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POST-BOONE OUTLIERS OF NORTHEASTERN OKLAHOMA

BY

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POST-BOONE OUTLIERS OF NORTHEASTERN OKLAHOMA

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R. C. SLOCUM

ABSTRACT

The area lies on the southwestern flank of the Ozark Dome, occupying portions of Mayes, Delaware, and Adair Counties, Oklahoma. The immediate purposes of the investigation were to map outliers of post-Boone age; to measure in detail the exposed sections; to collect and identify characteristic faunules; and to prepare regional cross-sections.

Rock units of the area range in age from Mississippian (Meramecian) to Pennsylvanian (Morrowan). The oldest of the post-Boone units is the Moorefield formation. The Hale formation, which forms the cap-rock of the hills and underlies the upland areas in Adair County, is the youngest unit exposed.

The Moorefield formation is unconformably overlain by the Hindsville formation. In the eastern part of the area the Moorefield formation is "cut out" by disconformity and is overlapped by the Hindsville. The Hindsville, which is present at all localities, is conformably overlain by the Fayetteville formation. Basal units of the Hale formation rest unconformably upon the Fayetteville formation.

The Hindsville carries a Chesterian fauna which resembles that of the type Hindsville formation of Arkansas, while the faunal content of the Moorefield formation is similar to that of the Moorefield formation of Arkansas.

ACKNOWLEDGMENTS

The writer wishes to acknowledge his indebtedness to Dr. George G. Huffman, who suggested the problem and gave constructive criticism and assistance throughout the entire period of the work, and to the Amerada Petroleum Corporation for an academic grant to defray daily field expenses. The Oklahoma Geological Survey furnished aerial photographs.

INTRODUCTION

Location: The area lies on the southwestern flank of the Ozark Dome, occupying portions of Mayes, Delaware, and Adair Counties. It includes T. 19 N., through T. 22 N., R. 21 E., of eastern Mayes County; all of Delaware County south of T. 22 N.; and all of Adair County north of T. 17 N. (See map, p. 43)

Purposes of Present Investigation: The purposes of this investigation were: (1) to map the outcropping formations of post-Boone age; (2) to measure in detail the exposed sections; (3) to collect and identify fossils from the various formations; (4) to prepare regional cross-sections; and (5) to investigate the "Mayes formation" in an effort to provide useful data in addition to that derived from extensive investigations in adjacent areas by graduate students from the University of Oklahoma.

Methods of Investigation: Airplane photographs, furnished by the Oklahoma Geological Survey, were used in mapping the formational contacts and in the preparation of the base map. The Locke Hand Level and a 6-foot steel tape were used for determining formational thicknesses. The field work was completed during the Spring of 1953.

History of Previous Investigations

Differentiation of the Mississippian and Pennsylvanian was made by N. F. Drake (1898). This was the first attempt to outline the stratigraphy or structure of this region.

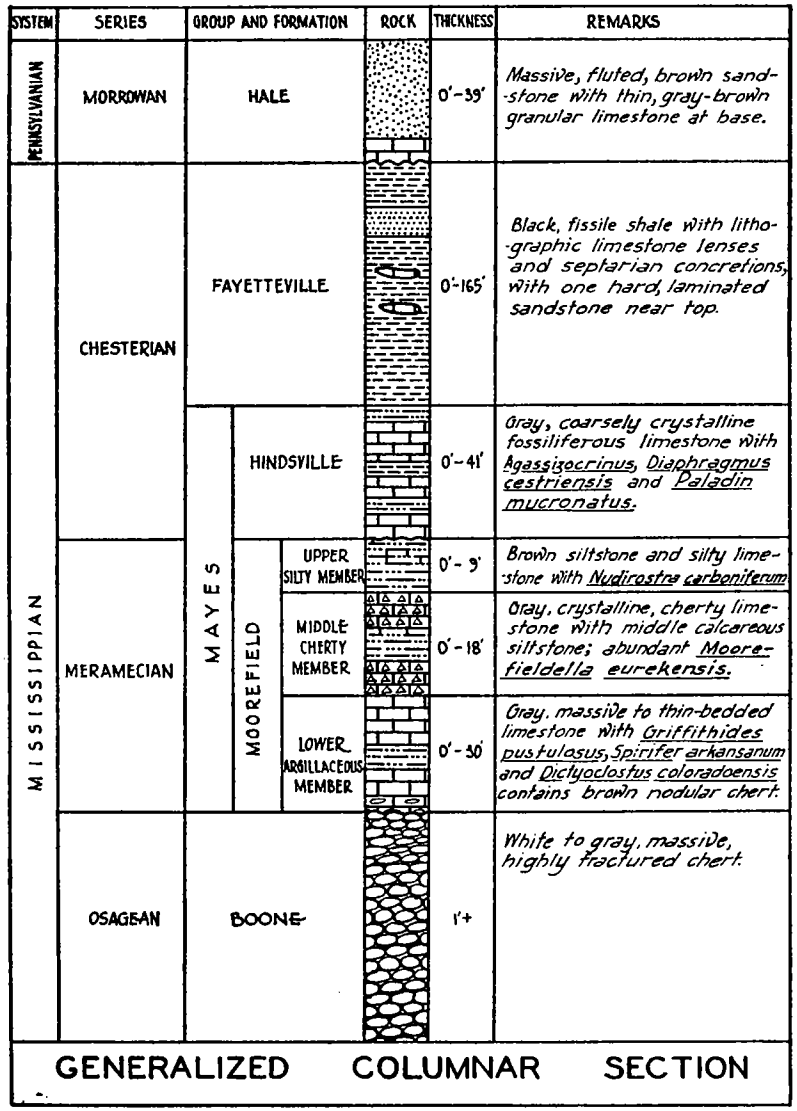
J. A. Taff (1905) (1906) mapped the geology of the Tahlequah and Muscogee quadrangles. He divided the Mississippian into two units, the Boone and the Fayetteville, and the Morrow was described as a separate unit of Pennsylvanian age.

L. C. Snider (1915) published a report on the geology of northeastern Oklahoma. He proposed the term "Mayes" for the beds between the Fayetteville shale and the Boone formation and discussed the paleontology of the Chester "Group".

Cram (1930) and Ireland (1930) completed a special study of the stratigraphy of northeastern Oklahoma with emphasis on oil and gas possibilities.

Brant (1941) divided the Mayes of Snider into four units of formational rank which he assigned to the Meramecian series.

The Morrow series of northeastern Oklahoma was described by Carl A. Moore (1947).



STRATIGRAPHY

General Statement

Rocks studied during the present investigation range from Mississippian (Meramecian) to Pennsylvanian (Morrowan) in age. The oldest of the post-Boone units is the Moorefield formation. The Hale formation forms the cap-rock of the hills and upland areas in Adair County and is the youngest unit exposed. Terrace gravels and alluvium of Pleistocene and Recent age overlie the older formations in several localities. The sequence of beds in this area is shown on page 8.

Mississippian System

Mayes "Group"

Snider (1915) proposed the term Mayes for the rocks between the Boone chert and the Fayetteville formation. The type locality is in northeastern Mayes County. Brant (1941) divided the beds formerly assigned to the Mayes into four lithic units which he called the Moorefield, Hindsville, Batesville, and Grand River. The three lower units were believed equivalent to established units in Arkansas. According to Huffman (oral communication, June 1953) the facies of these units closely resemble those of the type Moorefield of Arkansas and the upper shale unit of the "Batesville" resembles the Ruddell shale.

For the purpose of this report the writer has referred the Mayes of this area to two formations. The lower is the Moorefield formation, which is composed of: (1) the lower argillaceous limestone member ("Moorefield" of Brant); (2) the middle gray cherty limestone member ("Hindsville" of Brant); and (3) the upper siltstone member ("Batesville" of Brant). The upper unit of the Mayes is believed equivalent to the Hindsville formation of Arkansas. The Moorefield is Meramec in age and the Hindsville is of Chester age.

Moorefield Formation

The term Moorefield was proposed by Purdue, Ulrich, and Adams (1904) for the beds between the Boone chert and the Bates-

ville sandstone at Moorefield, Arkansas. Gordon (1944) restricted the term Moorefield to the lower limestone sequence and applied the name Ruddell to the overlying brown shales.

Lower Argillaceous Limestone Member

Distribution: The lower limestone member of the Mayes is exposed along streams in the Rose, Oaks, Colcord, and Baron areas.

Character and Thickness: The thickness is extremely variable, ranging from 0 to 30 feet, with the greatest thickness on the east flank of the Baron graben (measured section 1). The lower phase of the Moorefield consists of gray to black argillaceous limestones and gray, thin-bedded, silty limestones. A strong bituminous odor is characteristic of these limestones when struck with a hammer. At Oaks and Baron these limestones contain large amounts of nodular chert which appear on the weathered surface as lightweight "cotton rock" where the soluble material has been leached out.

Paleontology: Typical forms from the lower member of the Moorefield include *Griffithides pustulosus, Spirifer arkansanus, "Dictyoclostus" coloradoensis,* and *Linoproductus ovatus.* The complete faunal list is given in Table 1.

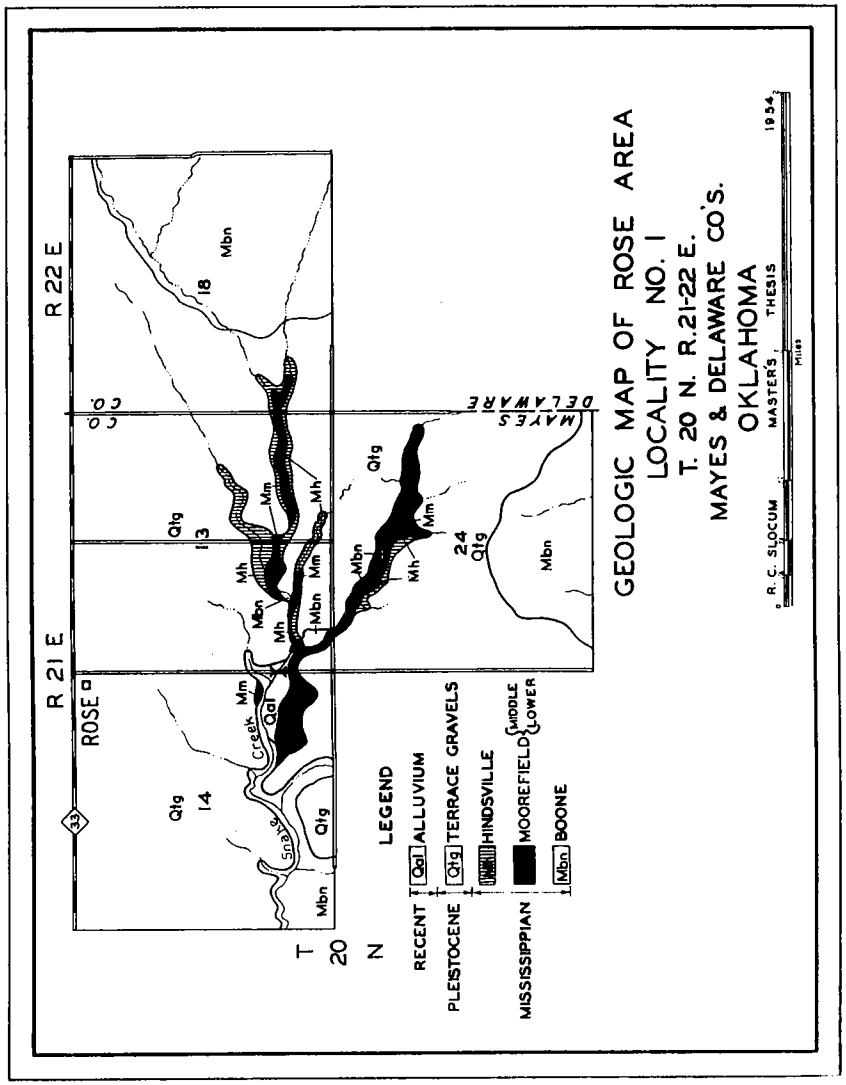


TABLE I

FAUNULES FROM THE MOOREFIELD FORMATION

Genus and Species	Localities 1	2	3	4	5	6
Upper Siltstone Member						
Camarotoechia purduei Girty	x	.	.	.	.	.
Echinoconchus alternatus (Norwood & Pratten)	x	.	.	.	.	.
Marginifera adairensis Drake	x	.	.	.	.	.
Nudirostra carboniferum (Girty)	x	.	.	.	.	.
Allorisma walkeri Weller	x	.	.	.	.	.
Aviculopecten sp.	x	.	.	.	.	.
Middle Gray Cherty Limestone Member						
Buxtonia arkansana (Girty)	x	.	.	.	.	x
Diaphragmus cestriensis (Worthen)	x	.	.	.	.	.
"Dictyoclostus" coloradoensis (Girty)	.	x	.	x	x	x
Dielasma arkansanum Weller	.	x	.	.	.	x
Linoproductus ovatus (Hall)	x	x	.	.	.	.
Moorefieldella eurekensis Girty	.	.	x	x	.	x
Nudirostra carboniferum (Girty)	.	.	.	.	.	x
Orthotetes subglobosus Girty	.	x	.	.	.	.
Spirifer arkansanus Girty	.	.	.	x	x	.
Spirifer increbescens Hall	x	x	.	.	.	.
Mourlonia sp.	.	.	.	.	.	x
Lower Argillaceous Limestone Member						
"Dictyoclostus" coloradoensis (Girty)	.	.	.	.	x	.
Linoproductus ovatus (Hall)	x	.	.	.	.	.
Spirifer arkansanus Girty	.	.	.	.	x	.
Aviculopecten sp.	.	.	.	.	x	.
Griffithides pustulosus Snider	.	.	.	.	x	.

