DESCRIPTION OF THE MUSCOGEE QUADRANGLE

By Joseph A. Taft

INTRODUCTION

LOCATION AND AREA

The Muscogee quadrangle is bounded by parallels of latitude 38° 30' and 39° and by meridians of longitude 95° and 95° 30' and contains 968.7 square miles. It is located in the Cherokee and Creek nations, Indian Territory, approximately the eastern two-thirds being in the former, and its southern boundary is within a few miles of the Choctaw Nation. Its name is taken from Muscogee, the principal town in the Creek Nation, which is located near the junction of Verdigris and Neosho rivers with Arkansas River.

PHYSIOGRAPHIC RELATIONS

The Muscogee quadrangle may be separated, physiographically, into two nearly equal parts, one of which belongs to the physiographic province of the Ozark Plateau, or highland, and the other to that of the Prairie Plains. The two provinces meet in this quadrangle in a broad, shallow basin occupied in part by Neosho and in part by Arkansas River. The Ozark Plateau is low and nearly flat in this, its extreme southwestern part, where it approaches these rivers, and from them the Prairie Plains rise gradually toward the west. Brief descriptions of the salient topographic features of the Ozark Plateau and of the Prairie Plains will assist in making clear the topography of the Muscogee quadrangle.

SOIL SOUTHERN MUSE

The Ozark region is a broad, relatively flat, dome-shaped, dissected highland. In parts of this region, notably the southern and eastern parts, the Ozark plateau is relatively low, broad, and prominent, and is characterized by hills and promontories that nearly coincide, and are inclined in the same direction as the slope of the Ozark highland. The crests of the hills in the southern part of the Ozark region are characterized by a bench-and-terrace or table-and-terrace form of topography. The bedrock formations and terraces are dissected and weathered chert. The outcrops of the Ozark plateau are partly covered by a mantle of soil and alluvium.

The rocks that cap the Boston Mountains and extend south along the edge of the Ozark plateau are the Missouri-Ozark formation. The rocks that cap the Boston Mountains are the Salem platform. The topography of the Ozark plateau, in the Muscogee quadrangle, is characterized by a bench-and-terrace form of topography. The bedrock formations and terraces are dissected and weathered chert. The outcrops of the Ozark plateau are partly covered by a mantle of soil and alluvium.
In the northeastern part of the Muscogee quadrangle there are tracts of gently rolling land. These areas are a part of the Springfield plain, which has been developed on the Boone formation in northeastern Arkansas, southwestern Missouri, and northeastern Illinois. The plain is characterized by gentle folds and faulting, which have produced a series of terraces or benches that are separated by valleys. The terraces are composed of sandstone, shale, and limestone, and are generally about 50 feet thick.

The Springfield plain is bordered on the east by the Ozark highland, and on the west by the Prairie Plains. The Ozark highland is a dissected upland area that is characterized by a series of north-south trending ridges and valleys. The ridges are composed of sandstone and limestone, and are generally about 200 feet above the surrounding lowlands. The valleys are typically 50 to 100 feet deep, and are filled with sediment that has been eroded from the surrounding hills.

The Prairie Plains are a broad, flat area that extends from the Ozark highland to the Arkansas River. The plains are characterized by gently rolling topography, and are covered with prairie grasses and forbs. The plains are drained by a series of small streams that flow into the Arkansas River.

The topography of the Prairie Plains in the Muscogee quadrangle is illustrated in the southwestern half of the Muscogee quadrangle, on a map having 50-foot contour intervals. Areas in the northeastern part of the Muscogee quadrangle, where much of the area has been surveyed, have been surveyed in detail. In the adjoining Tahlequah quadrangle erosion has gone on through the Carboniferous and Ordovician strata in parts of the deeper valleys, and the pre-Ordovician rocks have been cut through in the drainage of deep, steep valleys. At Fort Gibson, near the center of the Muscogee quadrangle, the Ordovician rocks are being deeply etched by small intermittent streams.

The Illinois highland has a greater and a narrower valley than the Arkansan valley. It approaches the latter in many respects, and is bordered on the north by the Ozark highland, and its valley is conical, typical of the larger streams of that region.

