:

Composite section of the east wall of Bear Creek valley near the northern border of Tishomingo State Park

	Feet	Feet
Tuscaloosa formation, total.....		22.0
Gravel, mostly coarse, and pudding stone conglomerate, the conglomerate ranging from a fraction of a foot to 15 feet in thickness.....		22.0

	Feet	Feet
Unconformity		
Forest Grove formation, total.....		117.0
Highland Church sandstone member. Massive gray and yellow sandstone without bedding planes. It forms cliffs at many places along the top of the valley wall.....	25.0	
Interval, practically all covered. At different places small intervals of thin sandstones, shaly sandstones, and sandy shales are exposed, some of which contain fossil Pelecypod and Gastropod shells.....	92.0	
Southward Bridge formation, total.....		69.5
Upper limestone. The upper part is crystalline and fossiliferous and weathers to thin beds; the lower part is crystalline and fossiliferous and constitutes a massive layer which stands out as a cliff-forming limestone and which forms a terrace.....	5.5	
Interval, covered.....	47.0	
Lower limestone. Massive layer of crystalline and fossiliferous limestone which is finer than the Upper limestone.....	2.0	
Interval, covered to water level of Bear Creek at the base of the terrace.....	15.0	

Section of the west wall of Bear Creek valley at the Spring and Foot Bridge

Tuscaloosa formation, total.....		35.0
Gravel, mostly covered in the slope.....	35.0	
Unconformity		
Forest Grove formation, total.....		80.5
Highland Church sandstone member. Massive coarse quartzose sandstone without definite bedding planes, but broken by two systems of vertical joints approximately at right angles to each other.....	25.0	
Interval, covered.....	5.0	
Sandstone, shaly, irregularly bedded.....	12.5	
Interval, covered to water level of Bear Creek.....	38.0	

Only into the lower stretches of Bear Creek valley in Tishomingo State Park does even the uppermost part of the Southward Bridge formation extend. Accordingly, its Lower limestone and Upper limestone and their underlying shales have to be studied just beyond the park boundaries and on to Southward Bridge itself.

Nowhere in the park or even in Tishomingo County is the whole of the lower member of the Forest Grove formation exposed. By examining here and there the thin sections that are exposed at different stratigraphic heights, it is possible to piece together a composite section that fairly well represents the composition of this member. It consists of thin regular layers of sandstone, shaly sandstone, and sandy shale.

Everywhere in the park, on the contrary, the Highland Church sandstone member is exposed. It is the cliff-forming stone, the stone that breaks into enormous rectangular blocks as large as rooms, the stone that makes such wild and rugged and beautiful scenery. It is the geologic member par excellence.

The gravel beds of the Tuscaloosa are exposed here and there in natural outcrops. Too, they have been opened for commercial purposes at others. The sandy phase, as well as the Eutaw, is mostly concealed.

DETAILED GEOLOGIC HISTORY OF TISHOMINGO STATE PARK

In reverse review, then, the highest and youngest beds in Tishomingo State Park or at its immediate borders are the gravels and sands of the Eutaw and Tuscaloosa formations. Below these unconsolidated gravels and sands is the massive hard cliff-forming sandstone of the Highland Church member of the Forest Grove formation. Below this massive sandstone is a series of thin sandstones, shaly sandstones, and sandy shales belonging to the lower unnamed member of the Forest Grove formation. And below these thin sandstones, in turn, is at least the upper part of the Southward Bridge formation, consisting of the Upper and Lower limestones and the clayey shales underlying each of the limestones. All these formations dip toward the southwest or the south, so that streams encounter the oldest of them at the surface first at the north.

Now as Bear Creek slowly carried away the gravel and sand of the Eutaw and Tuscaloosa formations lying above the Paleozoic rocks, it carved at first a small narrow valley--a youthful valley. As the ages passed, the creek slowly cut this valley deeper and wider until it formed a mature valley. And, as yet other ages passed, it cut a still wider valley that is approaching old age or has reached the early stages of old age.

As Bear Creek cut deeper and deeper into these loose gravels and sands, it eventually reached the much harder sandstone of the Highland Church toward the north. This resistant sandstone it could not

so readily cut. Accordingly, it began to flow back and forth on the surface of this hard sandstone. In technical language, the stream reached a temporary base level and began to meander back and forth and to cut by lateral planation a wider and wider valley. Thus it formed the broad comparatively shallow old age valley opposite the present sites of Dennis and Belmont (Figure 15).



Figure 15.—Bear Creek valley in the wide old-age stage, in the loose sands and gravels of the Eutaw and Tuscaloosa formations, as it appears from the east side looking southwest diagonally upstream toward Belmont, Mississippi—just upstreamward and southward from Tishomingo State Park.---Photographed June 20, 1936.

Eventually at the northern edge of the Highland Church cliff-forming sandstone, Bear Creek began slowly to cut into this resistant sandstone a very narrow channel which it extended upstream farther and farther toward the south. As it did so, it cut into this sandstone directly beneath its old channel in the loose sands and gravels that it had carved by meandering over the area of these unconsolidated rocks. In geologic terms, the large meander curves which it had formed in the loose rocks it now entrenched in the hard Highland Church sandstone. Thus was formed the huge entrenched meander curve that forms such a beautiful and conspicuous feature of Tishomingo State Park (Frontispiece).

As the eons came and went, Bear Creek eventually cut through the 20 or 25 feet of hard cliff-forming Highland Church sandstone at the northern border. When it did so, it reached the less resistant thin sandstones, shaly sandstones, and sandy shales of the lower 90-foot member of the Forest Grove formation. These less resistant beds it could cut faster than it could the resistant Highland Church sandstone. Consequently it cut a deeper and wider valley here than in the Highland Church sandstone alone. In doing so the stream undercut the 25-foot massive sandstone ledges, which were broken by two systems of vertical joints or cracks at right angles to each other. Because of this undercutting and these two systems of joints at right angles to each other, the stream has cut a wider valley here than in the Highland Church sandstone alone (Figure 16).



Figure 16.—Wide valley which Bear Creek has cut into both the Highland Church sandstone member and the shaly sandstone member of the Forest Grove formation and into the Southward Bridge formation, as it appears from Southward Springs looking southwestward and upstreamward toward Tishomingo State Park. ---Photographed June 18, 1936.

Thus Bear Creek has cut a wide old age valley in the Eutaw and Tuscaloosa gravels and sands. It has cut a narrow entrenched meander gorge in the Highland Church and underlying sandstones. And it has cut a deep wide valley in the thin sandstones and shales of the lower member of the Forest Grove formation.



Figure 17.—Huge blocks of Highalnd Church sandstone, which were formed by the two systems of vertical joints and which the stream's undercutting of the underlying shaly sandstone has permitted to creep slowly down the east valley wall of Bear Creek.---Photographed by Mr. H. C. Mitchell, Assistant State Forester November 25, 1934.



Figure 18.—A bit of the ruggedness and beauty of Bear Creek upstreamward from the foot bridge in Tishomingo State Park. ---Photographed June 20, 1936.

Wherever the stream has cut through the massive cliff-forming Highland Church sandstone, it cuts back the underlying thin sandstones and shales faster than it does the Highland Church sandstone. It thus undermines huge blocks of this sandstone, formed by two systems of vertical joints, until it has reached a point beyond their center of equilibrium. Then by gravity the blocks begin to settle and to creep inch by inch through the ages down the steep valley walls (Figure 17). Thus the stream has by undercutting these blocks and setting them free, added enormously to the ruggedness and beauty of the park (Figure 18)--a ruggedness and beauty that must be preserved against the destruction and despoliation of ignorant men.

SUMMARY

In review, then, Bear Creek has produced a beautiful rugged topography that is different, because the bed rock is different. In the loose Eutaw and Tuscaloosa sand and gravel it has produced a broad open valley. In the hard Highland Church sandstone it has produced a deep narrow gorge of vertical rock walls. In the Highland Church sandstone member and in the thinner sandstones and sandy shales of the lower member of the Forest Grove it entrenched its former meander in a deep valley having vertical cliffs at the top and blocks of sandstone as large as rooms scattered below along its more sloping valley sides. And still farther down stream beyond the limits of the park, it has cut a broader valley in the older less resistant rocks. For all these reasons it has produced an area that is different from any other region in Mississippi outside of Tishomingo County. Consequently, Tishomingo State Park is unique.

TISHOMINGO STATE PARK

BOTANY

BY

CALVIN S. BROWN, D. SC., PH. D.

INTRODUCTION AND ACKNOWLEDGMENTS

In the spring of 1936 Dr. William C. Morse, State Geologist, requested me to write a brief account of the botany of the new Tishomingo State Park in the northeastern part of Mississippi. The paper here presented is the result of brief studies in the park early in June and early in September. The list of plants is by no means complete, but it is hoped that it may serve as a working basis for the study of the more conspicuous plants of the park. With each plant has been given a few of its more obvious characteristics, but no effort has been made to give a complete botanical description.

I have derived much assistance from Mohr's Plant Life of Alabama, 1901, Lowe's Plants of Mississippi, 1921, Gattinger's Tennessee Flora, 1887, and from the works of Chapman, Small, Britton and Brown, Gray, and others, and from the Geological Survey herbarium.

My thanks are due to Mr. A. L. Cassell and Mr. W. M. Carter for valuable assistance in the park. The officers of the camp, both military and civil, were uniformly obliging.

The flora of this park is an undisturbed flora and is characteristic of the extreme northeastern part of the state. It is to be kept in its primitive purity, so that students of nature may always find here a typical group; no plants from the outside, either wild or cultivated, are to be brought into the park. The flora is sufficiently rich and beautiful for all decorative and landscape purposes.

PLANTS OF THE PARK, WITH BRIEF DESCRIPTIONS

POLYPODIACEAE. FERN FAMILY

***Polypodium vulgare*.** Common Polypody.

Rootstocks slender and creeping; fronds evergreen, 4 to 10 inches long, sterile and fertile fronds alike; fruit-dots large. Rocky woods in shady places.

Polypodium polypodioides*, *Polypodium incanum (Swartz, 1806). Gray or Hoary Polypody.

Rootstocks slender and creeping; fronds evergreen, lanceolate, 3 to 8 inches high; sterile and fertile fronds alike; smaller than the common polypody; fruit-dots small. On trees and rocks.

Asplenium filix-foemina*, *Polypodium filix-foemina (Linnaeus, 1853). Lady Fern.