1. Along Barren Fork Creek, sec. 26, T. 17 N., R. 25 E.
2. Along Spring Creek, sec. 27, T. 20 N., R. 23 E.
3. North of Snake Creek, sec. 13, T. 20 N., R. 21 E.
4. Mayes-Delaware County line, sec. 18, T. 20 N., R. 22 E.
5. Oaks, Oklahoma, sec. 33, T. 20 N., R. 23 E.
6. Kansas, Oklahoma, sec. 13, T. 20 N., R. 23 E.

Middle Gray Cherty Limestone Member

Distribution: The cherty limestone unit is the most widespread member of the Moorefield formation. It is exposed at Rose, Leach, Oaks, Kansas and Baron.

Character and Thickness: The middle member of the Moorefield varies from 0 to 18 feet in thickness. A complete section shows two gray, crystalline beds containing angular fragments of varicolored chert. These chert fragment-bearing beds are separated by a platy, gray siltstone (measured section 2).

Paleontology: The middle siltstone is fossiliferous, with abundant *Moorefieldella eurekensis.* The cherty limestone units contain *Nudirostra carboniferum, Spirifer increbescens,* and *"Dictyoclostus" coloradoensis.*

Upper Siltstone Member

Distribution: It is questionable whether or not the upp siltstone member of the Moorefield is present except in the Bar area. It may occur in the Rose area in a covered interval betwe the cherty limestone member and the base of the Hindsville form tion. The only definite exposure is along the north bank of Barr Fork Creek in sec. 26, T. 17 N., R. 25 E.

Character and Thickness: The section is 9 feet thick a consists of alternating silty limestones and siltstone beds.

Paleontology: The faunule collected and identified from t upper siltstone member is listed in Table 1.

Stratigraphic Relations of the Moorefield Formation: The un of the Moorefield formation are a gradational sequence and a conformable throughout. The Moorefield unconformably overl the Boone chert and is overlain by the Hindsville formation uncc formably.

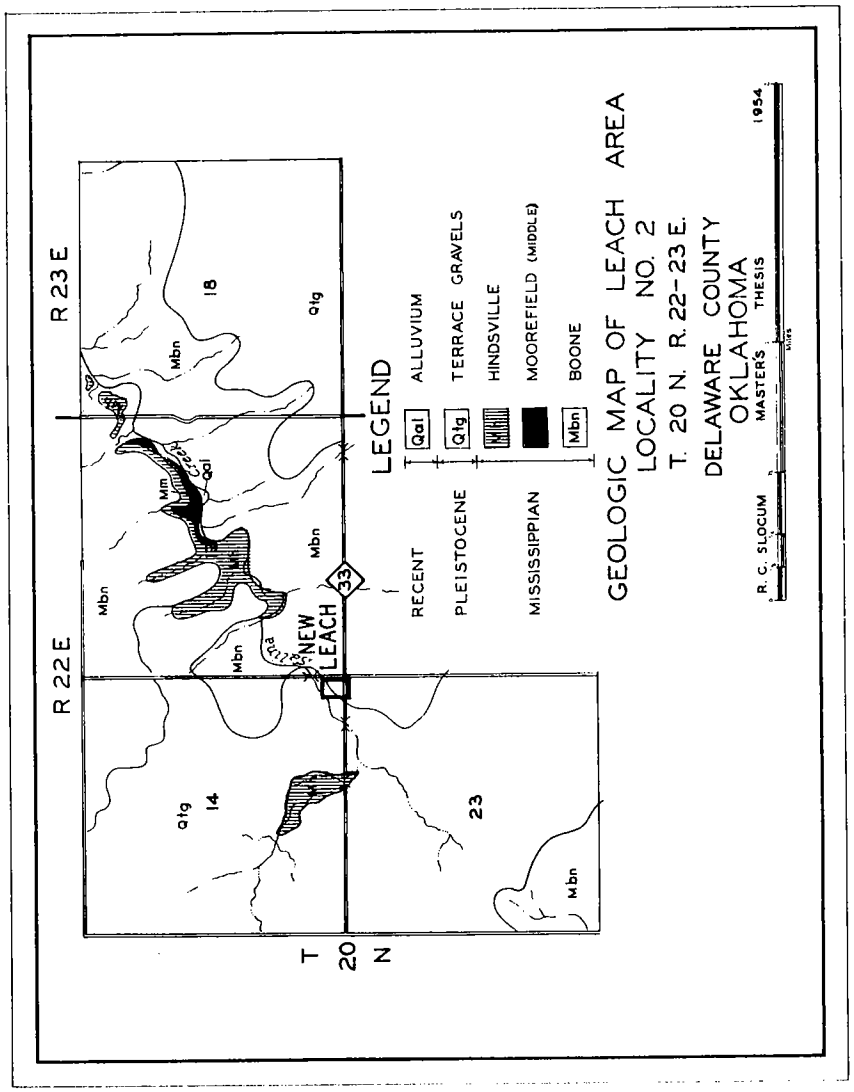
Age and Correlation of the Moorefield Formation: The Moo field is classed as Meramecian in age. It is correlated with the Moo field formation and the Ruddell shale of northwestern Arkans

Hindsville Formation

History of Nomenclature: Brant (1941) applied the ter "Grand River" to limestones between the Fayetteville shale a the "Batesville" siltstone along Grand River in Mayes Coun Oklahoma. Although the term is ideal for the type locality, it preoccupied. The term Hindsville formation is substituted f the purpose of this report.

Distribution: The Hindsville is the most widespread form tion in the area, and is found at every locality.

Character and Thickness: The formation consists of fine coarsely crystalline, fossiliferous, gray limestones with a few sil beds developed locally. A gray-green shaly development in se 18, T. 20 N., R. 22 E., is 0.7 foot thick. The greatest thic ness of the Hindsville is to the north of Cherokee Creek sec. 22, T. 21 N., R. 25 E., where it is 41 feet thick. Where tl Hindsville overlies the Boone chert a basal conglomerate is d veloped.



Paleontology: Certain forms like *Agassizocrinus, Diaphragmus cestriensis, Composita subquadrata,* and *Linoproductus ovatus* occur in abundance (See Table 2).

Stratigraphic Relations: The Hindsville rests unconformably upon the Moorefield formation or upon the Boone chert and lies conformably beneath the Fayetteville formation.

Age and Correlations: The Hindsville is correlated with the Hindsville-Batesville sequence of Arkansas and is classed as Chester in age.

TABLE 2

FAUNULES FROM THE HINDSVILLE FORMATION

	Localities							
Genus and Species	1	2	3	4	5	6	7	8
Pentremites godoni (Defrance)	x	.	.	.	.	.	.	.
Pentremites elongatus Shumard	.	.	.	.	.	.	x	.
Archimedipora distans (Ulrich)	.	.	.	x	.	.	.	.
Archimedipora proutana (Ulrich)	.	.	.	x	.	.	.	.
Fenestella sp.	.	x	.	.	x	.	x	.
Athyris cestriensis Snider	.	.	x	.	.	.	.	.
Buxtonia arkansana (Girty)	.	.	.	.	.	.	.	x
Camarotoechia purduei Girty	.	.	.	.	.	.	x	x
Composita subquadrata (Hall)	x	.	.	.	x	x	x	.
Diaphragmus cestriensis (Worthen)	.	x	.	.	x	x	.	x
"Dictyoclostus" inflatus (McChesney)	x	.	.	.	x	.	.	.
Dielasma arkansanum Weller	.	x	.	.	.	.	x	x
Dielasma formosum var. *whitfieldi* Girty	.	.	.	.	.	.	.	x
Eumetria verneuiliana (Hall)	.	.	.	.	x	.	.	.
Linoproductus ovatus (Hall)	.	.	.	.	x	x	.	x
Marginifera adairensis (Drake)	x	x	.	.	.	.	x	x
Orbiculoidea batesvillensis Weller	.	x	.	.	.	.	.	.
Orthotetes kaskaskiensis Weller	x	.	.	.	.	.	.	.
Spirifer increbescens Hall	x	x	.	.	x	x	x	x
Agassizocrinus sp.	x	x	x	x	.	.	x	x
Bellerophon sp.	.	x	.	.	.	.	.	.
Bembexia sp.	.	x	.	.	.	.	.	.
Platyceras sp.	.	x	.	.	.	.	.	.
Paladin mucronatus (Girty)	.	x	x	.	.	.	.	.

1. Along Snake Creek, sec. 13, T. 20 N., R. 21 E.
2. Kansas, Oklahoma, sec. 13, T. 20 N., R. 23 E.
3. Along Spring Creek, sec. 27, T. 20 N., R. 23 E.
4. Southeast ¼ of sec. 10, T. 21 N., R. 25 E.
5. North of Cherokee Creek, sec. 22, T. 21 N., R. 25 E.
6. Half-mile south of Ward farmhouse, sec. 34, T. 22 N., R. 25 E.
7. North end of Alberry Mountains, sec. 4, T. 17 N., R. 26 E.
8. North end of Alberry Mountains, sec. 8, T. 17 N., R. 26 E.

Fayetteville Formation

History of Nomenclature: The Fayetteville shale was named by Simonds (1891) for exposures near Fayetteville, Arkansas. The Wedington sandstone member is present in the upper portions in western Arkansas and eastern Oklahoma.

Distribution: The Fayetteville formation is found only in the eastern portion of the area, at Center Point, Westville, and Baron.

Character and Thickness: The Fayetteville consists predominantly of black shale but in the upper portion of the formation a fine grained, thinly laminated sandstone is developed. The formation attains its maximum development on Alberry Mountain, sec. 5, T. 17 N., R. 26 E., where a thickness of 165 feet was measured. North of Westville, Oklahoma, the black shale contains scattered septarian concretions and gray, lithographic limestone lenses.

Paleontology: No fossils were collected from the shaly part of the Fayetteville or from the Wedington sandstone member.

Stratigraphic Relations: The Fayetteville overlies the Hindsville formation conformably and appears to be overlain unconformably by the Pennsylvanian Hale formation.

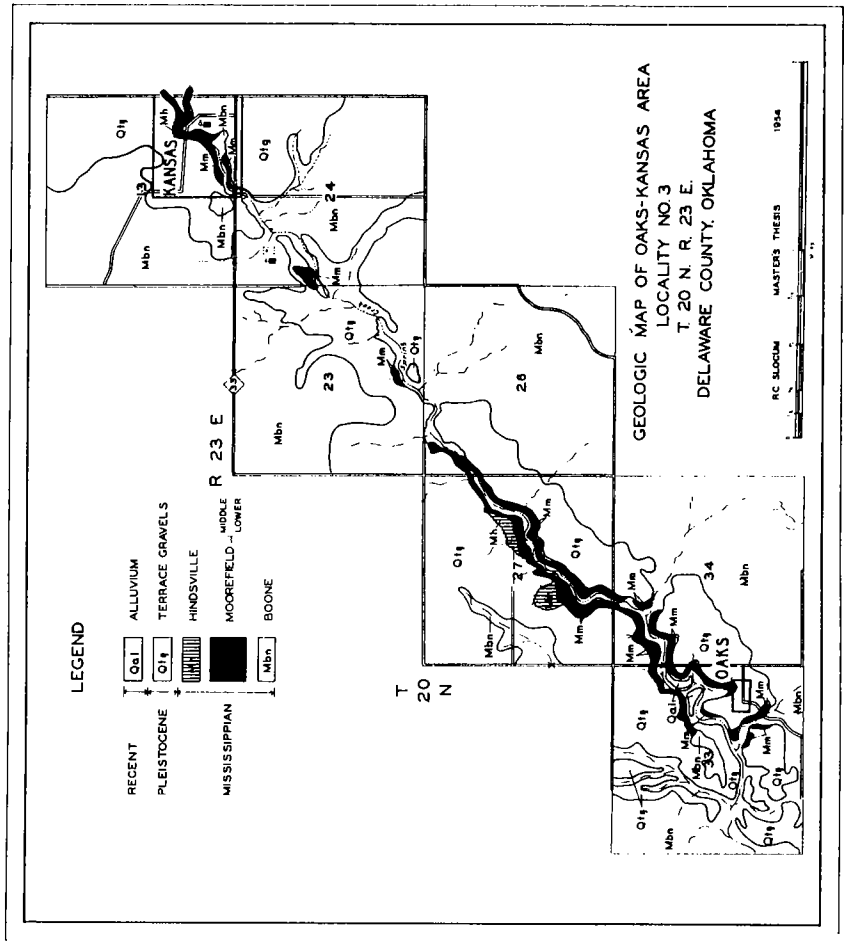
Age and Correlations: The Fayetteville is Chesterian in age and is correlated with the Fayetteville formation of Arkansas and the upper Caney shale of the Arbuckle section.

