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THE TOPEKA LIMESTONE

by

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Distribution and Thickness

The Topeka limestone forms a narrow belt of outcrop which extends across the state of Kansas from its northern to its southern boundary. It is recognized in Nebraska and Missouri and is said to form the top of the Braddyville formation in the state of Iowa. Despite the change in thickness and lithology, it can be traced into Oklahoma as an equivalent to the Pawhuska formation of that state. Field studies upon which the following report is based were confined to the Kansas outcrop. The principal sections which have been measured an described are located in the counties of Doniphan, Atchison, Jefferson, Shawnee, Coffey, Greenwood, Elk, and Chautauqua.

The thickness of the formation is known increase from the north to the south. In Nebraska it is less than ten feet in certain areas. In parts of southern Kansas it is known to be more than fifty feet in places. Through most of the outcrop in the northern area it is topographically distinct. It forms a well defined escarpment rising above the underlying Deer Creek limestone over much of the north central Kansas area. Farther to the north its topographic expression is somewhat subdued because of the presence of glacial drift. Differentiation from the Deer

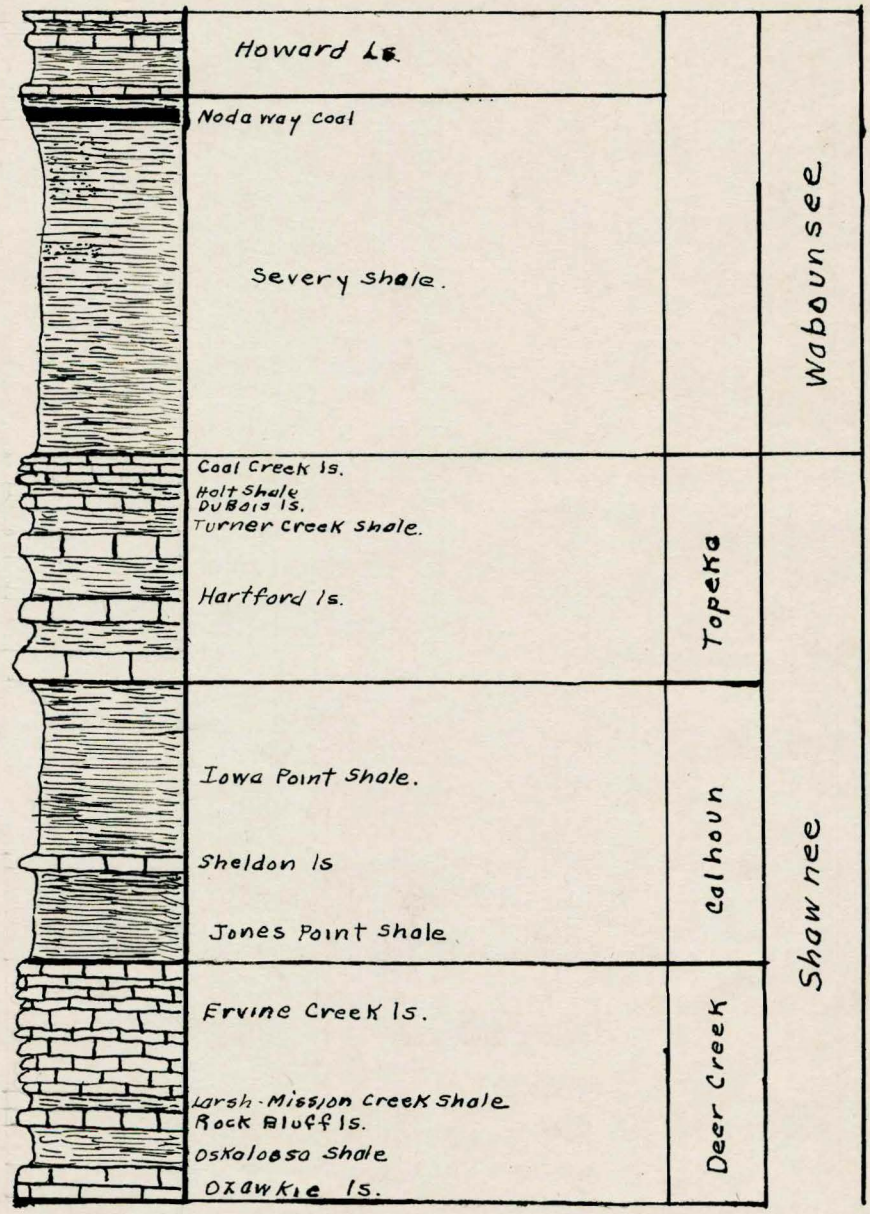
Creek is more difficult in the southern part of the area. Here the Deer Creek is the important scarp-maker and the lithology of the Topeka has changed into beds of less resistant nature. The intervening Calhoun shale has appreciably decreased in thickness in this area.