Slender creeping rootstocks; fronds broad, pointed, 1 to 3 feet long; fruit-dots short. Moist woods and thickets.

Cystopteris fragilis*, *Polypodium fragile (Linnaeus, 1753). Brittle Fern, Bladder Fern.

Rootstock short; fronds thin and brittle, doubly or irregularly pinnatifid or cut-toothed, oblong-lanceolate, 4 to 9 inches long; sori naked at maturity.

Woodwardia areolata*, *Woodwardia angustifolia (Smith, 1793). Chain Fern, Net-Veined Chain Fern.

Fronds 6 inches to 2 feet high, beautifully veined, pinnae smooth or undulate, their bases connected by wings. Shaded, moist soil.

***Pellaea atropurpurea*.** Cliff Brake.

Small fern, not more than 2 to 10 inches high, short rootstock, with purple or dark-brown stem; spores along the margin. Growing along the rock cliffs.

***Adiantum pedatum*.** Maiden-Hair Fern.

Dark brown stem divided into two parts, then sub-divided, smooth, 1 to 2 feet high; the whole giving a fan-shaped or semicircular form when pressed. Very graceful. Growing in moist rich shady soil.

There is a different maiden-hair fern, *Adiantum capillus-veneris*, growing in moist limey soil further south in the state.

***Pteris aquilina*.** Common Brake, Bracken.

Divided into three branches; rigid, 1 to 3 feet high; bipinnate. Widely distributed in various soils above the sandstone.

***Osmunda regalis*. Royal Fern.**

Fronds bipinnate, fertile at top on under side, 1 to 5 feet high; pinnae broadly lanceolate, very handsome. Low ground and swamps.

***Osmunda cinnamomea*. Cinnamon Fern.**

Fronds 1 to 4 feet high; pinnae sessile, lanceolate; cinnamon-colored sporangia on separate frond. Damp fertile soil, in coves of the sandstone.

***Dryopteris acrostichoides*, *aspidium acrostichoides* (Swartz, 1806). Christmas Fern.**

Fronds rigid, evergreen, from 1 to 2 feet high, bearing spores on the upper third on contracted pinnae; pinnae having triangular projection at the base above (auriculate). Damp to dry shady land.

***Camptosorus rhizophyllus*. Walking-leaf, Walking-leaf Fern.**

An unusual type of fern, with long narrow fronds, heart-shaped at base and prolonged into a very narrow midrib, taking root and forming a new plant at a distance of 10 to 15 inches; sori scattered on the lower side of the arrow-shaped part of the frond. Rare.

PINACEAE. PINE FAMILY***Pinus taeda*. Old Field Pine, Loblolly Pine.**

Tall forest tree, lower and more spreading in old fields; bark thick; leaves olive green, in three's, 6 to 10 inches long; cones solitary, 3 to 5 inches long. Valuable timber tree.

***Pinus virginiana*, *Pinus inops* (Aiton, 1789). Scrub Pine, Jersey Pine.**

A slender tree; leaves dark green or yellow green, in two's, 1 to 3 inches long; cones 2 inches long, with prickles at end of scales; wood soft and brittle.

***Taxodium distichum*, *Cupressus disticha* (Linnaeus, 1753.). Cypress, Bald Cypress.**

Large tall tree, expanding at the base, and sending up conical knees several feet high; leaves long and slender, more or less evergreen; cones nearly globular, about 1 inch in diameter. Low swampy ground along Bear Creek.

***Juniperus virginiana*. Red Cedar.**

An evergreen tree reaching large size; wood soft, straight-grained, durable, red, odorous, useful; leaves scale-like, imbricated; fruit small, globular, blue. Very abundant.

Chamaecyparis thyoides*, *Cupressus thyoides (Linnaeus, 1753). White Cedar.

Evergreen forest tree, of medium size; bark light reddish brown; wood soft, light, close-grained, durable, not so fragrant and red as that of red cedar; leaves imbricated; fruit $\frac{1}{4}$ inch in diameter, more angular than that of red cedar, light green changing to blue and brown; seeds winged.

COMMELINACEAE. SPIDERWORT FAMILY

***Tradescantia virginica*.** Spiderwort.

Green, jointed stem, 1 to 3 feet high; leaves linear-lanceolate, broadest at base, keeled, generally channeled, very pointed, 1 foot long; many showy blue or purplish flowers, blooming early in the morning. Fairly abundant in spring.

LILIACEAE. LILY FAMILY

***Yucca filamentosa*.** Bear Grass, Adam's Needle, Yucca.

Stalk or scape 3 to 8 feet high; leaves lanceolate, flat, sharp-pointed, and bearing filament on the edges, 1 to 2 feet long; flowers white or slightly cream-colored, numerous, in a large cluster, June.

***Uvularia perfoliata*.** Bellwort, Perfoliate Bellwort.

Slender stem forked above the middle, 6 to 18 inches high; leaves perfoliate, parallel-veined, oblong-lanceolate, smooth-margined, 2 to $2\frac{1}{2}$ inches long, 1 to 3 below the fork; flowers solitary, yellow, 1 to $1\frac{1}{2}$ inches long, bell-shaped.

***Uvularia sessilifolia*.** Bellwort, Sessile-Leaved Bellwort, Oakes's Bellwort.

Slender stem, forked above the middle, 6 to 14 inches high; leaves sessile, parallel-veined, oblong-lanceolate, acute at both ends, $1\frac{1}{2}$ to $2\frac{1}{2}$ inches long, 1 to 2 below the fork; flowers solitary, greenish-yellow or cream colored, $\frac{1}{2}$ to 1 inch long, bell-shaped.

Smilacina racemosa*, *Vagnera racemosa (Morong, 1894). False Solomon's Seal, Wild Spikenard.

Stem 1 to 2 feet high; leaves 6 inches long, sharply pointed; flowers alternate, in a terminal raceme, May and June; followed by red berries born on the stem. Name a diminutive of *smilax*.

Polygonatum biflorum*, *Convallaria biflora (Walter, 1788). Small or Hairy Solomon's Seal.

Stem 1 to 2 feet high; leaves 3 to 4 inches long, sessile; flowers and fruit hanging beneath the curving stem.

Polygonatum commutatum*, *Polygonatum giganteum (Dietrich, 1835).

Large or Smooth Solomon's Seal.

Stem 3 to 6 feet high, smooth; leaves ovate; flowers and fruit hanging beneath the curving stem.

The false Solomon's seal may be told at once by the fact that its flowers and fruit are at the top of the stem while in the true Solomon's seal they are scattered at intervals beneath the curving stem.

***Trillium sessile*.** Wake Robin.

A striking plant, 12 to 18 inches high, with three broad sessile ovate leaves, sometimes mottled; flowers sessile, at apex, March and April. Not common in the park.

SMILACEAE. SMILAX FAMILY

***Smilax ecirrhata*.** Upright smilax.

Stem simple, erect; leaves ovate, cordate, or varying in form, often whorled, on long wiry stems; small berries.

Smilax bona-nox*, *Smilax hastata (Willdenow, 1806). Bamboo Briar, Bristly Greenbriar.

Running stem, sometimes angled, prickles; leaves deltoid-hastate, fiddle-shaped, three or more inches long; numerous berries. Common.

Smilax rotundifolia*, *Smilax quadrangulata (Willdenow, 1806). Greenbriar, Low Bamboo.

Stems climbing; leaves ovate or nearly round, yellowish green, 2 to 4 inches long; berry three-seeded. Low valley ground.

The various smilaxes are often called greenbriar or bamboo. There are probably other species in the park in addition to those listed here.

AMARYLLIDACEAE. AMARYLLIS FAMILY

***Agave virginica*.** American Aloe.

A cluster of narrow oblong denticulate leaves 6 to 15 inches long; stem rising to 5 or more feet and bearing small yellowish flowers in July; later seed pods. Dry upland sandy soil.

DIOSCOREACEAE. YAM FAMILY

***Dioscorea villosa*.** Wild Yam.

A handsome vine running to the length of 11 or 15 feet over bushes; leaves heart-shaped, entire, strongly ribbed, alternate, opposite or in fours, showing beautiful colors in the fall; flowers greenish yellow, June and July; seed in three-winged capsule, ripe in September. In moist thickets.

ORCHIDACEAE. ORCHID FAMILY

Spiranthes gracilis, Gyrostachys gracilis (Kuntze, 1891). Ladies' Tresses.

Stem slender, erect, 8 to 16 inches high; leaves basal, ovate or oblong, disappearing early; flowers white, in a 2 or 3-inch spiral at top of stem.

SAURURACEAE. LIZARD'S-TAIL FAMILY

Saururus cernuus. Lizard's-Tail.

Stem erect, jointed, 1 to 2 feet high, branching; leaves heart-shaped, acuminate; flowers May to July, white, terminal, nodding, in a tail-like spike (whence the name). In wet places near Bear Creek.

JUGLANDACEAE. WALNUT FAMILY

Juglans nigra. Walnut, Black Walnut.

Large well-known valuable tree; alternate pinnate leaves with characteristic odor; flowers in spring; fruits in autumn, nut rough and furrowed, edible, oily. Not common in the park.

The generic name juglans is from the Latin *Jovis glans*, Jupiter's nut.

Hicoria ovata, Carya alba (Nuttall, 1818). Scaly Bark Hickory, Shag Bark Hickory, Shell Bark Hickory.

A tall slender tree reaching 120 feet in height; the bark shaggy, separating into strips; leaves compound with 5 (7) long pointed leaflets; the three upper much larger than the lower; nut white, slightly flattened, delicious. Valuable for timber, fuel, for food, and for shade. Valley land along the creek.

Hicoria glabra, Carya porchina (Nuttall, 1818). Pignut Hickory.

A tall tree; bark close, rough; leaves divided into 5 to 7 pointed leaflets; nut small and worthless.

Hicoria alba, Carya tomentosa (Nuttall, 1818). Hickory, Mocker-nut Hickory.

A tall forest tree; bark close and rough; leaves 7-9-parted, outer leaflets often larger and fragrant when crushed; nut thick-shelled, edible, but not choice.

There may be other species of hickory in the park.

SALICACEAE. WILLOW FAMILY

Salix nigra. Willow, Black Willow.

A small tree with soft weak wood; narrow long leaves, 3-5 inches long; odorous catkins in spring; reproducing readily from twigs and branches. Sparsely along the creek.