Pennsylvanian System

Hale Formation

History of Nomenclature: The Morrow series was described by Simonds (1891) and named by Adams and Ulrich (1904) from exposures near Morrow, Washington County, Arkansas. Taff (1905) considered the Morrow of Oklahoma to be a single formation composed of three lithic units. Moore (1947) divided the Morrow of Oklahoma into two formations which are lateral extensions of the Hale and Bloyd of western Arkansas.

Distribution: The Hale formation is present only in the Westville and Baron areas. In forms prominent bluffs on Walkingstick



Mountain, sec. 33, T. 17 N., R. 25 E., and on the outlier in sec. 13, T. 17 N., R. 25 E. The formation is also found within the Baron graben.

Character and Thickness: The thickest section of the Hale was measured on the north end of Walkingstick Mountain, sec. 33, T. 17 N., R. 25 E., where it is 39 feet thick (measured section 5).

The Hale is characteristically a massive, medium-grained, cross-bedded sandstone. Fluted and pitted weathered surfaces are characteristic. The massive and resistant nature of the Hale has made it a prominent cliff former. A brown, granular limestone marks the base of the Hale in sec. 33, T. 17 N., R. 25 E.

Paleontology: No fossils were collected from the Hale exposures.

Stratigraphic Relations: The Hale appears to lie unconformably upon the Fayetteville formation.

Age and Correlation: The Hale marks the base of the Morrow series in northeastern Oklahoma. It has been correlated with the Hale of Arkansas and with the Union Valley of the Ada area (Roth, 1929).

Pleistocene and Recent

Terrace Gravels

Terrace gravels composed of rounded and subrounded pieces of chert occur in the western and southern parts of the area. In the western sector both low and high-level terraces are present. Stovall and McAnulty (1950) assign most of the high-level gravel deposits in Oklahoma to the Pleistocene.

Alluvium

Alluvial material is deposited along Snake, Salina, Cherokee, Barren Fork, and un-named creeks of the area. These deposits consist predominantly of sand and mixed gravels.

DESCRIPTION OF LOCALITIES

Locality 1

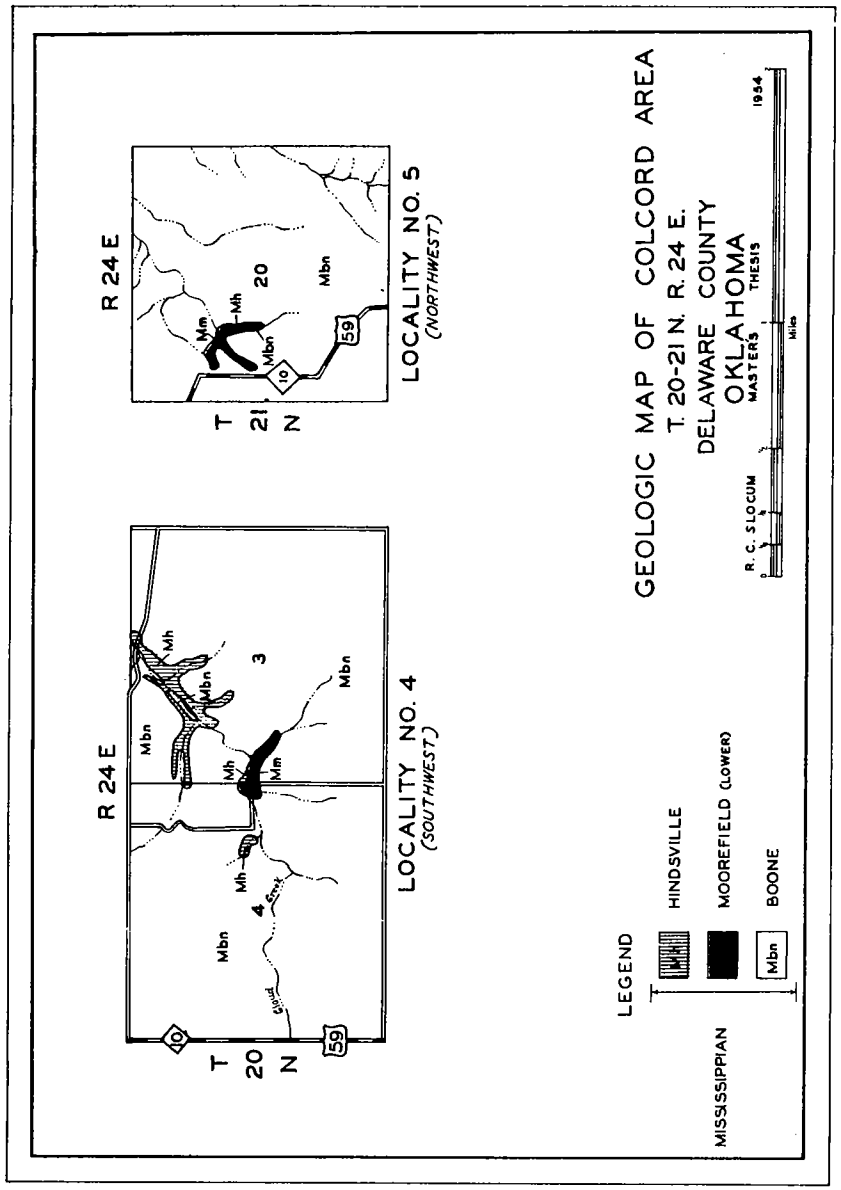
Rose Area

Stratigraphic Sequence: The post-Boone rocks exposed at the surface are assigned to the Mayes "Group" and are Mississippian in age. The oldest of these units is the lower limestone member of the Moorefield formation, which lies unconformably on the eroded surface of the Boone chert. Lying immediately above this gray, thin-bedded to massive, silty to finely crystalline limestone sequence is the middle gray cherty limestone member of the Moorefield. Although gradation is apparent between the two units the middle member is easily recognized. It is characterized by beds of varicolored, angular chert fragments along the lower and upper surfaces which are separated by a platy, calcareous, fossiliferous, brownish-gray siltstone bed. Excellent cross-bedding was observed in the silty phase of the middle Moorefield along the north side of Snake Creek, sec. 13, T. 20 N., R. 21 E.

It is questionable whether the upper siltstone member of the Moorefield formation is present here. It may be represented in the covered interval between the upper surface of the middle member of the Moorefield and the base of the overlying Hindsville. Because of the lack of definite exposures, the covered interval was mapped with the middle member of the Moorefield formation.

The upper surface of the Moorefield is overlain unconformably by the Hindsville formation. The Hindsville consists of gray, crinoidal, fossiliferous, crystalline limestone beds with a gray-green shale zone near the top. A marly limestone bed lies immediately above the *Agassizocrinus* zone in sec. 13, T. 20 N., R. 21 E., which is extremely fossiliferous.

The units of the Mayes, which were possibly preserved by post-Boone folding, were covered at one time by extensive terrace gravel deposits. These terraces have since been eroded away along Snake



Creek and its tributaries, leaving detrital portions of the post-Boone formations exposed at the surface. Both lowland and upland terrace levels were observed in the area.

The Hindsville formation, which is of Chesterian age, is the youngest Paleozoic formation in the area. The underlying Moorefield is Meramecian in age. The terrace gravels and alluvial deposits are of Pleistocene and Recent age.

Measured Sections: Numerous detailed measured sections were taken in the Rose Area (see measured sections 2, 3, 6, 7).

Locality II

Leach Area

Stratigraphic Sequence: The oldest unit exposed in this area is the middle gray cherty limestone member of the Moorefield formation. It is well exposed along the north bank of Salina Creek in sec. 13, T. 20 N., R. 22 E., where its unconformable relationship with the underlying Boone chert is excellently exposed. The unit is composed of light to dark gray, glauconitic, massively bedded, bituminous limestones which have angular chert fragments scattered throughout the sequence.

The Hindsville rests unconformably upon the middle member of the Moorefield. It has greater distribution than the Moorefield, being found in secs. 13, 14 and 23 of T. 20 N., R. 22 E., and sec. 18 of T. 20 N., R. 23 E. It is a gray, oolitic, thin- to massive-bedded, crystalline limestone formation which is excellently exposed along the north side of Salina Creek.

Extensive terrace deposits cover a large portion of the Leach area.

Measured Sections: Sections measured in the Leach area are shown in measured sections 8 and 9.

Locality III

Oaks-Kansas Area

Stratigraphic Sequence: The Moorefield and Hindsville formations are preserved in a shallow syncline trending N. 50° E. from Oaks to Kansas, Oklahoma, where they crop out along

Spring Creek. The oldest of the post-Boone units is the lower argillaceous limestone member of the Moorefield formation. It is predominantly a gray, thin-bedded, silty limestone which lies unconformably upon the Boone chert. Brown chert nodules are found on the weathered surface at numerous places along Spring Creek. Characteristic of the formation is the bituminous odor given off when struck with a hammer.

A bed containing angular chert fragments marks the contact between the lower and middle members of the Moorefield. The middle gray cherty limestone member is as widely distributed as the lower argillaceous limestone member and many excellent outcrop localities are available. The angular to subrounded chert fragments are characteristic of the middle Moorefield throughout the Oaks-Kansas area, but the greatest development is just west of the Kansas school. The two cherty beds are separated by brownish-gray siltstone, which is highly cross-bedded. Overlying the middle Moorefield unconformably is the younger Hindsville formation.

The Hindsville is limited in distribution, cropping out along the northwest side of Spring Creek in sec. 27, T. 20 N., R. 23 E., and to the north of the Kansas school in sec. 13, T. 20 N., R. 23 E. The gray, crinoidal, crystalline limestones of the Hindsville contain the *Agassizocrinus* zone near the base. This zone was extremely helpful in identifying and mapping the Hindsville.

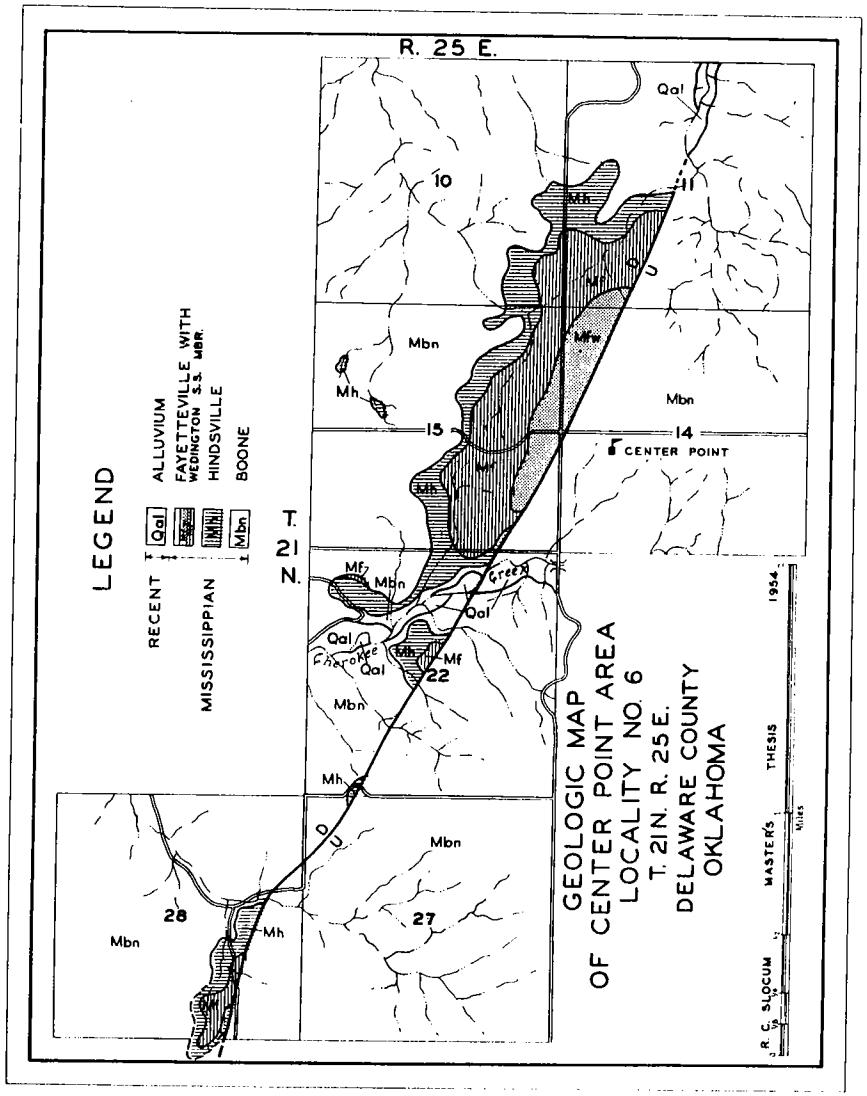
Terrace deposits cover a large portion of the area. Scattered alluvial deposits occur along Spring Creek.