**DRAINAGE.**

Four rivers drain the Muscogee quadrangle—the Arkansas, Verdigris, Neosho, and Illinois. The largest is the Arkansas, which flows across the central part of the quadrangle in a southeasterly course. From the Prairie Plains it flows outward, touches the southeastern border of the creek highland, and then takes a southeasterly course. South of the southeast corner of the quadrangle the river turns eastward again and continues parallel with the southern boundary of the Ozark region to the Mississippi river.

The Verdigris River drainage lies within the Prairie Plains. Rising in Kansas, it flows in a southeasterly direction, joining the Arkansas near the center of the Muscogee quadrangle. The Verdigris is a river of less than 200 feet thick. It is entirely absent, however, from the lower Palomino outcrops near Tahlequah, and is generally lacking throughout the remainder of the quadrangle.

The Illinois River has its source southeast of the center of Kansas, near that of the Verdigris. In southeast Kansas it approaches the river from the south, and the river empties into the Arkansas near the center of the Muscogee quadrangle.

The eastern part of the Muscogee quadrangle is drained by the Fort Gibson, the Double Spring Creek, and the Illinois. The Illinois River collects its waters entirely from the Ozark highland. It rises in the northern foothills of the Fort Gibson, in northern Arkansas, and flows northward into the springfield plain, thence westward and southwestern, with the pitch of the rocks, and enters the Arkansas near the southeast corner of the quadrangle.

The smaller streams in the western half of the quadrangle drain the Coal Measure shales and sandstones, and are the Arkansas, the Verdigris, and the Neosho. These streams are fed by springs that issue chiefly from the Boone formation, and their comparison with related formations described in the Burgen sandstone shows a close resemblance. Some variable beds of limestone in the upper part of this formation contain fossils of Tensite age. The formation has not been deeply eroded, and the surface topography is generally level.

**DESCRIPTION GEOLOGICAL.**

All the rocks exposed in the Muscogee quadrangle are stratified deposits formed in Carboniferous time. They are represented on the columnar section sheet, and their comparison with related rocks in northern Arkansas is shown in the correlation table. The structural relations of the rocks are of the same general type, and their composition is of the same general type, that is, each river is in any case sufficient to illustrate the river and its course.

In the northeastern part of the quadrangle the drainage is dissected by streams which flow to the north. In Indian Territory, as illustrated on the map, the principal rivers are the Arkansas, Verdigris, and Neosho. They have worn down their valleys to a considerable depth, and are characterized by a series of terraces or benches that are separated by valleys. The terraces are composed of sandstone, shale, and limestone, and are generally about 50 feet thick.

The principal rivers in the Muscogee quadrangle are the Arkansas, Verdigris, and Neosho. They have worn down their valleys to a considerable depth, and are characterized by a series of terraces or benches that are separated by valleys. The terraces are composed of sandstone, shale, and limestone, and are generally about 50 feet thick.

The Arkansas River is a large river that flows through the eastern part of the quadrangle. It is characterized by a series of terraces or benches that are separated by valleys. The terraces are composed of sandstone, shale, and limestone, and are generally about 50 feet thick.

The Verdigris River is a river that flows through the central part of the quadrangle. It is characterized by a series of terraces or benches that are separated by valleys. The terraces are composed of sandstone, shale, and limestone, and are generally about 50 feet thick.

The Neosho River is a river that flows through the southern part of the quadrangle. It is characterized by a series of terraces or benches that are separated by valleys. The terraces are composed of sandstone, shale, and limestone, and are generally about 50 feet thick.

The Illinois River is a river that flows through the northern part of the quadrangle. It is characterized by a series of terraces or benches that are separated by valleys. The terraces are composed of sandstone, shale, and limestone, and are generally about 50 feet thick.

The topography of the Arkansas River in the Muscogee quadrangle is illustrated in the southwestern part of the Muscogee quadrangle. The river is characterized by a series of terraces or benches that are separated by valleys. The terraces are composed of sandstone, shale, and limestone, and are generally about 50 feet thick.