BETULACEAE. BIRCH FAMILY

Corylus americana. Hazelnut, American Hazelnut.

A shrub, 4-9 feet tall; leaves ovate or oval, pointed, 3-5 inches long; small brown edible nut, in prickly bur, ripe in August; much smaller than the English hazelnut (*Corylus avellana*) found in the market.

Betula nigra, Betula rubra (Michaux, 1812). Birch, Red Birch, River Birch.

A medium-sized tree, with outer bark often peeling in papery sheets; twigs reddish; leaves simple, rhombic-ovate, acute, serrate; sterile aments or catkins 2-3 inches long and drooping; fertile aments oblong, yellowish, 1-2 inches long; fruit cone-shaped, 1 inch long. Along Bear Creek.

Alnus rugosa, Alnus serrulata (Willdenow, 1805). Alder.

Shrub 5-16 feet high, smooth; leaves obovate or oval, serrulate, green on both sides, 1-3 inches long; flowers in February; aments; nut angled or winged. Along the creek.

Carpinus caroliniana, Carpinus americana (Michaux, 1803). Ironwood.

Small tree with vertically furrowed or fluted trunk, close gray bark; wood very hard; leaves ovate, oblong, pointed (resembling those of the beech); catkins in spring; fruit 2 inches long. Rich woods along the creek.

Ostrya virginiana, Ostrya americana (Michaux, 1803). Hornbeam, Hop Hornbeam.

Small tree, with finely furrowed bark and hard, close-grained wood; leaves oblong, pointed, serrate; the mature ament hop-like. Rich low woods.

The English names of these two trees are sometimes confused. The trees may be distinguished readily by the trunks, as indicated above.

FAGACEAE. BEECH FAMILY

Fagus americana, Fagus ferruginea (Aiton, 1789). Beech.

A very handsome forest tree reaching a height of 100 feet, with smooth light gray bark; branches ending in very slender twigs; leaves delicate, parallel-veined, serrate, pointed; three-cornered edible nut inclosed in a small bur. Found along the lower levels beneath the sandstone.

Castanea dentata. Chestnut.

A rapid-growing nut-tree, with elongated narrow deeply serrate leaves; the nuts inclosed in a very spiny bur, very delicious when fresh, valuable both for timber and nuts. Rare in the park.

Castanea pumila. Chinquapin.

A species of small chestnut, 10 to 30 feet high; leaves similar to that of chestnut, but smaller; long catkins; single round small edible nut in bur. Near pumping station.

Quercus rubra. Red Oak.

Large tree with dark grey rather smooth bark; coarse reddish wood, hard and strong; long deeply cut leaves, 4 to 8 inches; acorn ovoid, about 1 inch long, ripe in October or November. Sandstone bluffs.

Quercus alba. White Oak.

Large forest tree with whitish or gray bark; leaves with 3 to 9 deep oblong obtuse lobes, 4 to 6 inches long; acorn 1 inch long with shallow rough cup, ripe in September and October; very valuable.

Quercus nigra, Quercus aquatica (Walter, 1788). Water Oak.

Medium-sized tree; leaves narrow, sometimes 3-lobed at outer broader end, thus differing from the willow-like unlobed leaf of the willow oak (*Quercus phellos*); acorn small. Creek valley.

Quercus phellos. Willow Oak.

Medium-sized tree; reddish-brown bark; leaves very narrow and pointed at both ends; small acorns. Along the valley.

Quercus prinus. Chestnut Oak, Rock Chestnut Oak.

A large valuable tree, reaching 100 feet in height; leaves resembling those of the chestnut; apparently several varieties or even species. Sandstone bluffs of Bear Creek.

Quercus cinerea. Upland Willow Oak.

Shrub or small tree; narrow downy leaf, 2-3 inches long; cup shallow with small acorn. (Similar to *Quercus virginiana*.) In the valley along Bear Creek.

Quercus minor, Quercus stellata (Wangenheim, 1787). Post Oak.

Tree with rough gray bark; leaves broadly obovate but deeply pinnatifid with 3 to 7 deeply-toothed lobes, 4 to 5 inches long; acorn oval or ovoid.

***Quercus coccinea*.** Scarlet Oak.

Large forest tree, with gray or reddish barks; leaves 4 to 8 inches long, deep cut, scarlet in autumn; cup covering half of acorn.

Quercus marilandica*, *Quercus nigra (Wangenheim, 1781). Black Jack, Barren Oak.

A small scrubby tree, bark rough, and nearly black; leaves broad and wedge-shaped, 3 to 5-lobed; acorns ovoid and small; of little value, except for fuel. Occurring on high sterile ground.

Quercus pagodaefolia*, *Quercus falcata (Michaux, 1801). Spanish Oak.

A tree 2 to 4 feet in diameter and 80 to 100 feet high; leaves 2 to 4 inches long, deeply lobed and characteristically (usually unevenly) rounded at the base; acorn twice height of cup. Valuable timber tree.

***Quercus*, species?** Oak.

A small tree, 15 to 25 feet high; twigs light-colored, variegated; leaves lanceolate or elliptical, somewhat narrower at the short petiole, silvery; acorn and cup small, flat, $\frac{1}{2}$ inch in diameter, not so tall.

ULMACEAE. ELM FAMILY

***Ulmus americana*.** American Elm, White Elm.

A common forest and shade tree, often large, with gray bark; wood hard, leaves oval, doubly serrate, 2 to 4 inches long; flowers early in the spring.

Ulmus fulva*, *Ulmus pubescens (Walter, 1788). Slippery Elm, Red Elm.

A smaller tree than the American elm; inner bark mucilaginous and fragrant; leaves similar to those of the American elm but considerably larger; flowers in March and April.

***Ulmus alata*.** Winged Elm, Wahoo.

A small elm, with corky or winged ridges on the branches; leaves doubly serrate, 1 to 3 inches long.

***Planera aquatica*.** Planer-Tree.

A small tree resembling the elm; leaves ovate or oblong, serrate, somewhat asymmetrical at base, pointed at apex, $1\frac{1}{2}$ - $2\frac{1}{2}$ inches long; flowers greenish, in early spring; fruit short. Shaded creek banks.

Celtis mississippiensis*, *Celtis laevigata (Willdenow, 1811). Hackberry, Southern Hackberry, Sugarberry.

A large tree resembling the beech, but with warty projections on the bark; leaves small, more sharply pointed than in *Celtis occidentalis* with which it probably intergrades (Br. and Br.); small fruits, ripe in July, August.

***Celtis*, species?** Hackberry.

A bush species or variety of hackberry with leaves $1\frac{3}{4}$ inches long, pointed, unsymmetrical at base; fruit brown to orange, $\frac{1}{4}$ inch in diameter, sweet; perhaps *Celtis pumila*.

MORACEAE. MULBERRY FAMILY

***Morus rubra*.** Mulberry, Red Mulberry.

Small tree; leaves heart-shaped or ovate, often deeply lobed, serrate; flowers in March; fruits in summer, cylindrical, red turning purple, edible. Not frequent.

The *Morus alba*, white mulberry, and the *Morus nigra*, black mulberry, found in America, are both introduced from Asia.

LORANTHACEAE. MISTLETOE FAMILY

Phoradendron flavescens*, *Viscum flavescens (Pursh, 1814). Mistletoe.

A yellowish-green parasitic plant 2 to 3 feet long with stout brittle stems, growing on oak and other trees; evergreen; leaves oblong, fleshy, persistent; flowers early, small; berries fleshy, white. The well-known Christmas decoration.

The word *Phoradendron* is Greek for tree-thief.

POLYGONACEAE. BUCKWHEAT FAMILY

***Polygonum hydropiper*.** Smart-Weed, Water-Pepper.

Annual herb, smooth, erect, 1 to 2 feet high; leaves alternate, simple, lanceolate, acute at apex, punctate, acrid, 1 to 4 inches long; green or greenish flowers in narrow paniced racemes, 1 to 3 inches long.

Polygonum punctatum*, *Polygonum acre (H. B. K., 1817). Smart-Weed, Water Smart-Weed, Water-Pepper.

Herb, erect or ascending stem, 2 to 5 feet high; leaves alternate, simple, narrow, lanceolate, acuminate at both ends, very acrid, 2 to 5 inches long; flowers in erect spikes, usually white or whitish, sometimes pale flesh-colored.

CHENOPODIACEAE. GOOSEFOOT FAMILY

Chenopodium album. Lamb's Quarter, Goosefoot, Pigweed.

Stem erect, branched, 2 to 6 feet high; leaves rhombic, ovate, petioled, deeply toothed; spikes terminal and paniced; seeds black and shining. Introduced from Europe.

PHYTOLACCACEAE. POKEWEED FAMILY

Phytolacca decandra. Pokeweed, Pokeberry.

A strong-smelling herb, 3 to 12 feet high, smooth; leaves ovate-lanceolate, pointed, 5 to 12 inches long; flowers rose-pink, July to September; dark purple conspicuous berries. Used in medicine.

PORTULACACEAE. PURSLANE FAMILY

Portulaca oleracea. Purslane.

Stem low, short, smooth, prostrate, spreading; leaves cuneate or obovate, short, very fleshy; flowers solitary, sessile, yellow, May to September; capsules globular, many-seeded.

NYMPHAEACEAE. WATER LILY FAMILY

Nymphaea advena, *Nuphar advena* (R. Brown, 1811). Yellow Pond Lily, Spatter-dock.

Aquatic herb, floating leaves rising from horizontal rootstocks by petioles several feet long, 6 to 8 inches in diameter, with sinus extending to base; flower yellow, 1 to 3 inches in diameter, in summer.

MAGNOLIACEAE. MAGNOLIA FAMILY

Magnolia virginiana, *Magnolia glauca* (Linnaeus, 1763). Sweet Bay, Swamp Bay, Laurel Magnolia.

A small tall tree, leaves 4 to 6 inches long, thick, green, glaucous beneath; flower in May and June, white, fragrant, 2 to 3 inches in diameter; cone pink, 1 to 2 inches long. Evergreen in Mississippi.

Magnolia acuminata. Cucumber Tree, Mountain Magnolia.

A fine tree 60 to 90 feet high, leaves 7 to 11 inches long, 3 to 6 inches wide, thin, more or less oval but somewhat acuminate, downy beneath; flowers campanulate, white or greenish yellow, large, in spring; cone 3 to 4 inches long; valuable for timber. East side of Bear Creek north of foot bridge.