Measured Sections: Detailed lithologic descriptions and formational thicknesses are given in measured sections. 12, 13, 14, and 15.

Locality IV

Southeast Colcord Area

Stratigraphic Sequence: The oldest unit exposed in the area is the lower argillaceous limestone member of the Moorefield formation. It is found to the east of a Boone chert "knob" along Cloud Creek in the southwest corner of sec. 3, T. 20 N., R. 24 E. The gray, finely crystalline, thin-bedded limestones of the lower



Moorefield, which are 2.5 feet thick, are unconformably overlain by the dark gray, crystalline limestones of the Hindsville formation.

The Hindsville has the greater distribution in this locality. It is in a small exposure near the Hughes farmhouse in sec. 4, T. 20 N., R. 24 E., and crops out rather extensively along Cloud Creek in the northern portion of sec. 3, T. 20 N., R. 24 E. (measured section 16). The limestones of the Hindsville are granular in the northern portion of the locality and crumble easily. Benches are formed along Cloud Creek by these fossiliferous, thin-bedded limestones.

Like the units of the Mayes to the southwest, the formations in the Colcord area have been preserved by post-Boone folding.

Locality V

Northwest Colcord Area

Stratigraphic Sequence: Exposures of the Hindsville and lower Moorefield formations occur in sec. 20, T. 21 N., R. 24 E., along the northeastward trending intermittent streams (measured section 17).

The lower limestone member of the Moorefield formation rests unconformably upon the irregular, knobby surface of the eroded Boone chert. It is composed of light gray limestones which are finely crystalline. Compact, thin limestone beds, which weather brownish-gray, floor the stream bed.

Unconformity separates the Moorefield formation from the younger, massive, gray Hindsville limestone. These crystalline limestone beds, which weather dark gray, contain scattered *Agassizocrinus* sp.

Locality VI

Center Point Area

Stratigraphic Sequence: Rocks exposed at the surface in the Center Point area have been preserved in the downthrown block of a normal fault trending approximately N. 25° E. All of the exposed units are of Chesterian age (measured sections 18 and 19).

The oldest formation, which is the upper member of the Mayes

"group", is the Hindsville formation. It is widely exposed to the north of Cherokee Creek along the northern portion of the fault trace. Characteristically, the Hindsville is a gray, crystalline, fossiliferous limestone unit, but in sec. 22, T. 21 N., R. 25 E., the lower limestones are silty and thin bedded. Locally developed brown to yellow-brown, calcareous siltstone beds occur in the Hindsville section.

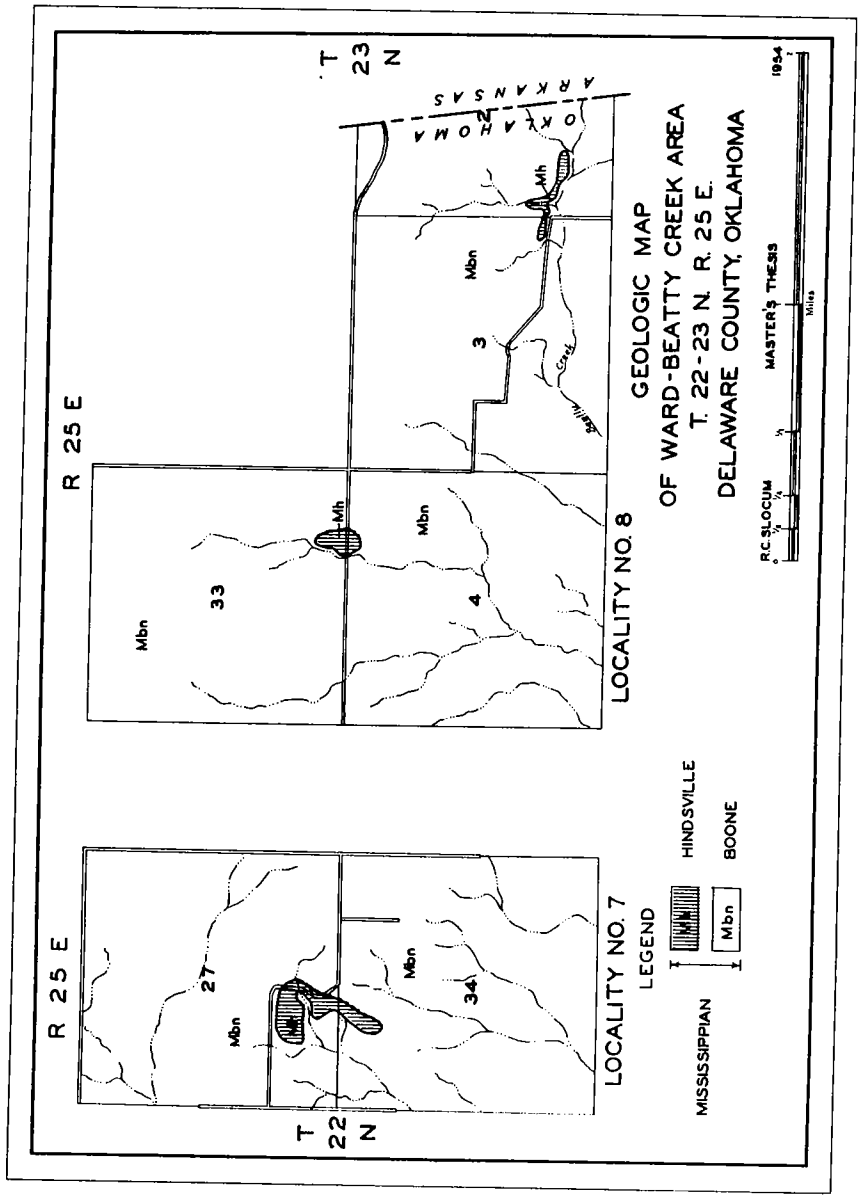
In the southeast corner of sec. 10, T. 21 N., R. 25 E., the upper six feet of the Hindsville is composed of a dense, brown to reddish-brown, fine-grained sandstone. The highly leached bed contains scattered crinoid stems and has a pitted, case-hardened surface. This sandstone, which marks the top of the Hindsville in this locality, is thought to be the equivalent of the true Batesville of Arkansas (Huffman, oral communication June, 1953).

The Hindsville is found along the fault to the southwest in three small exposures. As is the case in the larger Hindsville exposure to the northeast, the northwestern flanks of these exposures are covered by deposits of detrital Boone chert. Two small Hindsville exposures are in the creek beds of two intermittent streams in sec. 15, T. 21 N., R. 25 E.

Where the Hindsville is in contact with the Boone chert scattered chert pebbles occur near the base of the formation and at several places a limestone-chert conglomerate is developed. This chert zone marks the unconformable contact between the Hindsville formation and the underlying Boone chert.

A conformable relationship appears to exist between the Hindsville formation and the overlying black shales of the Fayetteville formation.

The Fayetteville occurs along the valleys and gentle slopes of the area. It is composed entirely of black, carbonaceous shale in the lower portion, and of finely laminated, brown sandstones in the upper portion (measured section 19). These sandstones, which belong to the Wedington member of the Fayetteville formation, are the youngest rocks exposed in the area. Only the lower black shale portion of the Fayetteville occurs in the small outliers in secs. 22 and 28.



Considerable drag is apparent along the fault in the southern portion of sec. 15, T. 21 N., R. 25 E., and numerous springs are present along the fault line.

Locality VII

Ward Area

Stratigraphic Sequence: The only post-Boone unit exposed in this area is the Hindsville formation. The upper portion consists of gray, crystalline limestones which are oolitic and crinoidal, The crinoidal content gives a rough appearance to the weathered surface. The massively bedded limestones become thin-bedded and silty in the middle portion of the formation. A brownish-gray, silty limestone, which contains angular chert fragments in the lower one inch, lies above the limestone-chert conglomerate bed in contact with the uneven surface of the Boone chert (measured section 20). This relationship marks the unconformity between the Hindsville and the Boone chert.

Lying above the upper massive, crystalline limestone bed is a brown, platy, unfossiliferous fine-grained sandstone which is believed to be the equivalent of the true Batesville of Arkansas. This sandstone was observed along the road approximately 100 yards south of the Ward farmhouse in sec. 27, T. 22 N., R. 25 E. No other exposures were found in the area.

Locality VIII

Beatty Creek Area

Stratigraphic Sequence: The Hindsville is exposed along the north side of Beatty Creek in sec. 3, T. 22 N., R. 25 E.. where it lies unconformably upon the Boone chert. It is composed of gray, crystalline limestones which are crinoidal and slightly oolitic. The beds are massive and weather dark gray.

The small outlier in sec. 4, T. 22 N., R. 25 E., consists of Hindsville beds which are poorly exposed. The beds consist of an upper thin, brown, oolitic limestone, a middle buff shale, and a

lower bluish-gray, silty, thin-bedded, fossiliferous limestone. The base of the formation is not exposed and the outer margins of the outlier are covered by detrital Boone chert.

Measured Sections: See measured sections 22 and 23 for details of the Beatty Creek area.

Localities IX and X

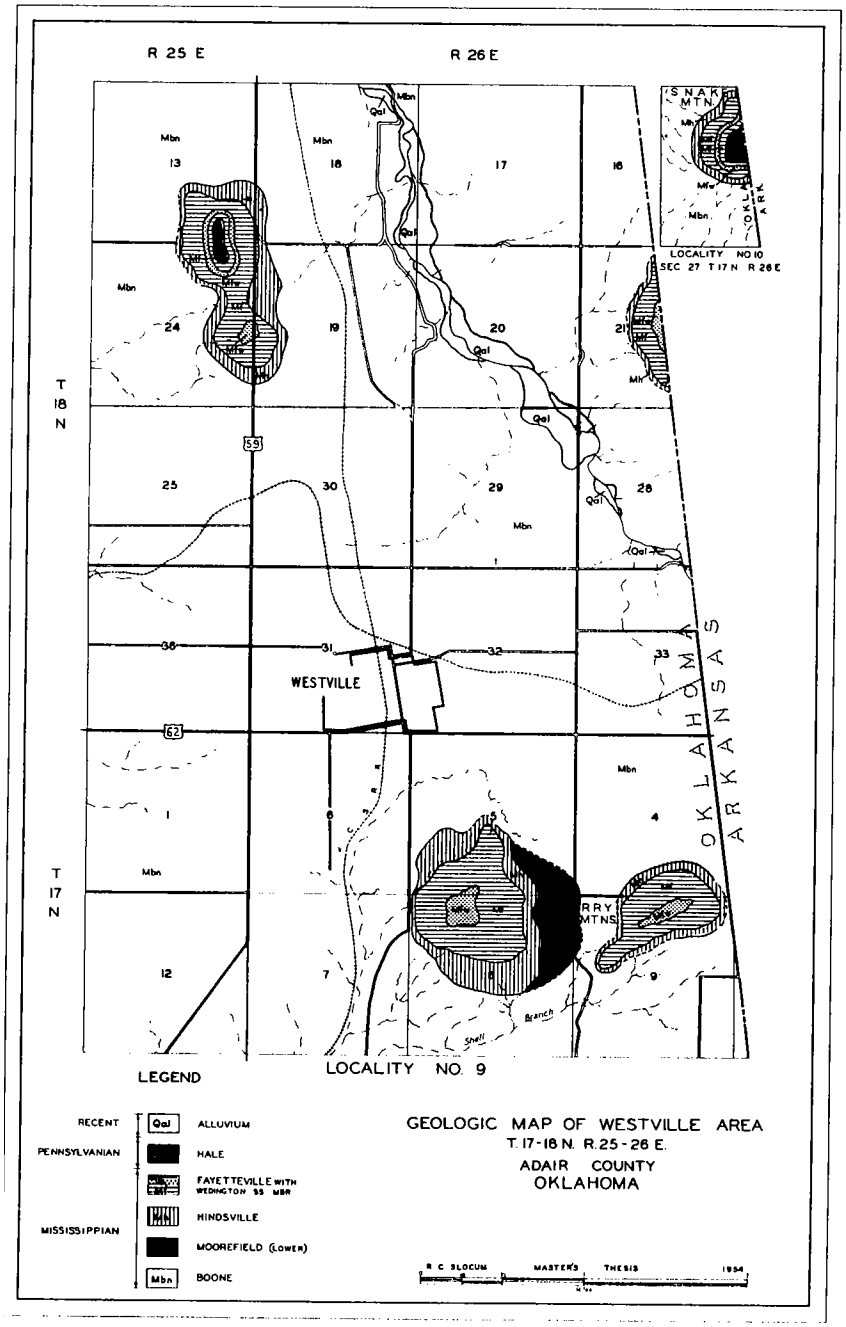
Westville Area

Stratigraphic Sequence: Rocks exposed in this area range from the lower member of the Moorefield formation (Meramecian) to the Hale formation (Morrowan). The Pitkin formation is not present in the area, and the middle and upper members of the Moorefield are not exposed.