The Verdigris River is a river that flows through the central part of the quadrangle. It is characterized by a series of terraces or benches that are separated by valleys. The terraces are composed of sandstone, shale, and limestone, and are generally about 50 feet thick.

The Neosho River is a river that flows through the southern part of the quadrangle. It is characterized by a series of terraces or benches that are separated by valleys. The terraces are composed of sandstone, shale, and limestone, and are generally about 50 feet thick.

The Illinois River is a river that flows through the northern part of the quadrangle. It is characterized by a series of terraces or benches that are separated by valleys. The terraces are composed of sandstone, shale, and limestone, and are generally about 50 feet thick.
The Morrow formation is described as being the formation which contains the Pinckney limestone, as this formation consists of limestones and shales, with local beds of thin sandstones. The limestone generally predominates in thickness. The sandstones which are most abundant in the upper part of this formation, but is found in place both at the base and near the middle of the main body of the formation. The limestone becomes thinner as its decreases toward the east, and in the same direction toward the north, the very thin, sandy beds of the succeeding Winfield formation are proliqued. The shales found locally at the base of the Mesozoic formation are more sandy as it gets thicker, until, in parts of the Tahlequah and in the Fayetteville quadrangle, it assumes the importance of a separate formation or member. In the Tahlequah and Fayetteville formations it is described as the Hale sandstone member of the Morrow formation. In parts of the Fayetteville quadrangle and adjoining quadrangles the formation consists almost entirely of shale and sandstones. Still farther east, in the vicinity of Yellville, the limestone is, it appears, entirely absent. As will be shown in discussing the relations of the Morrow formation to continuous formations, these local variations in the thickness of the formations are much greater than the thickness of the limestone in the section that is at its base.

3.

The main limestone, with its included shale, consisting of the lower and larger part of the formation, will be described as the Morrow formation. The succeeding shales, with their thin limestone and local sandstone will be described as the Hale sandstone.

Limestone of the Morrow formation.—The main formation is a very thin, gray, calcareous laminae, with a decided band of sandstone. This formation is 10 feet thick, but upon the middle part of the deposit there is a thin, argillaceous, dark-blue, fissile shale, which is usually very thin, sandy beds of the succeeding Winfield formation are proliqued. The shales found locally at the base of the Mesozoic formation are more sandy as it gets thicker, until, in parts of the Tahlequah and in the Fayetteville quadrangle, it assumes the importance of a separate formation or member. In the Tahlequah and Fayetteville formations it is described as the Hale sandstone member of the Morrow formation. In parts of the Fayetteville quadrangle and adjoining quadrangles the formation consists almost entirely of shale and sandstones. Still farther east, in the vicinity of Yellville, the limestone is, it appears, entirely absent. As will be shown in discussing the relations of the Morrow formation to continuous formations, these local variations in the thickness of the formations are much greater than the thickness of the limestone in the section that is at its base.

...
intersects having been removed, it is presumed, prior to the deposition of the Window sediments. Near the northeast corner of the quadrangle the thickness of the limestone increases very rapidly to nearly 200 feet. The same conditions occur near the boundary of the quadrangle, further south, in Tps. 16 and 17 N., R. 20 W.

Shale of the Morrow formation.—This deposit is essentially a sandstone, usually grey or yellow, with thin beds of limestone and sandstone locally developed and more nearly with thin coal in the lower part. The coarse sandstone and the shales interbedded with them are usually light grey and white and sometimes colour yellow. These shales resemble the limestone and associated shale layers in the formation. The shale in the lower part of this upper member occurs in other coarse sandstone associated with the coal is black, being impregnated with bituminous matter.

The upper thin limestone and sandy beds of the Morrow contains for the most part of blackish-brown and brown beds. All the forms observed occur also in the main limestone below. Essentially a single fauna pervades the whole formation.

The shale in the upper part of the Morrow formation is usually concealed by sandstone dikes and overlaid of soil overlying the Winslow formation. It crops out near the hilltops or in the valleys of the rivers near the sources of drainage. The rocks in consequence of these relations estimates of its thickness can be but roughly approximated. In places the main thickness in the formation rests on the limestone belonging below the shale; at others a belt of clayshale or, from black shaly sandstones are developed and more nearly with thin coal in the upper part. The fine sandstone and the shales interbedded with them are usually light grey and white and sometimes colour yellow. These shales resemble the limestone and associated shale layers in the formation. The shale in the upper part of this upper member occurs in other coarse sandstone associated with the coal is black, being impregnated with bituminous matter.