The *Magnolia grandiflora*, great-flowered magnolia, is abundant as a native tree in south Mississippi, but scarcely reaches as far north as the Tishomingo Park. The *Magnolia macrophylla*, great-leaved magnolia, is said to grow a short distance from the park.

Liriodendron tulipifera. Tulip Tree (wrongly called Poplar or Yellow Poplar).

A tall handsome tree, often planted for ornament and very valuable for lumber; leaves smooth, lobed, and as if cut off across the end; flower bell-shaped, yellow with green and orange, in May; cone 3 inches long, acute. The Greek generic name means *lily tree*, the Latin specific name *tulip-bearing*.

ANONACEAE. CUSTARD APPLE FAMILY

Asimina triloba. Papaw.

Shrub and small tree, 6 to 20 feet high; smooth bark easily detached in long strips from the trunk; oblong leaves 4 to 8 inches long, pointed; flowers dark purplish brown, small, in March; fruit oblong, many-seeded, suggesting bananas, edible to some people. Rich ground, rare in the park.

Asimina parviflora. Small Papaw.

Shrub 2-5 feet high; leaves thin, obovate-oblong; flowers greenish-purple, March-April; fruit fleshy, 1½ inches long, with few seeds, August and September. Not common. Also spelled pawpaw.

RANUNCULACEAE. BUTTERCUP OR CROWFOOT FAMILY

Xanthorhiza apifolia. Yellow Root, Shrub Yellow Root.

A smooth slender shrub, with yellow bitter roots, 1-2½ inches high; leaves clustered at end of stem, long-petioled, pinnate (the outer three sometimes united), lobed and toothed; flowers inconspicuous, 5-parted, dark purple. Formerly used in medicine and in dyeing.

The generic name is also spelled with initial Z and with double r.

Clematis virginiana. Virgin Bower, Clematis.

Long climbing vine; leaves opposite, compound; leaflets oblong, toothed, 2-3 inches long; flowers dioecious, many, white or yellowish; akenes with persistent styles.

Clematis viorna. Leather Flower, Leather-Flowered Clematis.

Smooth climbing vine, 10 feet long; leaves compound (some entire); leaflets entire or lobed; flowers with thick leathery sepals, reddish-brown, 1 inch long; persistent styles; plumose. Bear Creek valley.

Ranunculus fascicularis. Early Buttercup.

Tufted plant, 6-12 inches high; leaves petioled, 3-5-parted, the leaflets deeply lobed; flowers 5-parted, bright yellow, about 1 inch in diameter, April and May.

Ranunculus recurvatus. Hooked Crowfoot.

Stem erect, 8-24 inches high, usually hirsute, branching; leaves with long petioles, 3-parted, with subdivisions toothed and lobed; flowers very small, light yellow, April to June; akenes pointed with a recurved hooked beak.

Ranunculus pucillus. Spearwort.

Weak annual, with slender branching stem, 6-12 inches high; leaves very narrow, lanceolate, almost linear; flowers very small, yellow, April to July.

BERBERIDACEAE. BARBERRY FAMILY

Podophyllum peltatum. May Apple, Mandrake.

Perennial herb with thick creeping rootstock; stem with two leaves, 12 to 16 inches high; leaves peltate but deeply lobed; flower single, white, two inches in diameter, in April and May; fruit a large fleshy berry the size of a hen's egg, yellowish; leaves and root poisonous.

MENISPERMACEAE. MOONSEED FAMILY

Cebatha carolina, Menispermum carolinum (Linnaeus, 1753). Carolina Moonseed.

A slender vine climbing over other shrubs and small trees; leaves broadly ovate, cordate, thin, petioled, 2 to 4 inches long; flowers small, white or greenish white, July; scarlet berries in clusters in fall.

LAURACEAE. LAUREL FAMILY

Sassafras sassafras, Sassafras officinale (Nees and Ebermaier, 1831). Sassafras.

A tree growing to great height and diameter; bark rough and spicy; leaves large, entire or often deeply 3-lobed, aromatic, as also the twigs; flowers small, appearing in the spring; root used for aromatic oil and for "tea". Common in the park.

PAPAVERACEAE. POPPY FAMILY

Sanguinaria canadensis. Bloodroot, Red Puccoon.

A small low herb; rootstock thick, with orange-red juice; leaves large, broad, palmate and deeply lobed; flowers white, sometimes pinkish, small, April and May; pods one-celled; seeds crested.

BRASSICACEAE. MUSTARD FAMILY

Lepidium virginicum. Pepper-Grass.

Stem smooth, erect, branched, 1 to 2 feet high; basal leaves spatulate or obovate, dentate, stem leaves smaller; flowers small, in terminal racemes, white, June to September; pod flat, small.

SAXIFRAGACEAE. SAXIFRAGE FAMILY

Heuchera americana. Alum Root.

Stem erect, stout, generally leafless; leaves mostly basal with long petioles, thin, heart-shaped but lobed or dentate; flowers in racemes on top of stem.

Itea virginica. Itea.

A branching shrub 4 to 9 feet high; leaves 1 to 3 inches long, narrowly oval, serrate; flowers in a terminal raceme, white, 2 to 5 or 6 inches long. Valley of Bear Creek.

Hydrangea quercifolia. Oak-Leaf Hydrangea, Seven Bark.

Stout shrub, 3 to 8 feet high; leaves large, 5-lobed; flowers clustered in oblong panicle, many of them sterile, white, occasionally with a pink tint. Very abundant and pretty in May and June along the sandstone cliffs.

Hydrangea arborescens, Hydrangea vulgaris (Michaux, 1803). Wild Hydrangea.

Shrub 3 to 8 feet high; leaves ovate, pointed, serrate, 4 to 5 inches long; flowers in flat cymes with marginal sterile flower. Often found in park with the oak-leaved hydrangea, generally smaller.

HAMAMELIDACEAE. WITCH HAZEL FAMILY

Hamamelis virginiana. Witch Hazel.

A tall shrub 15 to 20 feet high with oval leaves resembling those of the hazel bush, 3 to 4 inches long, slightly lop-sided; flowers late in autumn or in winter, yellow; used in medicine and lotions. Abundant in valley east of Bear Creek.

Liquidambar styraciflua. Red Gum, Sweet Gum, Bilsted.

Large handsome tree with gray bark, branches often corked; leaves 5 to 7 lobed, sharply pointed, fragrant when crushed, deeply colored in fall; fruit a prickly ball 1 to 1½ inches in diameter; wood and gum valuable. Abundant in the valley along the creek.

PLATANACEAE. PLANE TREE FAMILY

Platanus occidentalis. Sycamore, Plane Tree.

A very large tree, outer bark peeling off revealing white close inner bark; leaves very wide, angular or lobed; fruit balls an inch or more in diameter, later scattering seeds by wind and water. Sparsely, along the river.

ROSACEAE. ROSE FAMILY

Rubus argutus, Rubus villosus (Aiton, 1789). Blackberry.

Bush 3 to 9 feet high; strong, hooked, prickled; large white flowers; berry oblong, black, edible, June and July. Frequent.

Rubus trivialis. Dewberry, Low Bush Blackberry.

Low trailing vine; prickles; white flower in February and March; berry 1 inch long, black, excellent, June and July.

Fragaria virginiana. Wild strawberry.

Small perennial herb propagating by runners; leaves trifoliate, deeply serrate; white blooms in March, April, and May; fruit red, ovoid, edible.

Rosa humilis. Low Rose.

Stem low, erect, armed with prickles; 1 to 2 feet high; leaflets 5 to 7; flowers few, May and June. Common in dry soil.

Rosa carolina. Swamp Rose.

Bushy, spiny, 4 to 6 feet high; leaflets usually 7, though 5 and 9 are found, serrate; flowers in June. Low and swampy ground, not common.

Agrimonia incisa. Agrimony.

A small herb with hairy stem, 2 feet high; leaves divided into 5-9 unequal pinnae (counting the pairs of small leaflets between); leaflets increasing in size outwardly, round-toothed; flowers small, yellow, on long racemes.

Potentilla canadensis. Five-Finger.

Small spreading plant with runners 1 to 2 feet long; leaves five-foliate (giving the common name), about 2 inches in spread; leaflets serrate; flowers small, yellow.

Aronia arbutifolia, Mespilus arbutifolia (Linnaeus, 1753). Red Chokeberry.

Branching shrub, 6-12 feet high; leaves short-petioled, oblong, elliptical, finely toothed, 2-3 inches long; flowers in clusters, small, 5-parted, fragrant, white or pink; fruit small, globose, bright red, very pretty.

Crataegus crus-galli. Cockspur Thorn, Hawthorn, Red Haw.

Small shrub or tree with long stout thorns; leaves thick, shining above, obovate, serrate; flowers white, 5-parted, in May and June; fruit round or pear-shaped, red.

Crataegus spathulata. Small-Fruited Haw.

Shrub or small tree, with thorns 1 to 2 inches long; leaves small, spatulate, crenate at the summit; flowers white, April; fruit red, October and November.

Crataegus apifolia. Parsley Haw, Cut-Leaf Haw.

Shrub or small tree, with stout spines; leaves deeply cleft into 5 to 7 parts, truncate at base; flowers white, ill-smelling, March and April; fruit red or scarlet.

There are several other species in the park; one with broad notched leaves and long slightly curved thorns. Sargent gives 153 species of *crataegus* for North America; Small (Beadle) gives 185 species for the southeastern states alone.

Prunus americana. Wild Plum.

A small tree; leaves thick, ovate, pointed, serrate, 2-3 inches long; flowers white, numerous; fruit globose, red or yellow, edible.

Prunus angustifolia*, *Prunus chिकास (Michaux, 1803). Chicasaw Plum, Old Field Plum.

A small tree, 10 to 20 feet high, somewhat thorny; leaves narrow, lanceolate or oblong-lanceolate, pointed, serrate; flowers small, appearing early; fruit red, globular, thin-skinned, edible, ripe in June and July; stone globular.

Prunus serotina. Wild Black Cherry.

A tree reaching 80 feet in height and 3 or 4 feet in diameter, but usually much smaller; bitter aromatic bark; leaves thick, lanceolate or ovate, pointed at the apex, serrate; racemes long and spreading; fruit globose, dark purple or black, astringent, in autumn. **Common.**

VICIACEAE. VETCH FAMILY

Schrankia uncinata. Sensitive-Briar.