Only two exposures of the finely crystalline limestones of the lower Moorefield were found. The outcrops are along the north-south road between secs. 8 and 9, T. 17 N., R. 26 E., where they contain large, brown chert nodules. The formation is covered except at these places.

Lying above the lower Moorefield in the Alberry Mountains is the Hindsville formation. It is a dark gray, thin-bedded, crystalline limestone which forms a bench around the base of each of the post-Boone outliers. The limestones weather brownish-gray and are quite fossiliferous. Among the most useful fossils present is *Agassizocrinus* sp., which marks a persistent zone near the base of the Hindsville throughout the area. The Hindsville is conformably overlain by the black shales of the Fayetteville formation.

Exposures of Fayetteville shale are excellent. The greatest thickness was measured in the Alberry Mountains, sec. 5, T. 17 N., R. 26 E., where the lower black shale attains a thickness of 140 feet. The black fissile, carbonaceous shale, which is highly jointed, contains black, lithographic, septarian limestone concretions and scattered lithographic limestone lenses. Occurring in the upper portion of the Fayetteville formation is the Wedington sandstone member. This sandstone caps all of the post-Boone outliers where the Hale is not present. It is a brown to reddish-brown, finely laminated sandstone which is very hard. Extensive



amounts of Wedington and Hale float present difficulties in mapping the lower and upper limits of the Wedington. A gray shaly zone overlies the Wedington where the Hale is present.

The sandstone member of the Hale formation occurs in secs. 13 and 24, T. 18 N., R. 25 E., of locality 9 and in sec. 27, T. 17 N., R. 26 E., of locality 10. The Hale is characteristically a massive, cross-bedded, medium-grained sandstone which fluted weathering. Its massive and resistant nature makes the Hale a prominent cliff former in the area.

Detrital Boone chert material covers the older formations around the base of the outliers.

Measured Sections: See measured sections 4 and 24 for formational detail and thicknesses.

Locality XI

Baron Area

Stratigraphic Sequence: The post-Boone rocks have been preserved, with the exception of the exposures on Walkingstick Mountain, by the Baron Graben. This graben, which is of post-Hale age, traverses the Baron area and extends southward into T. 16 N., R. 25 E.

The oldest of the post-Boone rocks exposed at the surface is the lower argillaceous limestone member of the Moorefield formation. It crops out at the intersection of the west flank of the Baron Graben and Barren Fork Creek, sec. 26, T. 17 N., R. 25 E., and along the east flank of the Baron Graben in secs. 25 and 35, T. 17 N., R. 25 E. These exposures consist of massive, finely crystalline, gray limestones which are of small areal extent. With the exception of the exposure in sec. 26, the lower limestone member is unconformably overlain by the Hindsville formation (measured section 1). In sec. 26 the middle cherty limestone member, 6.3 feet thick, overlies the lower Moorefield. This member is composed of gray, massive- to thin-bedded, medium crystalline limestone beds

which contain large amounts of angular chert fragments. The middle cherty limestone member is found in sec. 33, T. 17 N., R. 25 E., at the base of Walkingstick Mountain.

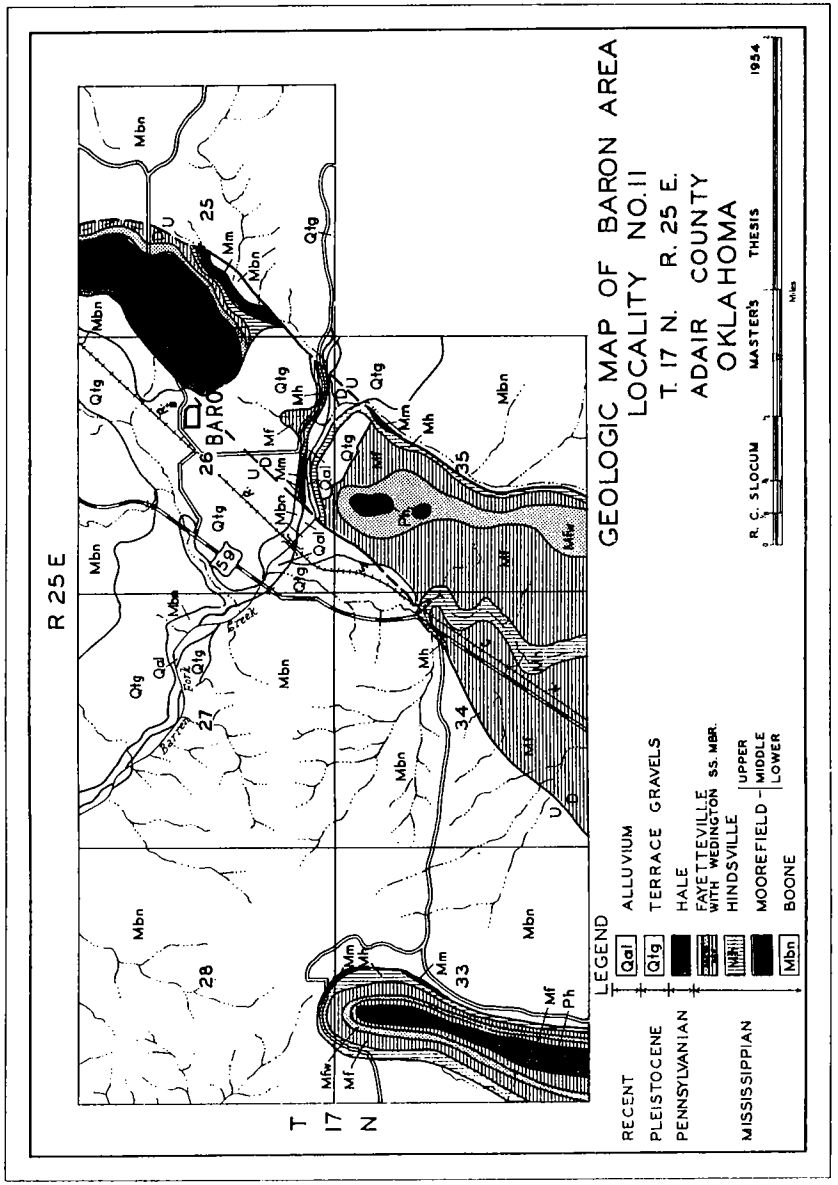
Lying above the cherty limestone member of the Moorefield formation in sec. 26, is a 9.0 foot section of the upper siltstone member. This unit contains alternating siltstone and silty limestone beds which are very fossiliferous. The brown siltstone beds weather platy, while the limestones are compact and thin-bedded.

Unconformably resting upon the Moorefield formation, depending on which member is present, is the younger Hindsville formation. The brownish-gray, crystalline, *Agassizocrinus*-bearing limestones of this formation are found in secs. 28, 32 and 33, T. 17 N., R. 25 E., at the base of Walkingstick Mountain (measured section 5); along a stream in the eastern portion of sec. 34, T. 17 N., R. 25 E.; in the center of the Baron Graben, sec. 26, T. 17 N., R. 25 E. (measured section 25); and along the eastern flank of the Baron Graben in secs. 25 and 35 (measured section 1). The Hindsville forms benches around the hillsides of much of the area.

The Fayetteville formation overlies the Hindsville limestone conformably. The lower black shales occur along the valleys and in the gentle slopes of the Baron area. The Fayetteville shale, and the upper brown, finely laminated Wedington sandstone member, have the widest distribution of the post-Boone formations of this area.

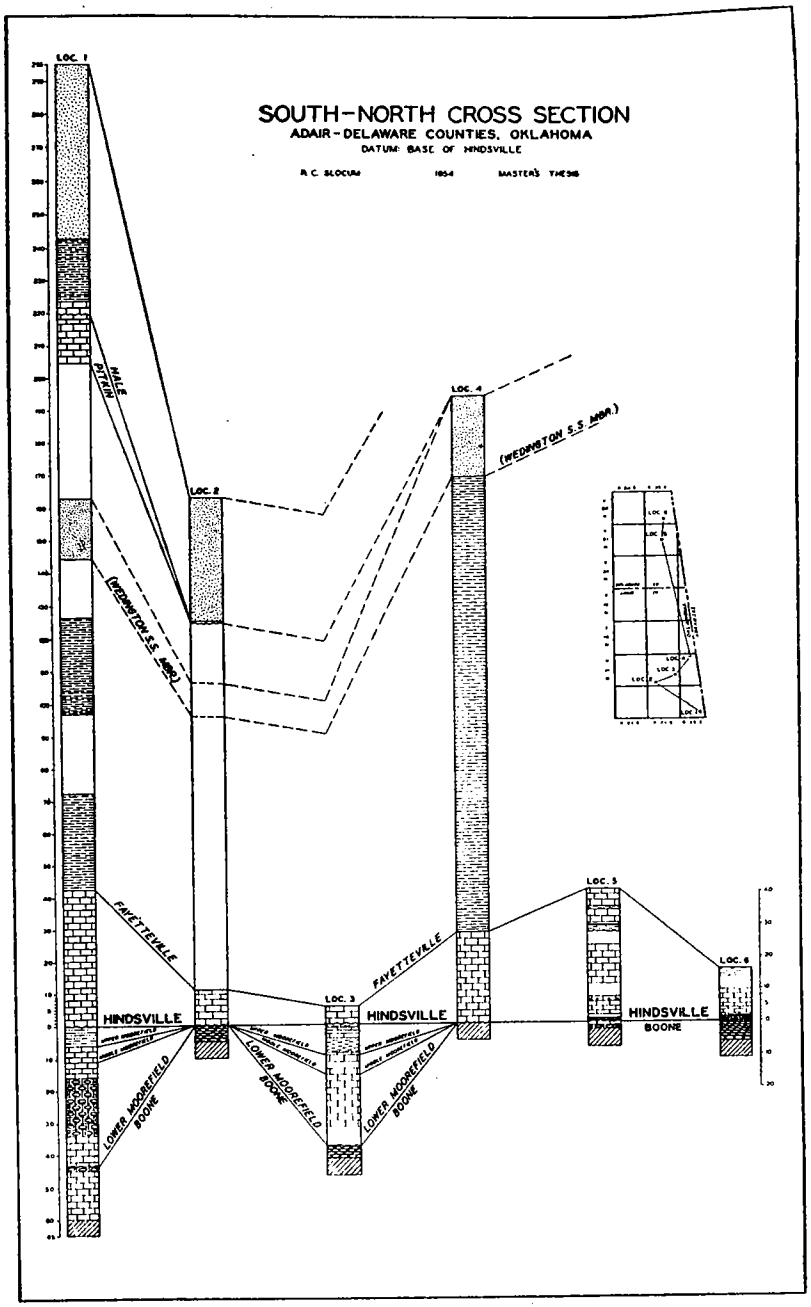
The Pitkin formation, which is present on Bugger Mountain, sec. 27, T. 16 N., R. 26 E. (measured section 26), and on the south end of Walkingstick Mountain, was not found in the Baron area.

Lying above the Fayetteville with apparent unconformity is the lower Pennsylvanian Hale formation. The base of the Hale formation in sec. 33, T. 17 N., R. 25 E., is marked by a gray-brown, granular, rubbly limestone which is 5.0 feet thick (measured section 5). This basal limestone was not observed at other exposures in this locality. The massive, fluted, brown sandstones of the Hale formation form a 33.5 foot cliff on Walkingstick Mountain. Other exposures of the Hale are present in the Baron Graben, where the



sandstones form the resistant cap rock above the underlying Mississippian formations. Between the flanks of the graben in the northeastern portion of the Baron area, where a northwestern dip-slope is present, the Hale sandstone forms the surface beds. Along the west flank of the graben the Hale has been down thrown against the Boone chert.

Extensive terrace deposits cover a large portion of the post-Boone in the Baron area. Alluvial deposits of Recent age are along Barren Fork Creek.



DESCRIPTION OF REGIONAL CROSS SECTIONS

South-North Cross Section

In preparing this cross-section an effort was made to extend the post-Boone formations from Bugger Mountain, sec. 27, T. 16 N., R. 25 E., northward to sec. 27, T. 22 N., R. 25 E.

The Hale formation is present in the southern part of the area, where it is a cliff former, but it is not found north of sec. 24, T. 18 N., R. 25 E. The underlying Pitkin formation has been "cut out" by the unconformity at the base of the Hale formation, and is not found north of the southern portion of Walkingstick Mountain.

The Fayetteville formation is widely distributed throughout the eastern portion of the area, extending northward as far as sec. 10, T. 21 N., R. 25 E. The thickness of the lower black shales remains fairly constant. Where the Hale does not overlie the Fayetteville formation, the upper gray shale unit has been eroded away, leaving the Wedington sandstone member forming the cap-rock for the formation.