Essentially a single fauna pervades the whole formation.

The deposits represented by the group of rocks which were separated to the formation in the Muscogee quadrangle doubtless are to be correlated with the Kesler limestone of the same report.

The fauna from the upper thin limestone and sandy beds of the Morrow consists of the species of a single fauna. The significant relations of the formation in the Muscogee quadrangle that extends from the valley of Fourteenmile Creek. Gravel of the same age is exposed near the mouth of Boggy Creek, in the Choctaw Nation, and has been described in the Tahlequah folio.

The terrace deposits at the border of the Neosho sandy beds are at the base of the Morrow formation, locally occurring in the southwestern part of the quadrangle, and the Atoka and Hartshorne formations, which overlie the Winslow formation, are at the base of the Morrow formation. At the top of the upper group of sandstone deposits, the shale becomes more limy and, near the bases of the main beds, it becomes more calcareous and it contains beds of black shale.
Sand deposits of the same character have been extensive deposits of similar nature widely distributed throughout the Ozark highlands. Terrace gravels and sands of the same kind have been mapped along Arkansas Valley in the adjoining Stanhills and Sallisaw quadrangles, and similar deposits have been reported by the Arkansas Geological Survey in Tishomingo and the Arkansas River Valley. These terrace deposits of the same kind occur in elevated channels along Canadian, Washita, and Red rivers. The sand in the Canadian and Washita valleys is described in the Council Grove and Topeka Ranges. Terrace gravels and sands in the Red River Valley continue southwestward, joining extensive deposits of similar nature distributed over the entire Tertiary rocks of eastern Texas and Louisiana. These gravel and sand deposits extend northwest along the edge of the Quaternary sediments bordering the Gulf Coast. Since these terrace sands in the Muscogee quadrangle are related to the large channels and location to the sand transported by the river at the present time, it can be seen that the Mississippi River was responsible for the deposition of Arkansas Valley. The larger streams have worn down channels to a depth of 50 to 100 feet and the small streams have cut a narrow, steep, flat-bottomed channel.

Sediments of the same character have been mapped along Arkansas Valley in the adjoining Stanhills and Sallisaw quadrangles, and similar deposits have been reported by the Arkansas Geological Survey in Tishomingo and the Arkansas River Valley. These terrace deposits of the same kind occur in elevated channels along Canadian, Washita, and Red rivers. The sand in the Canadian and Washita valleys is described in the Council Grove and Topeka Ranges. Terrace gravels and sands in the Red River Valley continue southwestward, joining extensive deposits of similar nature distributed over the entire Tertiary rocks of eastern Texas and Louisiana. These gravel and sand deposits extend northwest along the edge of the Quaternary sediments bordering the Gulf Coast. Since these terrace sands in the Muscogee quadrangle are related to the large channels and location to the sand transported by the river at the present time, it can be seen that the Mississippi River was responsible for the deposition of Arkansas Valley. The larger streams have worn down channels to a depth of 50 to 100 feet and the small streams have cut a narrow, steep, flat-bottomed channel.

The rivers of the Muscogee quadrangle, and especially the Arkansas River, have developed in part at the rate of nearly 2 feet per year in the time relatively broad flood plains and second bottom gravel, yellow sand, silts, and clays have been deposited more abundantly in the broader flood plains and in other localities protected from strong currents. The larger part of the Arkansas River deposits were derived from the red sands of the Pennsian and the more friable Ocmulgee, Tertiary, and later surficial sediments of Kansas and Colorado, so that they necessarily differ from the alluvium in the flood plains of the Mississippi and the Ohio.