Trailing prostrate prickly vine, grooved, 3 to 5 feet long; leaves twice-pinnate, sensitive; leaflets 8 to 15 pairs, small; flowers pink or rose-colored, in globular head; pods 2 inches long; most of the plant thickly set with short recurved hooks or prickles.

Cercis canadensis. Red Bud, Judas Tree.

A small ornamental tree, 20 to 30 feet high; leaves heart-shaped, about 4 inches in diameter; flowers small, deep red, appearing in April before the leaves; seed-pods 3 to 4 inches long. **Frequent.**

The latter English name is from the tradition that Judas hanged himself on this tree, the Eastern species, *Cercis siliquastrum*.

Gleditschia triacanthos. Honey Locust, Sweet Locust.

A tree of medium to large size, armed with formidable thorns; leaves petioled, compound; flowers inconspicuous, in May; pods flat, generally twisted, 9-18 inches long, containing many seeds. Bank of creek where the road descends into the valley.

Baptisia leucantha. Wild Indigo, False Indigo.

Smooth branching herb, 3 to 5 feet high; leaves petioled, divided into three obovate or oblanceolate leaflets $1\frac{1}{2}$ to 2 inches long, turning dark upon drying; flowers white, about 1 inch long, in long erect racemes; pod large, ellipsoidal. Bear Creek valley.

Crotalaria sagittalis. Rattle-Box, Cat-Bell.

Stem erect, branching, 4-10 inches high; leaves oblong, lanceolate, 2 or 3 times as long as wide, nearly sessile; flowers yellow, in summer; seed pod $\frac{1}{2}$ to 1 inch long, dark, nearly cylindrical or ellipsoidal, making a rattle when the seeds are mature, August and September.

Cassia chamaecrista. Sensitive Pea, Partridge Pea.

Herb erect, 1 to 2 feet high, branching; leaves petioled, subdivided into 15-20 pairs of linear leaflets, sensitive to touch; flowers yellow, in axils; pods linear, about 2 inches long. Common.

Amorpha fruticosa. False Indigo.

Shrub 5 to 15 feet high; leaves petioled, with 11 to 25 oval or elliptical leaflets; flowers violet or purple, in long dense racemes, in early summer.

Cracca virginiana, Tephrosia virginiana (Persoon, 1807). Goats' Rue, Hoary Pea, (Cat-Gut).

Clustered plant 1 to 2 feet high, leafy, pubescent with short white hairs; leaves compound with 9 to 27 narrow oblong leaflets; flowers in terminal raceme, yellowish white or showy yellowish purple, in May, June, and July; pod linear, downy. In dry soil, fairly common.

Wistaria frutescens, Kraunhia frutescens (Greene, 1891). American Wistaria.

A long vine 30 to 40 feet, but shorter and smaller than the cultivated wistaria (*Wistaria chinensis*); flowers in dense lilac-purple racemes 2 to 7 inches long; pod linear, 2 or 3 inches long. Along stream, not common.

***Robinia pseudacacia*.** Black Locust, Locust Tree.

Medium-sized tree; compound leaves; leaflets about 17 in number, elliptical, 1 to 2 inches long; flower white, very fragrant, long and hanging, in May and June; pod 2 to 4 inches long; wood strong and durable, especially for posts. Not abundant.

***Lespedeza striata*.** Lespedeza, Japanese Clover.

Stem branching and spreading, tufted, 6-12 inches long; leaves trifoliate; leaflets oblong, $\frac{1}{2}$ to $\frac{3}{4}$ inches long; flowers pink or purple, $\frac{1}{2}$ inch long, valuable for hay. Introduced from eastern Asia.

***Lespedeza virginica*.** Slender Bush-Clover. Virginia Bush-Clover.

Stem erect, slender, usually simple, crowded with narrow leaflets and violet-purple flowers, July to September; leaflets in three's, 5 times as long as wide.

***Lespedeza frutescens*.** Bush-Clover.

Stem erect, slender, 1-3 feet high, crowded with small elliptical leaflets and violet-purple flowers, August and September; leaflets in three's, twice as long as wide; heads heavier than in the preceding species.

Vicia caroliniana*, *Vicia parviflora (Michaux, 1803). Carolina Vetch.

Trailing vine, 2 or 3 feet high, with tendrils at tip of branches; leaves with 8 to 20 blunt leaflets; small nearly white flowers; small pod.

***Clitoria mariana*.** Butterfly Pea.

Erect or climbing herb, reaching several feet in length in the latter form; leaves generally trifoliate; leaflets lanceolate and blunt at base; flowers about 2 inches long, showy, blue. Fairly common.

Phaseolus polystachyus*, *Phaseolus perennis (Walter, 1788). Wild Bean.

Vine, climbing, branching, 3-13 feet long; leaves trifoliate; leaflets broadly ovate, pointed, sometimes unsymmetrical, 2-4 inches long; racemes axillary, loosely-flowered; flowers purple to whitish; bean-pods slightly curved, flat, 1-3 inches long.

GERANIACEAE. GERANIUM FAMILY

***Geranium maculatum*.** Wild Geranium, Spotted Cranesbill.

Stem erect, hairy, generally forking, 1-2 feet high; leaves palmately lobed, the divisions sharply toothed; flowers regular, 5-parted, light purple, 1 inch wide, in spring.

Geranium carolinianum. Cranesbill.

Stem erect, branched, hairy, 6-15 inches high; leaves palmate, deeply cleft, with toothed or lobed divisions; flowers in clusters, pale purple or rose-colored, one-half inch wide, in spring; this species about half as large as the preceding.

OXALIDACEAE. WOOD-SORREL FAMILY

Oxalis stricta. Yellow Wood-Sorrel.

Three to 12 inches high; leaves trifoliate; leaflets obcordate; yellow flowers in spring; characteristic oxalic taste.

Oxalis violacea. Violet Wood-Sorrel.

Three to 12 inches high; leaves trifoliate; leaflets obcordate; purple flowers in spring; sour acid taste.

ANACARDIACEAE. CASHEW FAMILY

Rhus radicans. Poison Ivy, Poison Vine.

A climbing and creeping woody vine, running to great length; leaves petioled and divided into three parts; leaflets ovate, pointed, 2 to 4 inches long; flowers and fruit in panicles 1 to 3 inches long; poisonous to the touch. Common.

Rhus toxicodendron. Poison Oak.

A shrub 1 to 4 feet high, standing erect; leaves thick, trifoliate; poisonous and similar to poison ivy, but not vining. Abundant.

There is in Mississippi also a Poison sumac, *Rhus vernix* or *Rhus venenata*, 10 to 18 feet high, with pinnate leaves, more poisonous than the poison oak or the poison ivy, which so far I have not found in the park. All three are to be avoided.

Rhus copallina. Sumac, Dwarf Sumac.

A shrub or small tree; leaves pinnate, 6 to 12 inches long; leaflets 9 to 21, lanceolate; flowers green, in large dense panicles, June to August.

Rhus glabra. Smooth Sumac, Scarlet Sumac.

A shrub 2-15 feet high; leaves glabrous, 15 to 20 inches long; leaflets 11-29, lanceolate, long pointed, strongly serrate, 2-5 inches long; flowers greenish-white, in June and July; fruit in large compound clusters, in September and October.

Leaves used for dyeing and tanning; fruit for medicine.

ILICACEAE. HOLLY FAMILY

***Ilex opaca*.** Holly, Evergreen Holly.

A tree 20 to 70 feet high, smooth gray bark; leaves evergreen, thick and rigid, prickled on the edges and apex; flowers white, inconspicuous, spring and early summer; red berries in clusters persisting into the winter. The Christmas tree. Abundant in Bear Creek valley.

***Ilex decidua*.** Deciduous Holly, Swamp Holly.

A shrub or small tree 10 to 30 feet high; leaves obovate or spatulate, slightly serrate, deciduous, $1\frac{1}{2}$ to 3 inches long; small red berries. Low ground.

***Ilex verticillata*.** Winter Berry.

A shrub or small tree, 6 to 25 feet high; leaves oval, acuminate, serrate, deciduous; flowers clustered, small; small red berries in abundance. Bear Creek valley.

CELASTRACEAE. STAFF-TREE FAMILY

***Euonymus americanus*.** Strawberry Bush.

Shrub 3 to 8 feet high; ovate or oblong-lanceolate pointed leaves; flowers greenish (seeming to sit in the middle of the leaves); capsules opening in the fall, showing crimson seeds (hence the strawberry name). Low woods along Bear Creek valley.

ACERACEAE. MAPLE FAMILY

***Acer saccharum*.** Sugar Maple, Sugar Tree, Rock Maple.

A large valuable tree; leaves 3 to 5 inches long, green above, pale below, lobed; fruit in a key or samara; valuable for lumber, for sugar, and for shade.

***Acer rubrum*.** Red Maple, Swamp Maple, Water Maple.

Tall tree, with reddish twigs; leaves 3 to 4 inches long, cordate at base, sharply lobed, beautifully colored in autumn; keys or samaras small, red. Along the stream.

Acer saccharinum*, *Acer dosycarpum (Ehrhart, 1789). Silver Maple, White Maple, Soft Maple.

Small tree; leaves 4 to 6 inches long, deeply lobed, dentate, silvery beneath; samaras large.

Acer negundo*, *Negundo aceroides (Moench, 1794). Box Elder, Ash-Leaved Maple.

Small tree 40 to 50 feet high, greenish twigs; wood soft and easily broken; leaves 3 to 5-foliate, deeply dentate; low ground, not abundant.

The box elder may be distinguished at once from the other maples by its compound leaf.

VITACEAE. GRAPE FAMILY

Parthenocissus quinquefolia, Ampelopsis quinquefolia (Michaux, 1803).
Virginia Creeper.

Long climbing vine, with tendrils; leaves with long wire-like stems, divided into five digitate parts, toothed, lanceolate, pointed, serrate beyond the middle, the two lower shorter than the others; flowers white, May and June; berries small, black or blue. Throughout the valley of the park.

Vitis aestivalis. Summer Grape.

High-climbing woody vine; leaves large, 4 to 7 inches, 3 to 5-lobed, pubescent; grapes small, numerous, acid, edible, ripe in September and October.

Vitis cinerea. Downy Grape.

Woody vine; heart-shaped leaves, 3-lobed, with whitish hairs beneath; grapes black, acid. Along the stream.