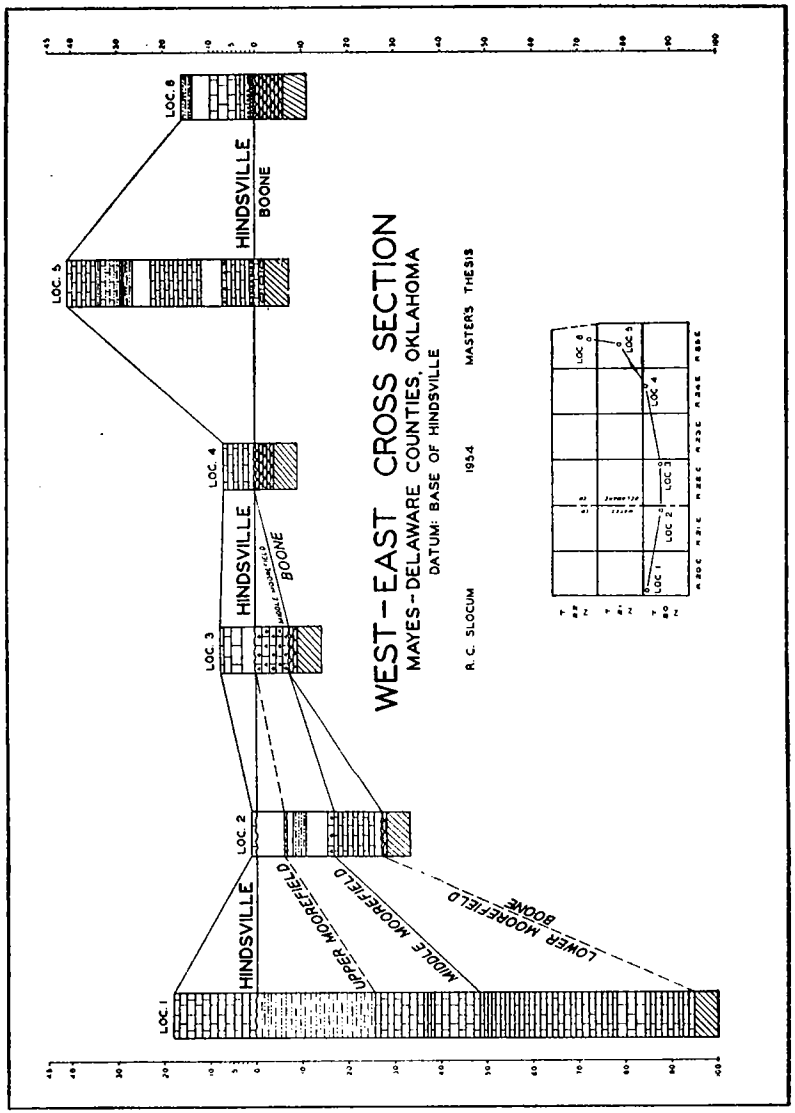
The Moorefield units and the Hindsville vary in thickness as a result of the uneven surface of the Boone chert. The Moorefield formation is not exposed north of section 8, T. 17 N., R. 26 E.

West-East Cross Sections

Sections of the west-east cross-section extend from the Lindsey Bridge, sec. 6, T. 20 N., R. 20 E. (measured section 27), northeastward to sec. 27, T. 22 N., R. 25 E.

The Moorefield formation thins eastward and disappears as the section traverses the area to the east. Unconformity separates the formation from the underlying Boone chert and from the overlying Hindsville formation.

The Hindsville formation, which is the datum for the cross-sections, varies in thickness as a result of the uneven surface of the Boone chert.



SUMMARY AND CONCLUSIONS

As a result of this study, the writer has arrived at the following conclusions:

1. The Boone chert surface, upon which the Mayes was laid, was topographically rugged.

2. Based upon lithologic similarities and faunal content of Brant's "Moorefield", "Hindsville", and "Batesville" the Arkansas formational name Moorefield was applied to this sequence for the purpose of this report.

3. The Hindsville (equivalent of the unit with the preoccupied name "Grand River" of Brant) formation carries a Chesterian fauna which resembles that of the Hindsville formation of Arkansas in the type area.

4. The Hindsville formation truncates the Moorefield by disconformity and overlap to the northeast.

5. A fine-grained sandstone at the top of the Hindsville formation in the northeastern part of the area is believed to be equivalent to part of the true Batesville sandstone of Arkansas.

6. The upper siltstone member of the Moorefield formation, which crops out extensively in adjacent areas, is found only at Rose (?) and at Baron.

7. The Hale formation, consisting predominantly of sandstones, is found only in the southern part of the area.

8. The Pitkin formation, if ever present in this area, was essentially removed by erosion at the end of Mississippian time.

9. Extensive high-level terrace deposits are present in the western and southern parts of the area.

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MEASURED SECTIONS

1. SECTION ALONG EAST FLANK OF GRABEN

Section 25, T. 17 N., R. 25 E.

Formational Description	Thickness in Feet Of Unit	To Base of Formation
Covered		
Hindsville:		
Limestone, gray, crystalline, thin-bedded, forms bench around hillside	5.5	16.5
Covered	4.0	11.0
Limestone, gray, thin-bedded, fossiliferous with *Agassizocrinus, Diaphragmus cestriensis,* crystalline	5.0	7.0
Covered	2.0	2.0
Moorefield:		
Lower argillaceous limestone member—("Moorefield" of Brant):		
Limestone, gray, finely crystalline, contains brown, nodular chert "stringers", weathers gray	2.5	29.5
Limestone, gray, weathers brownish-gray, finely crystalline, thin-bedded to platy	1.0	27.0
Covered	0.5	26.0
Limestone, gray, light gray weathering, finely crystalline, hard, nodular chert in lower 8", unfossiliferous	1.5	25.5
Limestone, black, weathers gray, finely crystalline, hard, massively bedded, petroliferous	8.0	24.0
Covered	2.0	16.0
Limestone, dark gray, thin-bedded, finely crystalline, brownish-gray weathering	0.5	14.0
Covered	1.0	13.5
Limestone, gray, sub-lithographic, hard, massively bedded, thin platy 2" bed near middle of sequence, unfossiliferous	5.0	12.5
Limestone, gray, argillaceous, platy, petroliferous, gray weathering	1.5	7.5
Limestone, black, weathers gray, lithographic, bituminous odor, jointed brown chert nodules near bottom	3.5	6.0
Covered	2.5	2.5
Boone:		
Chert, gray to white, massive, iron stained		

2. SECTION ALONG NORTH BANK OF SNAKE CREEK

Southwest ¼ of Section 13, T. 20 N., R. 21 E.

Formational Description	Thickness in Feet Of Unit	To Base of Formation
Covered		
Hindsville:		
Limestone, gray, crystalline, hard, glauconitic, bituminous, weathers dark gray, *Agassizocrinus,* rough weathered surface results from crinoid fragments, section may be slumped	1.0	1.0
Moorefield:		
Covered, may be upper silty limestone member of the Moorefield	6.0	6.0

Middle, gray cherty limestone member—("Hindsville" of Brant):		
Limestone, gray, silty, hard, thin-bedded, cherty, *Spirifer increbescens* zone, weathers gray, bituminous odor	0.8	10.4
Covered	1.0	9.6
Siltstone, brownish-gray, platy to thin-bedded, smooth surface, calcareous, limonitic, upper 8″ extremely fossiliferous with abundant *Moorefieldella eurekensis*, cross-bedded	2.8	8.6
Covered	4.6	5.8
Limestone, gray, hard, angular chert layer 4″ thick at base, dense, limonitic, weathers dark gray	1.2	1.2
Lower argillaceous limestone member—("Moorefield" of Brant:)		
Limestone, gray, weathers platy to thin-bedded, finely crystalline to silty, bituminous, limonitic, *Spirifer increbescens*	8.8	10.3
Covered	1.5	1.5
Boone:		
Chert, brown to gray to white, massive, irregular	1.0	1.0

3. SECTION ALONG SNAKE CREEK AT MAYES-DELAWARE COUNTY LINE

Section 18, T. 20 N., R. 22 E.

Formational Description	Thickness in Feet Of Unit	To Base of Formation
Covered		
Hindsville:		
Limestone, gray, finely crystalline, hard, weathers massive to thin-bedded, crinoidal, limonitic, weathers brownish-gray	4.7	12.0
Shale, gray-green, platy, brittle, weathers to buff color	0.7	7.3
Limestone, gray-green, buff weathering, silty, finely crystalline, thin-bedded	0.3	6.6
Limestone, gray to dark gray, finely crystalline, abundant *Composita subquadrata*, limonitic, upper zone contains clay or shale particles	1.3	6.3
Limestone, gray, weathers brownish-gray, medium-crystalline, crinoidal, abundant fenestellid bryozoans, thin-bedded	5.0	5.0
Covered, base of formation not exposed		

4. SECTION SOUTHEAST OF WESTVILLE

Southeast ¼ of Section 5, T. 17 N., R. 26 E.

Formational Description	Thickness in Feet Of Unit	To Base of Formation
Fayetteville:		
Sandstone, brown to reddish-brown, thinly laminated, weathers to thin "slabs", hard, very fine-grained, brown weathered surface	25.0	165.0
Shale, black, fissile, carbonaceous, with black, lithographic, septarian limestone concretions, unfossiliferous, jointed, iron stained	140.0	140.0
Hindsville:		
Limestone, dark gray, crystalline, hard, crinoidal, weathers brownish-gray, thin-bedded, limonitic, fossiliferous with *Diaphragmus cestriensis, Composita subquadrata,* and *Fenestrellina sp.*, forms bench around hillside	28.0	28.0
Covered		

5. SECTION AT NORTH END OF WALKINGSTICK MOUNTAINS

Section 33, T. 17 N., R. 25 E.

Formational Description	Thickness in Feet Of Unit	To Base of Formation
Hale:		
Sandstone, brown, medium-grained, fluted surface, massive, unfossiliferous, weathers reddish-brown, alternating dark and light bands, not thought to be lamination, provides large amount of float, noncalcareous	33.5	38.5
Limestone, gray-brown, granular, jasperoid-like particles, fossiliferous with abundant crinoid and small brachiopod fragments, rubbly	5.0	5.0
Fayetteville:		
Covered, mapped as Wedington sandstone and Fayetteville shale	123.0	123.0
Hindsville:		
Limestone, gray, weathers brownish-gray crystalline, rather thin-bedded, crinoidal, limonitic, *Agassizocrinus* abundant, forms bench around hillside, lies unconformably on Boone surface	11.0	11.0
Boone:		
Chert, buff, pitted, angular surface		

6. SECTION ALONG WEST SIDE OF SNAKE CREEK

Southwest ¼ of Section 13, T. 20 N., R. 21 E.

Covered		
Moorefield:		
Middle gray cherty limestone member—		
Limestone, gray to dark gray, medium crystalline, massive to thin-bedded, oolitic, glauconitic, upper surface contains angular chert fragments, limonitic	8.0	10.0
Limestone, light gray, weathers brownish-gray, crystalline, thin-bedded, cherty, fossiliferous, with *Athyris cestriensis, Spirifer increbescens*, bryozoans, limonitic, rough weathered surface	2.0	2.0
Lower argillaceous limestone member		
Limestone, gray, finely crystalline, hard, thin-bedded	0.5	8.5
Covered	1.0	8.0
Limestone, gray, brownish-gray weathering, silty, massive to thin-bedded, nonfossiliferous, lies unconformably on the Boone surface	7.0	7.0
Boone:		
Chert, mottled, pitted, irregular surface, gray weathering in stream bed	3.0	3.0

7. SECTION IN SMALL OUTLIER NORTH OF SNAKE CREEK

Section 14, T. 20 N., R. 21 E.

Formational Description	Thickness in Feet Of Unit	To Base of Formation
Covered		
Moorefield:		
Lower argillaceous limestone member—("Moorefield" of Brant):		

Siltstone, brown to gray, weathers gray, hard, platy in upper portion, lower part is massive with shaly development in lower 2", calcareous	5.0	11.0
Limestone, brown to gray with black streaks developed locally near top, weathers brown, hard, finely crystalline, thin-bedded to platy, fossiliferous with *Spirifer arkansanus*	3.0	6.0
Covered, base not exposed	3.0	3.0
Boone:		
Limestone and chert, massive, weathers to rough angular surface	6.0	6.0

Covered to creek bed.