The rivers of the Muscogee quadrangle, and especially the Arkansas River, have developed in part at the rate of nearly 2 feet per year in the time relatively broad flood plains and second bottom gravel, yellow sand, silts, and clays have been deposited more abundantly in the broader flood plains and in other localities protected from strong currents. The larger part of the Arkansas River deposits were derived from the red sands of the Pennsian and the more friable Ocmulgee, Tertiary, and later surficial sediments of Kansas and Colorado, so that they necessarily differ from the alluvium in the flood plains of the Mississippi and the Ohio.

The Mississippi River drains the Carboniferous rocks of southeastern Missouri and northern Illinois. Its alluvium, especially that of the finer sand, gravel, and chocolate clays have been deposited more abundantly in the Mississippi than those of Arkansas and Verdigris rivers, as they are characterized by yellow sand, silts, and chocolate and limy clays. The larger streams have worn down channels to a depth of 50 to 100 feet and the small streams have cut a narrow, steep, flat-bottomed channel.

The rivers of the Muscogee quadrangle, and especially the Arkansas River, have developed in part at the rate of nearly 2 feet per year in the time relatively broad flood plains and second bottom gravel, yellow sand, silts, and clays have been deposited more abundantly in the broader flood plains and in other localities protected from strong currents. The larger part of the Arkansas River deposits were derived from the red sands of the Pennsian and the more friable Ocmulgee, Tertiary, and later surficial sediments of Kansas and Colorado, so that they necessarily differ from the alluvium in the flood plains of the Mississippi and the Ohio.

The rivers of the Muscogee quadrangle, and especially the Arkansas River, have developed in part at the rate of nearly 2 feet per year in the time relatively broad flood plains and second bottom gravel, yellow sand, silts, and clays have been deposited more abundantly in the broader flood plains and in other localities protected from strong currents. The larger part of the Arkansas River deposits were derived from the red sands of the Pennsian and the more friable Ocmulgee, Tertiary, and later surficial sediments of Kansas and Colorado, so that they necessarily differ from the alluvium in the flood plains of the Mississippi and the Ohio.

The rivers of the Muscogee quadrangle, and especially the Arkansas River, have developed in part at the rate of nearly 2 feet per year in the time relatively broad flood plains and second bottom gravel, yellow sand, silts, and clays have been deposited more abundantly in the broader flood plains and in other localities protected from strong currents. The larger part of the Arkansas River deposits were derived from the red sands of the Pennsian and the more friable Ocmulgee, Tertiary, and later surficial sediments of Kansas and Colorado, so that they necessarily differ from the alluvium in the flood plains of the Mississippi and the Ohio.

The rivers of the Muscogee quadrangle, and especially the Arkansas River, have developed in part at the rate of nearly 2 feet per year in the time relatively broad flood plains and second bottom gravel, yellow sand, silts, and clays have been deposited more abundantly in the broader flood plains and in other localities protected from strong currents. The larger part of the Arkansas River deposits were derived from the red sands of the Pennsian and the more friable Ocmulgee, Tertiary, and later surficial sediments of Kansas and Colorado, so that they necessarily differ from the alluvium in the flood plains of the Mississippi and the Ohio.

The rivers of the Muscogee quadrangle, and especially the Arkansas River, have developed in part at the rate of nearly 2 feet per year in the time relatively broad flood plains and second bottom gravel, yellow sand, silts, and clays have been deposited more abundantly in the broader flood plains and in other localities protected from strong currents. The larger part of the Arkansas River deposits were derived from the red sands of the Pennsian and the more friable Ocmulgee, Tertiary, and later surficial sediments of Kansas and Colorado, so that they necessarily differ from the alluvium in the flood plains of the Mississippi and the Ohio.

The rivers of the Muscogee quadrangle, and especially the Arkansas River, have developed in part at the rate of nearly 2 feet per year in the time relatively broad flood plains and second bottom gravel, yellow sand, silts, and clays have been deposited more abundantly in the broader flood plains and in other localities protected from strong currents. The larger part of the Arkansas River deposits were derived from the red sands of the Pennsian and the more friable Ocmulgee, Tertiary, and later surficial sediments of Kansas and Colorado, so that they necessarily differ from the alluvium in the flood plains of the Mississippi and the Ohio.