Stratigraphic Relations

In his recent classification of the Pennsylvanian rocks of Kansas, Moore[1] has placed the Topeka limestone as the topmost formation of the Shawnee Group of the Virgil Series. Such a position, he states, segregates beds in which thick limestones and distinctive type of cyclic sedimentation are important characteristics. This group (Shawnee) as now defined is also equivalent to the upper thick limestone beds encountered in drilling in the area to the west of the outcrop. The Topeka is overlain by the Severy shale, basal member of the Wabaunsee group. It overlies the shales of the Calhoun formation which separates it from the important limestone members which make up the Deer Creek formation. All members of the Topeka limestone are well exposed in the type section in SE $\frac{1}{4}$, Sec. 5, T. 11 S., R. 16 E., in the vicinity northeast of Topeka. These members, in ascending order, include the Hartford limestone, Turner Creek shale, DuBois limestone, Holt shale, and the Coal Creek limestone.

1. Moore, R. C. Stratigraphic Classification of the Pennsylvanian Rocks of Kansas. Kans. Geol. Survey, Bull.22, 1935

Generalized Section
showing
Stratigraphic Relations of the Topeka limestone



From Moore, R. C. Stratigraphic Classification of the Pennsylvanian Rocks of Kansas. Kansas Geological Survey Bulletin 22, pages 48- 49.

The Hartford limestone derives its name from the town of Hartford in ~~Coffey~~ Lyon County Kansas, where the type locality is situated. It consists of from one to three or four beds of massive or irregularly bedded gray limestone which weathers to a brown color. The individual limestone beds are separated by shales a few inches to several feet in thickness. The texture of the limestone beds is typically fine and dense but locally, crystalline phases may occur. In general the beds have a high ferruginous content but outcrops are known in which the limestones are pure and weather to a white color. In the northern part of the state chert horizons are to be found within the member. Fossil distribution within the Hartford is irregular and the faunal content is variable in its characters. Fusulinids are found at various horizons. Field observations of this member at the type locality of the Topeka indicate that it is made up of two, and perhaps three, partial cycles. The lower fusulinid zone is separated from the upper by a limited thickness of sandy, micaceous shale containing plant fossils. The cycle thus initiated extends to the Osagia limestone (Interval 8 of the type section) and it is likely that this should be considered the top of the Hartford. Should the Hartford be made to extend up to the Osagia limestone(Interval 10 of the type section) another partial cycle it seems must be included.

The Turner shale has been named by Condra[1] from its type locality on Turner Creek a short distance southeast of Du Bois Nebraska. It is a bluish gray, argillaceous to calcareous shale and is in general unfossiliferous. Its average thickness is 3 feet.