8. SECTION NORTHEAST OF LEACH ALONG SALINA CREEK
Center of Section 13, T. 20 N., R. 22 E.

Formational Description	*Thickness in Feet* Of Unit	To Base of Formation
Hindsville:		
Limestone, gray, granular, gray weathering, massively bedded, crumbly, petroliferous	1.0	7.8
Limestone, brownish-gray, weathers gray, thin to massively bedded, finely crystalline, limonitic, fossiliferous with *Agassizocrinus, Fenestrellina* sp., *Spirifer increbescens*	2.0	6.8
Limestone, gray with brown streaks, granular, crumbly, fossiliferous, with scattered small gastropods and abundant crinoid fragments	0.8	4.8
Covered	4.0	4.0
Moorefield:		
Middle gray cherty limestone member—("Hindsville" of Brant):		
Limestone, dark gray, medium crystalline, hard, massively bedded, stains of heavy oil, glauconitic, cherty	2.0	7.0
Limestone, light gray, weathers brownish-gray, dense, massively bedded, glauconitic, hard, angular chert fragments throughout entire sequence, unconformable on Boone surface	5.0	5.0
Boone:		
Chert, gray to black, mottled, knobby, rough surface	2.0	2.0
Covered to stream bed	4.0	4.0

9. SECTION ONE HALF MILE EAST OF SMITH FARMHOUSE
Section 13, T. 20 N., R. 22 E.

Formational Description	*Thickness in Feet* Of Unit	To Base of Formation
Covered	6.0	6.0
Hindsville:		
Limestone, dark gray, massive to thin-bedded, upper part oolitic, weathers platy, finely crystalline, light gray weathered surface	1.5	6.5
Limestone, light gray with brown streaks, fine to medium crystalline, limonitic, hard, massive, oolitic near base	3.0	5.0
Limestone, gray, finely crystalline, thin-bedded, fossiliferous with *Diaphragmus cestriensis, Spirifer increbescens, Fenestrellina* sp., rough weathered surface results from abundant fossils	1.0	2.0
Limestone, dark gray, finely crystalline, oolitic, thin-bedded, brownish-gray weathering, found in stream bed	1.0	1.0

10. SECTION AT SOUTH END OF HIGHWAY 33 BRIDGE
Section 14, T. 20 N., R. 22 E.

Formational Description	*Thickness in Feet* Of Unit	To Base of Formation
Covered	6.0	6.0
Hindsville:		
Limestone, gray, weathers brownish-gray, crystalline, oolitic, limonitic, thin-bedded	1.5	2.5
Siltstone, brown, yellowish-brown weathering, platy	1.0	1.0

Covered to stream bed; section has since been covered by construction work.

11. SECTION SOUTHWEST OF OAKS ALONG INTERMITTENT STREAM
Southeast ¼ of Section 33, T. 20 N., R. 23 E.

Formational Description	*Thickness in Feet* Of Unit	To Base of Formation
Covered		
Moorefield:		
Lower argillaceous limestone member—("Moorefield" of Brant):		
Limestone, blue gray, weathers light gray, lithographic, conchoidal fracture, contains tripolitic chert nodules, thin-bedded, smooth surface	3.7	7.9
Limestone, brown, silty, slightly fossiliferous	0.5	4.2
Limestone, brownish-gray, brown weathering, silty, smooth weathered surface	1.0	3.7
Siltstone, dark gray, brownish-gray weathering, calcareous, weathers to thin layers, fossiliferous	2.0	2.7
Limestone, gray, dense, thin-bedded, silty, fossiliferous, unconformable on Boone chert	0.7	0.7
Boone:		
Chert, rubbly, white to gray	6.0	6.0

12. SECTION ALONG SPRING CREEK 200 YARDS NORTH OF SOUTH SECTION LINE
Section 27, T. 20 N., R. 23 E.

Formational Description	*Thickness in Feet* Of Unit	To Base of Formation
Covered	6.0	6.0
Moorefield:		
Middle gray cherty limestone member—("Hindsville" of Brant):		
Limestone, brownish-gray, weathers gray, medium crystalline, thin-bedded, cherty, knobby weathered appearance	11.0	17.6
Limestone, gray, weathers light gray, thin-bedded, medium crystalline, fossiliferous, *Fenestrellina, Spirifer increbescens*, bituminous, lower 1′ contains angular chert fragments	6.6	6.6
Lower argillaceous limestone member—("Moorefield" of Brant):		
Limestone, gray, weathers light gray, silty, platy weathering	2.7	7.7
Limestone, gray, light gray weathering, bituminous, thin-bedded, lower 6" marked by large chert boulders	2.5	5.0
Limestone, gray, lithographic, thin-bedded, weathers into flat ledges along creek	1.0	2.5
Limestone, brownish-gray, weathers light gray, silty, platy	1.5	1.5

Base of exposure at water level.

13. SECTION ALONG WEST SIDE OF SPRING CREEK

Center of Section 27, T. 20 N., R. 23 E.

Formational Description	Thickness in Feet Of Unit	To Base of Formation
Covered		
Moorefield:		
Middle gray cherty limestone member—("Hindsville" of Brant):		
Limestone, gray, crystalline, massive to thin-bedded, cherty, weathers gray, *Dictyoclostus coloradoensis*, varying hardness	2.8	6.3
Limestone, blue-gray, medium crystalline, hard, contains angular chert fragments with larger pieces at base, massive	3.5	3.5
Lower argillaceous limestone member—("Moorefield" of Brant):		
Limestone, blue-gray, weathers light gray, lithographic, massive, contains large chert nodules, unfossiliferous	2.0	5.0
Limestone, brownish-gray, silty, hard massive, fossiliferous with *Spirifer arkansanus, Dictyoclostus coloradoensis, Griffithides pustulosus*, yellow-brown weathering	3.0	3.0
Covered to stream level	5.0	5.0

14. SECTION 100 YARDS NORTH OF HIGHWAY 33 BRIDGE ALONG SPRING CREEK

Section 13, T. 20 N., R. 23 E.

Formational Description	Thickness in Feet Of Unit	To Base of Formation
Moorefield:		
Middle gray cherty limestone member—("Hindsville" of Brant):		
Limestone, gray, dark gray weathering, coarsely crystalline, glauconitic, oolitic, slightly fossiliferous, limonitic	0.8	3.8
Limestone, dark gray, dense, hard, contains angular to subrounded chert fragments, rough surface	3.0	3.0
Lower argillaceous limestone member—("Moorefield" of Brant):		
Limestone, gray, brownish-gray weathering, finely crystalline, hard	0.03	4.9
Limestone, brownish-gray, weathers dark gray, limonitic, sparingly fossiliferous, forms bench along stream	2.2	4.6
Siltstone, brown, platy, slightly fossiliferous, productid zone	2.4	2.4
Boone:		
Chert, brown, knobby surface, extends beneath water level	1.0	1.0

15. SECTION WEST OF KANSAS SCHOOL ALONG SPRING CREEK

Section 13, T. 20 N., R. 23 E.

Formational Description	Thickness in Feet Of Unit	To Base of Formation
Covered		
Moorefield:		
Middle gray cherty limestone member—("Hindsville" of Brant):		
Limestone, gray, granular, oolitic, limonitic, angular chert fragments	0.5	6.5
Siltstone, brownish-gray, platy, limonitic, cross-bedded, slightly fossiliferous	2.5	6.0

Limestone, dark gray, weathers gray, hard crystalline, abundant chert fragments scattered throughout, fossiliferous with *Nudirostra carboniferum, Mooreifieldella eurekensis*	3.5	3.5
Lower argillaceous limestone member—("Moorefield" of Brant):		
Limestone, blue-gray, weathers light gray, lithographic, contains large, tripolitic, nodular chert, floors stream bed	2.0	2.0

16. SECTION ALONG CLOUD CREEK

Northeast ¼ of Section 3, T. 20 N., R. 24 E.

Formational Description	Thickness in Feet Of Unit	To Base of Formation
Covered		
Hindsville:		
Limestone, dark gray, granular, crumbles easily, thin-bedded, limonitic crinoidal, fossiliferous with *Spirifer increbescens, Diaphragmus cestriensis*, bryozoans, forms bench along stream	3.5	7.0
Covered, platy limestone float	1.0	3.5
Limestone, brownish-gray, crystalline, massively bedded, cherty, overlies Boone unconformably	2.5	2.5
Boone:		
Chert, gray to white, irregular, iron stained, forms stream bed	4.0	4.0

17. SECTION ALONG INTERMITTENT STREAM

Center of Section 20, T. 21 N., R. 24 E.

Formational Description	Thickness in Feet Of Unit	To Base of Formation
Covered		
Hindsville:		
Limestone, gray, crystalline, massive, soft, irregular weathered surface, weathers dark gray, *Agassizocrinus* sp.	4.0	4.0
Moorefield:		
Lower argillaceous limestone member—("Moorefield" of Brant):		
Limestone, light gray, finely crystalline, thin-bedded, very hard, weathers brownish-gray, *Nudirostra carboniferum*, lies unconformably on Boone surface	0.8	0.8
Boone:		
Chert, gray, irregular, knobby surface, found in stream bed.		

18. SECTION NORTH OF CHEROKEE CREEK

Southwest ¼ of Section 22, T. 21 N., R. 25 E.

Formational Description	Thickness in Feet Of Unit	To Base of Formation
Covered		
Hindsville:		
Limestone, gray, coarsely crystalline, thin-bedded, crumbly in places, abundant crinoid stems and fenestellid bryozoans	5.5	41.0
Siltstone, yellow-brown, soft, crumbly, very irregular surface, calcareous	1.0	35.5
Limestone, blue-gray, silty, brown weathering, platy to thin-bedded, nonfossiliferous	4.0	34.5
Covered	0.5	30.5

Limestone, blue gray, silty, brown weathering, platy, non-fossiliferous	0.3	30.0
Siltstone, brown, calcareous, characterized by thin, platy beds, hard	2.0	29.7
Covered	4.0	27.7
Limestone, dark gray, finely crystalline, wavy surface, thin-bedded	1.5	23.7
Limestone, brownish-gray, silty, thin-bedded, fossiliferous in middle portion with abundant *Spirifer increbescens*, and *Diaphragmus cestriensis*	10.5	22.2
Covered, silty limestone float	4.5	11.7
Limestone-chert conglomerate, with angular to sub-rounded varicolored chert fragments	0.5	7.2
Limestone, gray, weathers gray, medium crystalline, thin-bedded, nonfossiliferous, cherty	1.0	6.7
Limestone, blue-gray, weathers brown, finely crystalline, thin-bedded, forms bench along creek	4.0	5.7
Covered	1.0	1.7
Limestone-chert conglomerate, with angular to sub-rounded, varicolored chert fragments, lies unconformably on Boone	0.7	0.7
Boone:		
Limestone, gray, weathers gray, sub-lithographic, smooth surface, fossiliferous, with Spirifer zone	1.0	2.0
Interbedded chert and gray limestone	1.0	1.0

19. SECTION ONE MILE NORTH OF CENTER POINT SCHOOL

Section 11, T. 21 N., R. 25 E.

Formational Description	*Thickness in Feet* Of Unit	To Base of Formation
Covered		
Fayetteville:		
Sandstone, brown to reddish-orange, fine-grained to quartzitic, poorly exposed, laminated	3.5	54.0
Covered	4.0	50.5
Shale, dark gray, weathers brownish-gray, crumbly, iron stained	2.0	46.5
Covered	3.5	44.5
Sandstone, brownish-gray, fine-grained thin-bedded, finely laminated, contains large amount of micaceous particles, hard, reddish-brown weathering	3.0	41.0
Clay, blue-gray, buff colored streaks, gray weathering	1.5	38.0
Shale, black, fissile, carbonaceous, brittle, nonfossiliferous, iron stained	6.0	36.5
Covered	16.5	30.5
Shale, black, fissile, brittle, jointed, iron stained, non-fossiliferous	14.0	14.0
Covered, base of formation not exposed		

20. SECTION 100 YARDS SOUTH OF WARD FARMHOUSE

Section 27, T. 22 N., R. 25 E.

Formational Description	*Thickness in Feet* Of Unit	To Base of Formation
Covered		
Hindsville:		
Sandstone, fine-grained, brown, weathers reddish-brown, platy, unfossiliferous, iron stained	2.5	16.0
Covered	4.0	13.5

Limestone, gray, dark gray weathering, crystalline, massively bedded, limonitic, hard, oolitic, glauconite-like particles, rough crinoidal surface	5.5	9.5
Limestone, brownish-gray, weathers brown, silty, platy, lower one inch contains angular chert fragments	3.0	4.0
Limestone-chert conglomerate, gray, granular limestone with angular to sub-rounded, varicolored chert fragments, massive, lies unconformably on Boone surface	1.0	1.0
Boone:		
Chert, white to gray, with blackish-gray weathered surface, highly fractured and jointed, iron stained	6.0	6.0

21. SECTION ONE-HALF MILE SOUTH OF WARD FARMHOUSE

Section 34, T. 22 N., R. 25 E.

Formational Description	*Thickness in Feet* Of Unit	To Base of Formation
Hindsville:		
Limestone, gray, weathers dark gray, finely crystalline, oolitic, crinoidal	5.5	27.0
Limestone, blue-gray, brown weathered surface, silty, thin-bedded	2.0	21.5
Covered	1.5	19.5
Limestone, blue-gray, weathers brown, thin-bedded, silty	2.0	18.0
Covered	4.5	16.8
Limestone, gray, dark gray weathering, crystalline, massively bedded, crumbly in places, limonitic	3.5	12.3
Covered	3.0	8.8
Limestone, gray, sub-lithographic, thin-bedded, angular fracture	0.3	5.8
Covered	5.5	5.5
Keokuk:		
Chert, blocky, white to gray	11.5	11.5

22. SECTION NORTH OF BEATTY CREEK

Section 3, T. 22 N., R. 25 E.