The rivers of the Muscogee quadrangle, and especially the Arkansas River, have developed in part at the rate of nearly 2 feet per year in the time relatively broad flood plains and second bottom gravel, yellow sand, silts, and clays have been deposited more abundantly in the broader flood plains and in other localities protected from strong currents. The larger part of the Arkansas River deposits were derived from the red sands of the Pennsian and the more friable Ocmulgee, Tertiary, and later surficial sediments of Kansas and Colorado, so that they necessarily differ from the alluvium in the flood plains of the Mississippi and the Ohio.

The rivers of the Muscogee quadrangle, and especially the Arkansas River, have developed in part at the rate of nearly 2 feet per year in the time relatively broad flood plains and second bottom gravel, yellow sand, silts, and clays have been deposited more abundantly in the broader flood plains and in other localities protected from strong currents. The larger part of the Arkansas River deposits were derived from the red sands of the Pennsian and the more friable Ocmulgee, Tertiary, and later surficial sediments of Kansas and Colorado, so that they necessarily differ from the alluvium in the flood plains of the Mississippi and the Ohio.

The rivers of the Muscogee quadrangle, and especially the Arkansas River, have developed in part at the rate of nearly 2 feet per year in the time relatively broad flood plains and second bottom gravel, yellow sand, silts, and clays have been deposited more abundantly in the broader flood plains and in other localities protected from strong currents. The larger part of the Arkansas River deposits were derived from the red sands of the Pennsian and the more friable Ocmulgee, Tertiary, and later surficial sediments of Kansas and Colorado, so that they necessarily differ from the alluvium in the flood plains of the Mississippi and the Ohio.

The rivers of the Muscogee quadrangle, and especially the Arkansas River, have developed in part at the rate of nearly 2 feet per year in the time relatively broad flood plains and second bottom gravel, yellow sand, silts, and clays have been deposited more abundantly in the broader flood plains and in other localities protected from strong currents. The larger part of the Arkansas River deposits were derived from the red sands of the Pennsian and the more friable Ocmulgee, Tertiary, and later surficial sediments of Kansas and Colorado, so that they necessarily differ from the alluvium in the flood plains of the Mississippi and the Ohio.

The rivers of the Muscogee quadrangle, and especially the Arkansas River, have developed in part at the rate of nearly 2 feet per year in the time relatively broad flood plains and second bottom gravel, yellow sand, silts, and clays have been deposited more abundantly in the broader flood plains and in other localities protected from strong currents. The larger part of the Arkansas River deposits were derived from the red sands of the Pennsian and the more friable Ocmulgee, Tertiary, and later surficial sediments of Kansas and Colorado, so that they necessarily differ from the alluvium in the flood plains of the Mississippi and the Ohio.

The rivers of the Muscogee quadrangle, and especially the Arkansas River, have developed in part at the rate of nearly 2 feet per year in the time relatively broad flood plains and second bottom gravel, yellow sand, silts, and clays have been deposited more abundantly in the broader flood plains and in other localities protected from strong currents. The larger part of the Arkansas River deposits were derived from the red sands of the Pennsian and the more friable Ocmulgee, Tertiary, and later surficial sediments of Kansas and Colorado, so that they necessarily differ from the alluvium in the flood plains of the Mississippi and the Ohio.

The rivers of the Muscogee quadrangle, and especially the Arkansas River, have developed in part at the rate of nearly 2 feet per year in the time relatively broad flood plains and second bottom gravel, yellow sand, silts, and clays have been deposited more abundantly in the broader flood plains and in other localities protected from strong currents. The larger part of the Arkansas River deposits were derived from the red sands of the Pennsian and the more friable Ocmulgee, Tertiary, and later surficial sediments of Kansas and Colorado, so that they necessarily differ from the alluvium in the flood plains of the Mississippi and the Ohio.
the Muscogee quadrangle affect only the Mississippian part of the Ozark uplift. The record of this Neosho rivers are not expressed in the mapping monoclinal structure of the Prairie Plains region, have extended over nearly the whole of the mar­ they were deposited and the nature of the contigu­
acter and structure of the rocks, show oscillations reached, however, little effect of folding can be
forms of animal and vegetable life changed or
of the rock occur, but as a whole the inclination of
mergence is found in the Chattanooga black
submergence is found in the Mississippi black
sandstone beds near the
across the surface, reaching the limit of the dip of the rock occur, as but a whole the inclination of the strata is toward the west at approximately 100 feet per mile.