Vitis rotundifolia. Muscadine, Bullace Grape.

Woody vine, trailing on rocks and bushes and climbing high trees; bark close; leaves cordate, 2 to 3 inches in diameter, with deep triangular dentations; grapes large, scattered, purple, musky, tough but good, ripe in August and September. Throughout the park.

This is the *Vitis vulpina* of Torrey and Gray, 1838, but not of Linnaeus, and is the original of the scuppernong.

TILIACEAE. LINDEN FAMILY

Tilia, americana(?) Linden, Basswood.

A large handsome tree, with relatively smooth, light gray bark and spreading branches; leaves ovate, sometimes cordate, thin, green above, lighter green to white below, slightly asymmetrical; flowers white or yellowish-white or cream-colored, fragrant, yielding excellent honey; fruit a small globular woolly nut suspended beneath a float 2 or 3 inches long. Not common; young trees on creek bank opposite where the road descends into the valley.

This is probably the tree described by Sargent as *T. glabra* or *T. neglecta*. He makes 15 species in North America.

VIOLACEAE. VIOLET FAMILY

***Viola palmata*.** Blue Violet, Blue Wood-Violet.

Low herb; leaves from a thick rootstock, the upper ones lobed, parted, or palmate, the lower ones reniform or cordate; flowers on an erect scape, 5-parted, perfect but irregular, the lower petal larger and making a sack or spur, sky-blue, April and May.

***Viola pedata*.** Bird's Foot Violet.

Rootstock short, thick, erect; leaves 7 or 9-parted almost to the base, the divisions nearly linear or spatulate; flowers one inch broad, lilac, deep blue, or purple, April and May.

***Viola primulaefolia*.** Primrose-Leaved Violet.

A violet with entire oblong leaves (primrose-shaped) and small white flowers, April and May.

PASSIFLORACEAE. PASSION FLOWER FAMILY

***Passiflora incarnata*.** Maypop, Common Passion Flower.

Trailing or low-climbing vine; leaves 3-cleft, serrate; tendrils axillary; purple handsome flowers, in June and July, 2 to 3 inches in diameter, in which the symbols of the crucifixion may be seen by those who can find them; petals and stamens five; fruit a yellowish pod as large as a hen's egg and edible (for some people). Over all the park.

***Passiflora lutea*.** Yellow Passion Flower.

Slender, low-climbing vine, with blunt cordate 3-lobed leaves, 2 to 3 inches broad, broader than long; tendrils; greenish-yellow flower, about one inch in diameter, May to July; less conspicuous than *Passiflora incarnata*.

CACTACEAE. CACTUS FAMILY

Opuntia opuntia*, *Opuntia vulgaris (Miller, 1768), ***Cactus opuntia*** (Linnaeus, 1753). Prickly Pear, Cactus, Indian Fig.

Low, prostrate or ascending; joints oblong, lanceolate, or (the younger ones) obovate, flat, 3 to 6 inches long; leaves rudimentary, appressed; bristles; flowers yellow; fruit red, fleshy, edible, 1-1½ inches long. Growing in scattered colonies.

ONAGRACEAE. EVENING PRIMROSE FAMILY

Onagra biennis*, *Oenothera biennis (Linnaeus, 1753). Evening Primrose.

Stout erect stem, simple or branched, hirsute, 2 to 7 feet high; leaves lanceolate, acute, more or less wavy, 1 to 4 inches long; flowers large, 4-parted, with obcordate petals, yellow, opening in the evening, odorous.

ARALIACEAE. GINSENG FAMILY

Aralia spinosa. Hercules' Club, Angelica-Tree.

A spiny shrub or small tree of peculiar aspect, 10 to 25 feet high; leaves doubly compound, immense, reaching 3 to 4 feet in length; flowers white, terminal, in large umbels, in June; fruit following the arrangement of the flowers; individual berries small. Common.

APIACEAE. PARSLEY FAMILY

Daucus pusillus. Wild Carrot, Queen Ann's Lace.

Stem erect, bristly, 2 feet high; leaves finely divided; flowers in flattened compound umbels, white, showy; fruit dorsally flattened.

Eryngium yuccaefolium, Eryngium aquaticum (Linnaeus, 1753). Button Snakeroot, Eryngo.

Stem stout, 2 to 5 feet high; leaves linear, lanceolate, 1 to 2½ feet long, narrow, parallel-veined, fringed with bristles; globular thick prickly head, 1 inch in diameter, three smaller. Relatively infrequent.

Cicuta maculata. Water Hemlock, Cow-Bane, Beaver-Poison.

Stem erect, large, smooth, hollow, with purple lines or purplish, 2 to 6 feet high; leaves compound, poisonous; leaflets lanceolate, pointed, serrate, 1 to 5 inches long; flowers small, white, in large umbels. Growing near water.

CORNACEAE. DOGWOOD FAMILY

Cornus florida. Dogwood, Flowering Dogwood.

Tree 15 to 35 feet high, very ornamental when in bloom or in fruit; wood hard and valuable; leaves ovate, pointed, bright red in fall; flowers white or greenish white, occasionally with a touch of pink or rose, 4-parted, notched, in May; berries red and showy. Abundant along edge of woods and somewhat exposed places.

Cornus stricta, Cornus fastigata (Michaux, 1803). Cornel, Stiff Dogwood.

A shrub or small tree, 6 to 16 feet high; leaves small, ovate, or oblong, and pointed; flowers in cymes, loose and flat; small pale blue fruit.

In addition to these two there are probably one or two other small dogwoods in the park.

Nyssa sylvatica, Nyssa multiflora (Wangenheim, 1787). Black Gum.

A large upland tree with rough bark, somewhat valuable for its tough wood; leaves entire, ovate or obovate, glossy, 2-4 inches long, turning crimson in fall; fruit ovoid, black or bluish-black, acid, and not edible, half-inch long, abundant, September and October; stone ovoid.

Nyssa aquatica, *Nyssa uniflora* (Wangenheim, 1787). Tupelo Gum.

A large tree growing in swamps; leaves ovate or oblong, 4–12 inches long; flowers inconspicuous; fruit oblong, oval, blue, 1 inch long. (Cassell).

ERICACEAE. HEATH FAMILY

Azalea nudiflora, *Rhododendron nudiflorum* (Torrey, 1824). Azalea, Purple Azalea, Wild Honeysuckle.

A handsome shrub 3 to 6 feet high, branched; leaves oblong or obovate; flowers pink, rose-red, to white and yellow. Abundant.

Kalmia latifolia. Mountain Laurel, Calico Bush.

Showy shrub, 4 to 16 feet high; branches smooth; leaves elliptical, acute at both ends, bright green on both sides, shining; flowers large, white, or rose-color, in May and June. Abundant in the park.

Oxydendrum arboreum, *Andromeda arborea* (Linnaeus, 1753). Sourwood, Sorrel Tree.

A small tree, 15 to 40 feet high; leaves oblong, finely serrate, pointed, 4 to 6 inches long; flowers small, white, in long terminal racemes, in April and May. Around the brow of the sandstone cap above the valley.

VACCINIACEAE. HUCKLEBERRY FAMILY

Vaccinium arboreum. Farkleberry, Sparkleberry.

Shrub or small tree, with rigid branches; leaves oval, oblong, or obovate, glossy and green above, evergreen in Mississippi, $\frac{1}{2}$ to 1 inch long; flowers small, white, April to June; berries small, globose, black, mealy, and insipid.

Vaccinium corymbosum. Blueberry, Huckleberry.

Bush 4 to 12 feet high; branches stiff; leaves oval or oblong, green above, 1 to 2 inches long; flowers small, white to pale pink; berries small, globose, blue (or black), edible.

There are probably several other species of huckleberries in the park.

EBENACEAE. EBONY FAMILY

Diospyros virginiana. Persimmon.

Small to medium size tree; leaves ovate with short petioles, deciduous; flowers inconspicuous; fruit globular, 1 to $1\frac{1}{2}$ inches in diameter, astringent until fully ripe, then sweet and edible, September to November; seeds flat and large.

OLEACEAE. OLIVE FAMILY

Fraxinus americana. Ash, White Ash.

A tall handsome tree, valuable for timber and shade; leaves compound; leaflets 5-9, ovate-oblong or lanceolate, pointed, entire, 3-5 inches long; flowers generally dioecious, inconspicuous; fruit a wedge-linear samara, 1-1½ inches long.

LOGANIACEAE. LOGANIA FAMILY

Gelsemium sempervirens, Bignonia sempervirens (Linnaeus, 1753).

Yellow Jessamine.

A smooth woody climbing vine with opposite lanceolate or ovate evergreen leaves; flowers yellow, showy, handsome, fragrant, an inch long or longer, in early spring; seeds flat, winged; poisonous throughout.

Spigelia marilandica, Lonicera marilandica (Linnaeus, 1753). Pink Root, Indian Pink.

Herb 1 to 2 feet high; leaves sessile, ovate or lanceolate, acute at apex, 2 to 4 inches long; flowers in terminal one-sided spike, corolla slender, 1 to 2 inches long, red without, yellow within; root used as a popular vermifuge.

GENTIANACEAE. GENTIAN FAMILY

Gentiana Andrewsii. Closed Gentian.

Stem smooth, leafy, 1-1½ feet high; leaves green, lanceolate, entire, 1½-2½ inches long; flowers in cluster, closed, 1½ inch long; seeds winged. Above the sandstone.

ASCLEPIADACEAE. MILKWEED FAMILY

Asclepias tuberosa. Butterfly Weed, Pleuris Root.

Stem 1 to 2 feet high, in clusters often; leaves alternate, 2 to 3 inches long; flowers bright orange at top of stalk, in June and July. Light dry soil.

Asclepias obtusifolia, Asclepias purpurascens (Walter, 1788). Obtuse-Leaved Milk-Weed.

Stem stout, erect, 2-3 feet high; leaves sessile or nearly so, oblong, nearly elliptical, wavy, 2-4 inches long; flowers many in umbels, greenish-purple, in June and July; follicles smooth, 5 inches long; seeds comose.

Vincetoxicum carolinense, Gonolobus carolinensis (R. Brown, 1820).

Vincetoxicum.

Stem hirsute, vining; leaves opposite, thin, cordate, petioled, 4-7 inches long; flowers 5-parted, wheel-shaped, brownish-purple,

in summer; follicles with soft projections (muricate); seeds flat, with abundant white coma.