Formational Description	*Thickness in Feet* Of Unit	To Base of Formation
Hindsville:		
Limestone, gray, hard, weathers dark gray, slightly oolitic, crinoidal, massive	3.0	3.0
Boone:		
Chert, white to gray, irregular, massive	3.5	3.5
Covered		

23. SECTION 200 YARDS EAST OF ROBINSON FARMHOUSE

Northeast ¼ of Section 4, T. 22 N., R. 25 E.

Formational Description	*Thickness in Feet* Of Unit	To Base of Formation
Hindsville:		
Limestone, dark brown, very oolitic, porous along weathered surface	0.4	7.9
Shale, buff, poorly exposed	2.0	7.5
Limestone, blue-gray, weathers brown, silty, thin-bedded, fossiliferous, with *Diaphragmus cestriensis*, *Spirifer increbescens*, *Linoproductus ovatus*, exposed in ditch along north side of road	5.5	5.5
Covered		

24. SECTION ALONG HIGHWAY 59 NORTH OF WESTVILLE

Section 25, T. 18 N., R. 25 E.

Formational Description	Thickness in Feet Of Unit	To Base of Formation
Hale:		
Sandstone, brown, medium grained, weathers brown to reddish-brown, friable, unfossiliferous, fluted weathering, non-calcareous, massive, forms cliff around upper portion of outlier; not measured.		
Fayetteville:		
Float, sandstone, buff to brown, fine grained, smooth surface, hard, finely laminated (Wedington); not measured.		
Shale, black, fissile, brittle, contains black, lithographic, hard, nonfossiliferous, brownish-gray weathered limestone lenses and septarian concretions, shale is nonfossiliferous, jointed, carbonaceous, rests conformably on Hindsville	60.0	60.0
Hindsville:		
Limestone, dark gray, weathers light gray to brownish-gray, crystalline, hard, *Agassizocrinus* sp., thin-bedded, crinoidal, rough surface	5.0	5.0
Covered		

25. SECTION ALONG BARREN FORK CREEK

Section 26, T. 17 N., R. 25 E.

Formational Description	Thickness in Feet Of Unit	To Base of Formation
Covered		
Hindsville:		
Limestone, dark gray, massive, weathers light gray, crystalline, crinoidal, fossiliferous with *Agassizocrinus* sp., *Linoproductus ovatus*, and *Spirifer increbescens*	5.5	5.5
Moorefield:		
Upper siltstone member:		
Siltstone, brown, weathers brown, same fossils as siltstone below, shaly weathering	0.8	9.1
Limestone, dark gray, silty to finely crystalline, brownish-gray weathering, hard, fossiliferous with abundant *Nudirostra carboniferum* and *Echinoconchus alternatus*	1.0	8.3
Covered	1.0	7.3
Limestone, brown, silty, contains same fossils as siltstone below, weathers brown, rubbly weathered surface, may be slumped slightly	1.3	6.3
Siltstone, brown, platy weathering, brown weathered surface, calcareous, abundantly fossiliferous with *Allorisma walkeri*, *Nudirostra carboniferum*, *Aviculopecten batesvillensis*, and *Spirifer increbescens*	4.5	5.0
Limestone, black, weathers brown, thin-bedded, lithographic, platy, unfossiliferous	0.5	0.5
Middle gray cherty limestone member:		
Limestone, gray medium crystalline, thin-bedded, weathers gray, contains angular reddish-brown chert fragments, fossilliferous with *Linoproductus ovatus*, *Spirifer increbescens*, and *Diaphragmus cestriensis*, crinoidal	2.2	6.2
Covered	2.0	4.0

Limestone, gray, brownish-gray weathering, massively bedded, rough crinoidal surface, contains angular chert fragments	2.0	2.0
Lower argillaceous limestone member:		
Covered	2.0	22.0
Limestone, gray, massive, hard, thin shaly partings between thicker limestone beds, contains weathered chert nodules and "stringers", finely crystalline, light gray weathering, fossiliferous with *Linoproductus ovatus* and *Spirifer increbescens*	14.0	20.0
Covered (includes base of argillaceous member)	6.0	6.0
Boone:		
Chert, white to gray, with large amount of iron staining, highly fractured, unmeasured.		

26. SECTION ON SOUTH END OF BUGGER MOUNTAIN[1]

Section 27, T. 16 N., R. 26 E.

Formational Description	Thickness in Feet Of Unit	To Base of Formation
Hale:		
Sandstone, typical fluted weathering and cross-bedding, coarse grained, weathers reddish-brown, no fossils observed	54.0	77.0
Shale, gray to green blocky shale	19.0	23.0
Limestone, reddish-brown, conglomeratic, weathers to thin beds, unfossiliferous	0.5	4.0
Limestone, reddish-gray, weathers brown, granular, weathers rubbly, contains jasperoid particles, fossiliferous with crinoid fragments	3.5	3.5
Pitkin:		
Limestone, gray to medium gray, finely crystalline to dense, weathers light gray and rubbly, *Archimedes*	15.2	15.2
Fayetteville:		
Covered (includes the base of the Pitkin)	42.0	162.0
Sandstone, massive to thin-bedded, hard, laminated, light brown to buff, forms bench on hillside (Wedington member)	18.0	120.0
Covered	18.0	102.0
Shale, gray-green, limonitic concretions, fissile or platy	30.0	84.0
Covered	24.0	54.0
Shale, black, platy, bituminous, jointed, weathers out in small steps	30.0	30.0
Hindsville:		
Limestone, largely crystalline, gray, massive, fossiliferous	3.0	22.5
Limestone, dense, lithographic, weathers dark blue-gray to white	1.0	19.5
Limestone, medium to coarsely crystalline, gray, hard, fossiliferous, rough surface, *Agassizocrinus*, *Diaphragmus centriensis*	18.5	18.5
Moorefield:		
Upper siltstone member—("Batesville" of Brant):		
Siltstone, calcareous, hard, brownish-yellow, fossiliferous with *Nudirostra carboniferum*, *Sphenotus meslerianus*, *Camarotoechia purduei*, and *Orbiculoidea newberryi* var. *marshallensis*	1.5	6.0
Shale, dark brownish-green, platy, fossiliferous with fossils named in overlying siltstone	3.5	4.5

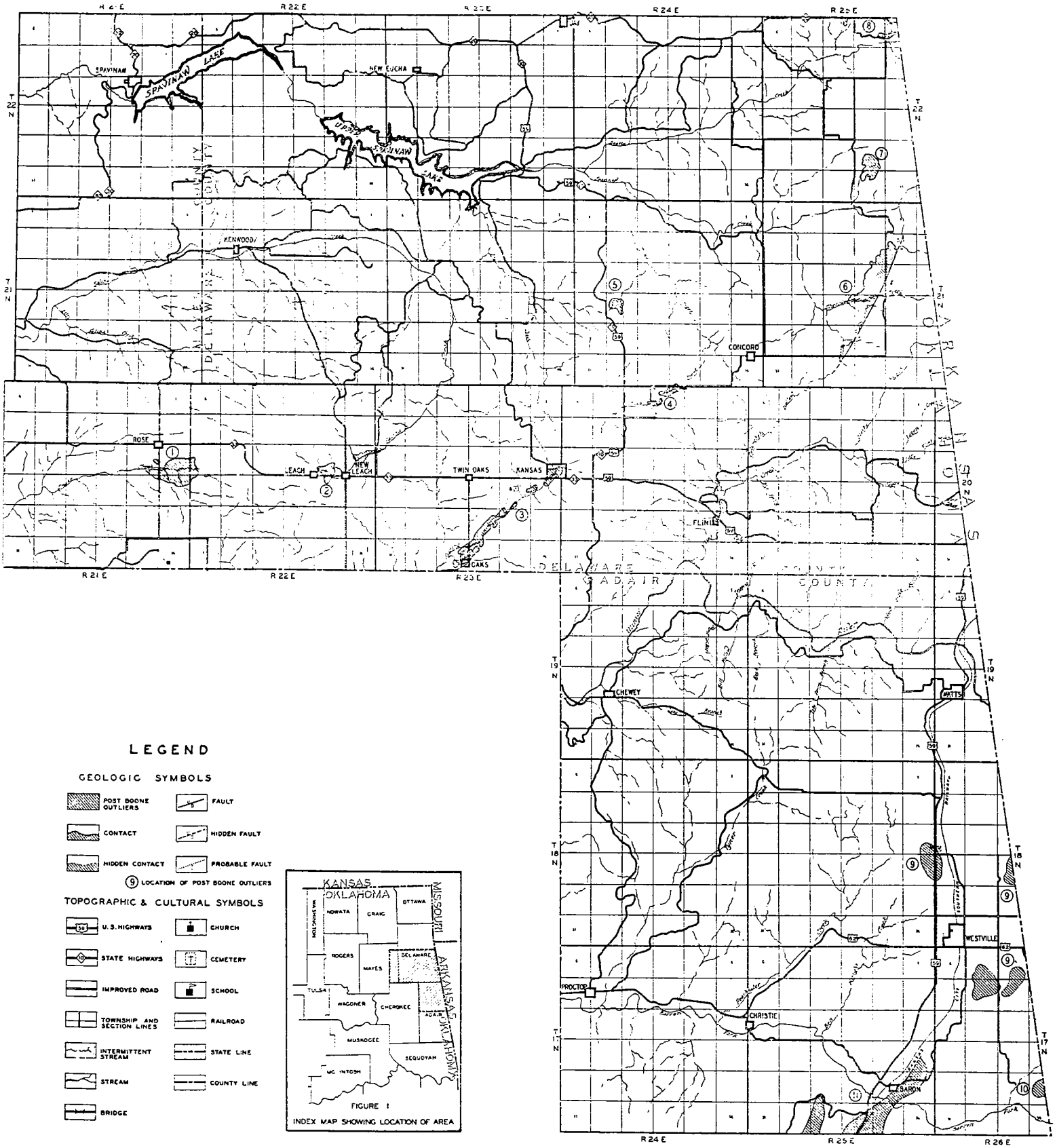
[1] Modified from Snodgrass, Elvis D., "Geology of the Church Area, Adair County, Oklahoma", University of Oklahoma, Master's Thesis, 1951.

Siltstone, fine-grained, calcareous, dark brown	1.0	1.0
Middle gray cherty limestone member—("Hindsville" of Brant):		
Limestone, blue-gray, coarsely crystalline, hard, relatively unfossiliferous	4.2	5.0
Limestone, coarsely crystalline, blue-gray, bituminous odor, small angular chert pebbles weathered out on surface	0.8	0.8
Lower argillaceous limestone member—("Moorefield" of Brant):		
Limestone, hard, blue-gray, fine to coarsely crystalline, unfossiliferous	5.0	32.1
Limestone, silty, gray-green, weathers platy	0.3	27.1
Chert and limestone, hard, light gray, largely crystalline, sparingly fossiliferous limestone interbedded with tripolitic nodular, cherty limestone which weathers soft and brown	17.8	26.8
Limestone, dense, medium to light gray unfossiliferous, very hard, weathers to a smooth surface	9.0	9.0
Boone:		
Limestone and chert beds 2 to 4 inches thick, gray, crystalline, hard limestone; brown, tripolitic chert, weathers to "cotton rock"	1.5	16.0
Limestone, medium to coarsely crystalline, blue-gray, glauconitic, bituminous odor, hard	14.5	14.5
Covered		

27. SECTION EAST OF LINDSEY BRIDGE

Section 6, T. 20 N., R. 20 E.

Formational Description	*Thickness in Feet* Of Unit	To Base of Formation
Hindsville:		
Limestone, gray, medium gray weathering, massively bedded, crystalline, fossiliferous with *Agassizocrinus* and *Diaphragmus cestriensis* in abundance, top of hill	18.0	18.0
Moorefield:		
Upper siltstone member:		
Siltstone, yellow-brown, brownish-gray weathering, alternating massive and platy beds, calcareous, *Nudirostra carboniferum*	25.5	25.5
Middle gray cherty limestone member:		
Limestone, gray, weathers gray, massive, medium crystalline, forms cliff along river, bituminous, unfossiliferous, cherty	12.3	22.8
Limestone, gray, gray weathering, finely crystalline, cross-bedded, thin-bedded near top, unfossiliferous	10.5	10.5
Lower argillaceous limestone member:		
Limestone, gray, weathers gray, thin-bedded, with calcareous shale partings	16.0	46.8
Limestone, gray, argillaceous, thin-bedded, shaly weathering, platy float covers surface or area, unfossiliferous	14.8	30.8
Limestone, gray-blue, dense, massive, large amount of black chert nodules	6.0	16.0
Limestone, gray, weathers gray, platy in upper zones, massive in lower zones, dense, black nodular chert "stringers" or bands between beds	4.5	10.0
Limestone, gray, weathers light gray, shaly weathering, dense, *Griffithides pustulosus*	5.5	5.5
Covered to water level; Boone chert knob exposed 80 yards to east.		



MAP SHOWING LOCALITIES OF

POST BOONE OUTLIERS

IN

EASTERN MAYES, SOUTHERN DELAWARE, AND NORTHERN ADAIR COUNTIES

OKLAHOMA

R C SLOCUM MASTERS THESIS 1955

SCALE IN MILES

SURE 25

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