HISTORICAL GEOLOGY.
The rocks of the Muscogee quadrangle were deposited in water as sediments from the waste of neighboring lands and from the remains of ani­mals and plants which lived or in or near the borders of the Ozark region, on a low and nearly level surface. These rocks are limestones, shales, and sandstones, and when they were deposited con­sisted of tiny clay, mud, and sand, respectively.

The characteristic of these rocks when traced and studied westward shows, though not in the complete story, many of the formation of the subsurface. As successive formations were deposited the forms of the sedimentation changed, and they were altered and migrated by processes of erosion. At certain stages in the sedimentation the life surface of the earth was raised or lowered, and thus the old land surface and the nature of the contigu­ous lands. The fossil remains not only show the relative ages of the successive strata, but aid in identifying and correlating formations which occur in the surface in separated localities.

Stratigraphically below the lowest rocks at the surface in the Muscogee quadrangle lie dolomites, limestones, sandstones, shales, etc., of Ordov­ician, Silurian, and Devonian age. These formations, with rocks of Cretaceous age, appear around the older igneous rocks of the axial part of the Ozark region. These beds are especially rich in fossil remains such as stromatolites, brachiopods, corals, and fau­naceous and floras. The beds of limestones and sandstones, with thinner strata of limestone, make the

The oldest part of the region, underlying the Muscogee quadrangle, consists of Mississippian sediments. The existence of a broad land surface at this time is shown by the extent of the elevation in the eastern part of the region where the

The Muscogee quadrangle is characterized by the presence of large areas of sandstone, with thinner strata of limestone, known as the Mississippian series. These beds are especially rich in fossil remains such as stromatolites, brachiopods, corals, and fau­naceous and floras. The beds of limestones and sandstones, with thinner strata of limestone, make the

The earliest type of deposition in the region of the Ozark uplift was a sand and shale deposits, with cyclic changes in the water level. These cycles are called cyclothems, and they are characterized by a series of thin beds of sandstone, shale, and limestone, which are deposited in response to changes in sea level. The cycles show a repeating pattern of sequences of beds, which reflect changes in the environment of deposition.

The Mississippian series in the Ozark region is characterized by a general evenness of the old land surface and the rapid­ly increasing thickness of the formations, particularly near lines of faulting, as shown by the map of the con­

The Mississippian series is characterized by a general evenness of the old land surface and the rapid­ly increasing thickness of the formations, particularly near lines of faulting, as shown by the map of the con­

The Mississippian series is characterized by a general evenness of the old land surface and the rapid­ly increasing thickness of the formations, particularly near lines of faulting, as shown by the map of the con­
and, where a profitable flow of oil was obtained. Another well, at the north end of the area, yielded an estimated flow of more than 1,000,000 barrels of oil per day. However, the exploration was abandoned.

**BUILDING STONE.**

The various classes of rocks enumerated in the discussion of building stones are not utilized for that purpose. The sandstone beds of the Winslow formation at various localities in the eastern drainage of the Rattlesnake Mountains and in the Pitkin and Morrow formations are the principal sources of building stone. The sandstone beds occur near the base of the Permian in the southeast corner of the county, and it is probable that they could be utilized for the construction of buildings and other structures. The sandstone is a coarse-grained, light-colored rock, and it is well suited for the construction of buildings.

**DRAINAGE.**

The various classes of rocks enumerated in the discussion of building stones are not utilized for that purpose. The sandstone beds of the Winslow formation at various localities in the eastern drainage of the Rattlesnake Mountains and in the Pitkin and Morrow formations are the principal sources of building stone. The sandstone beds occur near the base of the Permian in the southeast corner of the county, and it is probable that they could be utilized for the construction of buildings and other structures. The sandstone is a coarse-grained, light-colored rock, and it is well suited for the construction of buildings.