CONVOLVULACEAE. MORNING-GLORY FAMILY

Ipomoea purpurea*, *Convolvulus purpureus (Linnaeus, 1762). Morning-glory.

A trailing vine, 5 to 10 feet long; leaves broadly heart-shaped, 2 to 4 inches wide; flower funnel-shaped, variegated with blue, purple, and pink, 2 inches long, June to September. Introduced from tropical America.

Ipomoea pandurata*, *Convolvulus panduratus (Linnaeus, 1753). Wild Potato Vine.

Stem trailing several feet from a large fleshy root; leaves heart-shaped, acuminate, sometimes fiddle-shaped, 2 to 5 inches long; flower open funnel-form, white, pinkish, purple in the throat, 3 inches long, May to September.

CUSCUTACEAE. DODDER FAMILY

Cuscuta Gronovii. Love Vine, Large Love Vine, Dodder.

A parasitic climbing vine, thread-like, yellow to orange; no leaves; flowers white, numerous, in dense cymes. In the creek valley.

Cuscuta glomerata*, *Cuscuta paradoxa (Rafinesque, 1820). Love Vine, Glomerate Dodder.

A parasitic climbing vine, yellowish white; no leaves; flowers sessile, numerous, white with yellow anthers, in dense clusters forming a spiral around the host; spiral clusters of small seeds in fall. Valley of Bear Creek.

POLEMONIACEAE. PHLOX FAMILY

Phlox divaricata. Blue Phlox, Sweet William.

Stem erect or ascending, slender, 12 to 16 inches high; leaves lanceolate, the lower ones broader, 1 to 1½ inches long; flowers blue, 1 inch in diameter, slightly fragrant, grouped in clusters, late spring.

VERBENACEAE. VERBENA FAMILY

Callicarpa americana. French Mulberry.

A branching shrub, 3 to 8 feet high; leaves opposite, thin, ovate, scurfy, toothed, 3 to 6 inches long; flowers in clusters, bluish; fruit globular, violet-blue, conspicuous in showy clusters.

NEPETACEAE. MINT FAMILY

Monarda fistulosa. Horsemint, Wild Bergamot.

Stems 2 to 3 feet high, square, generally branching; leaves ovate, lanceolate, pointed, serrate, 2 to 3 inches long; flowers terminal, white, rose-colored, and purple; characteristic mint odor. Relatively common.

Salvia lyrata. Meadow Sage, Lyre-Leaved Sage.

Stem 1 to 2 feet high, square; leaves lyrate, in clusters near the ground, upper pair entire; flowers labiate, lower lips larger, 1 inch long, blue, in April and May.

Scutellaria parvula. Skullcap, Small Skullcap.

Perennial from rootstock; stem slender, erect, branching, 6 to 12 inches high; leaves oval, entire, $\frac{1}{2}$ inch long; flowers opposite, solitary in axils, small, 2-lipped, violet or blue, April to June.

Prunella vulgaris. Self-Heal, Heal-All.

Slender stem, simple, or sometimes branched; leaves ovate to oblong, 1 to 3 inches long; flowers violet to purple, 1 inch long; spikes terminal, dense, $1\frac{1}{2}$ to 2 inches long. Also called Brunella.

SOLANACEAE. NIGHTSHADE FAMILY

Solanum nigrum. Nightshade, Black Nightshade.

An annual with erect branched stem, green, 1-2 $\frac{1}{2}$ feet high; leaves ovate, entire, 1-2 $\frac{1}{2}$ inches long; flowers white, in clusters; berries small, globular, black when ripe.

Solanum carolinense. Horse Nettle, Apple of Sodom.

Stem erect, branched, 1-3 feet high, beset with yellow prickles; leaves oblong or ovate, some deeply lobed, with midribs bearing sharp prickles, 3-5 inches long; flowers white to blue; berries orange-yellow, $\frac{1}{2}$ inch in diameter. A pest.

Physalis virginiana. Ground Cherry, Virginia Ground Cherry.

Stem erect, branched, 1-2 $\frac{1}{2}$ feet high; leaves ovate or oblong and tapering, 1 $\frac{1}{2}$ -2 inches long; flowers yellow; berry yellow or green, pulpy, inclosed by the 5-angled calyx. Type variable.

Datura stramonium. Jamestown-Weed (Jimson-Weed), Thorn-Apple.

Stem stout, smooth, branching, green, 1-3 or 4 feet high; leaves thin, more or less ovate, with deep lobes, acute at apex; flowers large, funnel-shaped, 5-pointed, white, foetid, all summer; capsules 2 inches long, covered with prickles; poisonous, yielding the narcotic drug stramonium.

***Datura tatula*.** Purple Jamestown-Weed, Purple Thorn-Apple.

Similar to *D. stramonium*, but distinguished by its purple stem and lavender or violet or purple color in the flowers and by its larger size; likewise poisonous and ill-scented.

SCROPHULARIACEAE. FIGWOOT FAMILY

***Verbascum thapsus*.** Mullein (Mullen).

Stem woolly, rigid, simple (or with occasional branches), 2 to 6 feet high; leaves woolly, oblong, large (lowest 1 foot long); flowers yellow, sessile, on a long dense spike, in spring and summer. Introduced from Europe.

***Verbascum blattaria*.** Moth Mullein (Mullen).

Stem erect, slender, 2 to 3 feet high, and smaller than that of the common mullein; leaves oblong, lanceolate; racemes long and loose, with yellow or white flowers. Naturalized from Europe.

Leptandra virginica*, *Veronica virginica (Linnaeus, 1753). Culver's-Root, Culver's Physic.

Herb with simple straight stem, 2-6 feet high; leaves whorled, lanceolate, serrate, pointed, 2-4 inches long; flowers clustered at top of stem in several racemes, white or bluish or purple, June to September; capsule ovate, many-seeded. Common.

RHAMNACEAE. BUCKTHORN FAMILY

***Ceanothus americanus*.** New Jersey Tea, Red-Root.

Bushy shrub, 2 feet high, with red root; leaves ovate or ovate-lanceolate, finely serrate, 3-ribbed, 1 to 3 inches long; clusters of small white odorous flowers in May, June, and July. Common in the upper woods of the park.

Used as tea during the American Revolution.

BALSAMINACEAE. BALSAM FAMILY

***Impatiens biflora*.** Jewel Weed, Touch-Me-Not, Balsam, Snapweed.

A branching annual, 2-4½ feet high; leaves thin, ovate or oval, serrate, 2-3 inches long; flowers orange to yellow, in July; capsules 5-celled, bursting upon touch. Creek valley.

OROBANCHACEAE. BROOM-RAPE FAMILY

Epiphegus americana*, *Leptamnum virginianum (Rafinesque, 1878). Beech-Drops, Cancer-Root.

Stem with ascending straight branches, 6-12 inches tall; flowers small, purplish; in summer and autumn; parasitic on beech roots. Under beeches near the pump house.

ACANTHACEAE. ACANTHUS FAMILY

Ruellia ciliosa. Ruellia, Hairy Ruellia.

Stem simple, erect, 1 to 2 feet high; leaves hairy, oblong or oval, 1 to 2 inches long; pale blue flower on apex.

MARTYNIACEAE. UNICORN-PLANT FAMILY

Martynia louisiana, Martynia proboscidea (Gloxin, 1785). Unicorn Plant, Elephant's Trunk, Double Claw.

Herb, clammy, coarse, pubescent, scented, bunched; leaves broadly ovate, cordate at base, rounded at apex, almost entire, 4-8 inches in diameter, petiole long; flowers large, whitish with purple and yellow, in summer; fruit-pod strongly curved, 6 inches long, with claw or beak longer than the body, opening longitudinally and showing crested endocarp beneath. East of camp, near the new road.

BIGNONIACEAE. BIGNONIA FAMILY

Bignonia crucigera, Bignonia capriolata (Linnaeus, 1753). Cross-Vine.

A high-climbing woody vine, with stem showing a cross in transverse section; leaflets long, nearly evergreen; corolla bell-shaped, 2 to 2½ inches deep, scarlet or orange-red without and yellow within, with strong opium-like odor, April; capsule 6 to 8 inches long, containing flat-winged seed. Common.

Tecoma radicans, Bignonia radicans (Linnaeus, 1753). Trumpet Vine, Trumpet Creeper.

A woody climbing or prostrate vine; compound leaves, with 7 to 11 leaflets, deeply toothed; flaming red or scarlet trumpet-shaped flowers, 2 to 3 inches long, June; capsules 4 to 5 inches long, containing flat-winged seed. Common on Bear Creek.

Catalpa catalpa, Catalpa bignonioides (Walter, 1788). Catalpa, Bean-Tree.

A large spreading tree; leaves cordate, entire or three-lobed, 6 to 10 inches in diameter; flowers white, spotted with yellow and purple; pods a foot long, hanging, with many flat winged seeds. Rare in the park.

PLANTAGINACEAE. PLANTAIN FAMILY

Plantago major. Plantain.

Stemless herb with short rootstock; leaves basal, with long petioles, ovate, generally entire, 4 to 6 inches long; scape bearing densely flowered spike; flowers perfect, all summer; said to be naturalized from Europe.

Plantago virginica. Plantain.

Leaves lanceolate or oblong, with short petioles, 3 to 5-veined, 2 to 5 inches long; scape and spike 6 inches tall; flowers dense, on spike, in spring and early summer.

RUBIACEAE. MADDER FAMILY

Mitchella repens. Partridge Berry.

Small creeping vine with ovate evergreen leaves one-half inch long; small white 4-parted flower in April, May, or June; small scarlet or red berry persistent throughout the winter. Dry shady woods, often at the base of a tree. A dainty plant.

VIBURNACEAE. HONEYSUCKLE FAMILY

Viburnum rufotomentosum. (Southern) Black Haw.

Tree 10 to 25 feet high; leaves elliptical to oval, entire, finely serrate; cymes large, white; fruit oval, half-inch long or longer, blue, purple, or black.

Does this really differ from *Viburnum prunifolium*, except possibly as a variety?

Sambucus canadensis. Elder.

Shrub 5 to 8 feet high, stem generally pithy; leaflets 5 to 11 (generally 7); flowers in broad white cymes; fruits numerous, purple to black. Very showy.

Lonicera sempervirens, Caprifolium sempervirens (Michaux, 1803).

Coral Honeysuckle, Trumpet Honeysuckle.

Climbing vine (evergreen in the South); leaves obtusely oval, perfoliate at top; flowers in tubes or trumpets, scarlet or yellow; berries scarlet to red.

Lonicera japonica. Japanese Honeysuckle.

Vine climbing and running to a distance; leaves ovate, entire, dull green; flowers vari-colored, white, pink, and yellow, very fragrant, especially in the evening. Introduced from Japan.

VALERIANACEAE. VALERIAN FAMILY

Valerianella radiata, *Fedia radiata* (Michaux, 1803). Lamb Salad.

Small herb, 6-12 inches high, forking by two's; leaves opposite, small; corolla white, funnel-form, in spring.

CAMPANULACEAE. BLUE-BELL FAMILY

Specularia biflora, *Legouzia biflora* (Britton, 1894). Venus' Looking-Glass.

Stems slender, sometimes branched, 6-18 inches high; leaves alternate, ovate, generally acute at apex, sessile; flowers blue or purplish, in spring, two-flowered.

Specularia perfoliata, *Legouzia perfoliata* (Britton, 1894). Venus' Looking-Glass.

Stem slender, leafy, hairy, 5-20 inches high; leaves clasping the stem, as broad as long; flowers small, in the axils, blue (or violet).

Lobelia cardinalis. Cardinal Flower. Lobelia.

Stem leafy, generally simple, 2-4 feet high; leaves oblong or lanceolate, thin, 2-6 inches long; flowers in racemes, crimson, bright scarlet, or red, July to September. Common.

CICHORIACEAE. CHICORY FAMILY

Taraxacum taraxacum, *Leontodon taraxacum* (Linnaeus, 1753). *Taraxacum dens-leonis* (Desfontaine, 1800). Dandelion, Blow-Ball, Lion's-Tooth.

Root thick, long, bitter; stemless; scape erect, hollow, 3-15 inches long, ending in a single yellow flower; leaves radical, oblong, lanceolate, deeply dentate; flowers many, golden yellow, composite, April to September; copious soft white pappus.

Adopogon virginicum, *Tragopogon virginicum* (Linnaeus, 1753). False Dandelion, Virginia Dwarf Dandelion.

Perennial, stem erect, small, with one small upper leaf, 1-1½ feet high; basal leaves thin, tufted, entire or slightly sinuate, 2-6 inches long; flowers orange, on end of branches, few, in spring; pappus.

Adopogon carolinianum, *Hyoseris virginianica* (Linnaeus, 1753). False Dandelion, Carolina Dwarf Dandelion.

Annual, stem erect, 1 foot high, with solitary flower; leaves basal, variable (lanceolate, spatulate, sinuate, dentate, lobed), 1-6 inches long; flowers orange, in spring and summer; pappus.

This genus is also called *Krigia*.

AMBROSIACEAE. RAGWEED FAMILY

Ambrosia artemisiaefolia. Ragweed, Roman Ragweed.

Weed 1 to 3 feet high, hairy or roughish, branched; leaves twice-pinnatifid, 2 to 4 inches long; flowers in racemes or spikes.

Ambrosia trifida. Great Ragweed, Giant Ragweed, Tall Ragweed.

Tall, coarse weed, 3 to 12 feet high, branched; leaves large, opposite, 3 to 5-lobed, serrate; fruit clustered.

The pollen of both these species is irritating to many people.

Xanthium canadense. Cocklebur.

A rough stout weed, branching, 1 to 5 feet high; leaves coarse, alternate, 3-veined, 3-lobed, dentate, 3 to 4 inches long; bur oblong, nearly an inch long, covered with spines or prickles. A troublesome weed.

CARDUACEAE. THISTLE FAMILY

Vernonia gigantea, Vernonia altissima (Nuttall, 1818). Iron-Weed.

A tall erect weed branching above, 5-9 feet high; leaves alternate, thin, lanceolate, pointed, serrate; flowers clustered in scattered corymbs, purple, July to September.

Vernonia fasciculata. Iron-Weed, Western Iron-Weed.

Stem slender, smooth, 3-6 feet high; leaves alternate, linear, narrowly lanceolate, sharply pointed, serrate; flowers clustered, pale-purple, July to September.

Elephantopus carolinianus. Elephant's Foot.

Stem hairy, branched, 1-2 feet high; leaves thin, oblong, hairy, crenate or dentate, 3-6 inches long; flowers terminal, purple, July and August.

Elephantopus tomentosus. Hoary Elephant's Foot.

Stem erect, pubescent or hairy, branching near the top, 1-2 feet high; basal leaves ovate, oval, or obovate (more nearly round than in *E. carolinianus*), crenate or dentate; few stem leaves, much smaller, lanceolate; flowers small, terminal, pale purple, June to August.

Eupatorium perfoliatum. Boneset, Thoroughwort.

Stem stout, branched near the top, 2 to 4 feet high; leaves opposite, lanceolate, pointed, serrate, perfoliate, 4 to 7 or 8 inches long; flowers white, in large clusters, autumn; used in popular medicine.

Eupatorium purpureum, Eupatorium trifoliatum (Linnaeus, 1753).
Joe Pye Weed.

Tall showy weed, branching at top, 3 to 10 feet high; leaves whorled, ovate, lanceolate, serrate, 4 to 7 inches long; flowers clustered in a large pyramidal head, pale purple to pink, in August and September. Common.

Eupatorium rotundifolium. False Horehound, Round-Leaved Thoroughwort.

Pubescent stem, simple or branching at top, 1 to 2½ feet high; leaves opposite, sessile, ovate or nearly round, crenate, 1 to 1½ inches long; flowers white, in a large cluster, August and September. Common.

Ageratum conyzoides, Ageratum mexicanum (Sims, 1787). Ageratum, Mexican Ageratum.

Herb, 1 to 2½ feet high, often branched; leaves ovate, opposite, serrate; flowers azure-blue, in heads, in summer and fall. Escaped from cultivation.

Solidago odora. Sweet Golden-Rod.

Stem simple, erect, 2-4 feet high; leaves alternate, sessile, thick, entire, lanceolate, pointed, sweet-scented (anice-scented); flowers terminal in spreading racemes.

Solidago canadensis. Canada Golden-Rod, Yellow-Weed.

Stem slender, pubescent or rough, 3 to 8 feet high; leaves lanceolate with pointed apex, serrate, 2 to 5 inches long; branching into a large spreading panicle of yellow flowers, August to October. Very showy.

The golden-rods constitute a large genus, and there are at least half a dozen species in the park.

Aster paludosus. Swamp Aster.

Stem somewhat rough, slender, generally simple, 1½-2 feet high; leaves very narrow (almost linear), rough, 2-6 inches long; flowers few, near the top, purple, in autumn. Despite the generic name this plant is not confined to swamps.

The aster genus is a large one, and there are probably a number of species in the park.

Rudbeckia hirta. Black-Eyed Susan, Ox-Eye Daisy, Nigger-Head, Cone-Flower.

Stem rigid, simple or sparingly branched, hairy, 1 to 2½ feet high; leaves undivided, lanceolate, 2 to 6 inches long, slightly serrate; compo-

site flowers with orange or yellow rays and purplish black disks, throughout the summer.

Antennaria plantaginifolia, Gnaphalium plantaginifolium (Linnaeus, 1753). Everlasting, Cudweed.

Small woolly plant, stoloniferous; stem 6–14 inches high; basal leaves obovate or spatulate, 3-ribbed, dark green above, silvery below, 1–2 inches long, stem-leaves small, narrow; heads small.

Gnaphalium obtusifolium, Gnaphalium polycephalum (Michaux, 1803). Sweet Everlasting, Life Everlasting, Sweet Balsam.

Stem erect, branched, 1 to 3 feet high; leaves linear or lanceolate, sessile; flowers white, in large clusters, woolly, odorous, July to October.

Helianthus, several species. Sunflower.

The genus *Helianthus* belongs to the *Compositae*, composite flowers; stems erect, stout, branched at top; leaves entire, opposite or alternate; flowers with yellow rays, in the fall; akenes thick, usually compressed.

There are about 60 species in the Western World, 40 in North America, 20 in the Atlantic States, several in the park.

Coreopsis major, Coreopsis senifolia (Micheaux, 1803). Wood Coreopsis. Tickseed.

Stem pubescent, leafy to the top, 1–3 feet high; leaves sessile, divided to the base into three's, the two thus seeming to be a whorl of six leaves; flowers yellow, July and August; akenes oblong. Common.

There are several other species of coreopsis in the park.

Achillea millefolium. Yarrow, Milfoil.

Perennial herb, one foot high or higher; basal leaves alternate, twice-pinnatifid, with feathery appearance; flowers white, sometimes pink, in broad terminal corymbs.

Helenium tenuifolium. Bitter-Weed, Sneeze-Weed.

A troublesome pasture weed, slender, very leafy, branching, 1–2 feet high; leaves linear or filiform; flowers yellow, in clusters at top of plants, August and September.

Bidens bipinnata. Spanish Needles.

Stem erect, quadrangular, branched, 1–3 feet high; leaves thin, petioled, pointed, deeply dissected; flowers small, yellow; seeds slender; akenes with barbed awns.

***Bidens frondosa*.** Stick-Tight, Beggar-Ticks.

Stem erect, branched, 2-6 feet high; leaves thin, pinnately divided below, entire above, serrate; akenes flat with 2 slender awns.

***Carduus altissimus*.** Tall Thistle, Roadside Thistle.

Stem branched, downy, 3-9 feet high; leaves alternate, sessile, lanceolate, lower 5-8 inches long, less dentate, white on under side, upper leaves smaller with many prickles, more dentate, white beneath; flowers purple, in prickly heads, 1½-2 inches high, in August and September.

***Carduus discolor*.** Field Thistle. Two-colored Thistle.

Stem leafy and branching, 2-6 feet high, leaves alternate, deep-cut, spiny, green above and white below; similar to the tall thistle, but lower; called by Gray (6th ed.) and Chapman (3rd ed.) a variety rather than a species.

The generic names *Cirsium* and *Cnicus* are also used for *Carduus*.

***Gaillardia lanceolata*.** Gaillardia.

Small branching herb, 1 to 2 feet high; leaves narrow, lanceolate, sessile, often spatulate; flowers composite, solitary on terminal peduncles, 1½ to 2 inches in diameter, sweet-scented, rays yellow, disks generally purple or brown; very pretty.

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