The DuBois limestone has also been named from its type locality along Turner Creek near Du Bois Nebraska. It is easily distinguished from other members of the Topeka by its peculiar lithology which is persistent over wide areas. It is made up of one or two dark blue , fine grained, dense limestone beds which show prominent jointing. This member is a typical "middle limestone" of the cycle and typically shows little bedding in the limestones from top to bottom. Fossils are numerous but not conspicuous since they weather from the homogeneous matrix with difficulty. Mollusks and brachiopods, especially Derbya, are common and in places the fusulinid limestone is also present. Weathering into fragments is rare but solution action is strong within the member. The thickness of the Dubois is slight and nowhere is over two feet. Its importanceas a stratigraphic horizon is determined by its distinct lithologic characters and its significance in the cyclothem sequence.

The Holt shale overlies the Dubois member of the Topeka limestone and is named from its type locality in Holt County, near Oregon, Missouri.

1. Condra, G. E. Nebraska Geol. Survey, Bull. 1 1927

It is a persistent, distinctive member which overlies the Du Bois limestone and underlies the Coal Creek limestone. The lower part consists of a black, fissile shale containing conodonts and some cornecus brachiopods. The upper part is bluish and argillaceous and contains pelecypods, calcareous brachiopods, and bryozoans. The contact between the two is gradational. The thickness ranges from two to three feet.

The type locality for the Coal Creek limestone, the uppermost member of the Topeka, is near Union Nebraska. In its cyclic relationship it corresponds to the Ervine Creek limestone of the Deer Creek. It shows at tendency to thin,wavy bedding and in places where the member is shaly, it is made up of light blue-gray lenses and nodules of limestone in a matrix of calcareous shale. Farther to the north it develops a more solid limestone phase. Black chert has been found within it in Iowa and Nebraska. Fossils are abundant and well preserved. Fusulinids and a large variety of bryozoans, and brachiopods are common. The thickness of the Coal Creek is about 8 feet.

Statement of the Problem

The members which have been described above are no equally distributed onver the area of outcrop which is known to be Topeka. The lithology changes from north

north to south with an increase in thickness in the same direction. The Coal Creek limestone has been traced into Iowa and Nebraska from the Topeka type section but has not been identified in any of the region to the south of Topeka. The same is true for the beds of the Holt shale, Dubois limestone, and the Turner Creek shale which lie below the Coal Creek. The Hartford limestone is the only member which can be identified to the south of the Kansas River but does not appear to be present in Nebraske and Iowa where the upper members are typically developed. The problem of the Topeka is thus one of explaining these variations in the development of the upper part of the section and the lower part the section in the northern and southern areas. It is somewhat complicated by the change in lithology from north to south and the increase in the thickness of the section. Such a study has been handicapped by the brief period over which field studies have been made and the lack of complete sections in vital points over the area. It is thought that any correlations which might be made is dependent upon the ability of one to recognise and interpret successive groups of beds showing cyclic sedimentation. Sections, which were measured in the field, however, are in most cases too lacking in detail to recognize all the changes in cyclic sedimentation. Areas which are labelled as covered in the sections may contain important changes in that regard. It is to be understood

any conclusions which may be made cannot be backed with any degree of certainty until more complete study of the area is made.

Description of Measured Sections

The type section of the Topeka limestone, as measured in section 16, T 11 S, R 16 E is about thirty feet in thickness and shows four partial cycles. These units are designated on the section shown on the following page. The nearest section in the southern area is one measured some distance to the south in section 25, T 25 S, R 11 E, Greenwood County, Kansas. Partial sections were measured in the intervening area but are of no value for study of the formation as a whole. It seems likely that parts of the cyclothems observed in the type section can also be recognized in the Greenwood county section where there is a slight increase in the thickness of the formation. The suggested relationships are shown in Figure 1 of a later page. The most easily traceable beds which link the type section to the southern area appears to be the Cyclothem B which contains the Hartford limestone of the type area. The Hartford itself has thinned to the south over the intervening area and the underlying shale has had a corresponding increase in thickness. Cyclothem A which is represented in the type section by thin fusulinid-bearing limestones has somewhat expanded to the south and may

Type Section of the Topeka Limestone

16- 11S- 16 E

Div. | Beds | Foss. | Strat. | Name

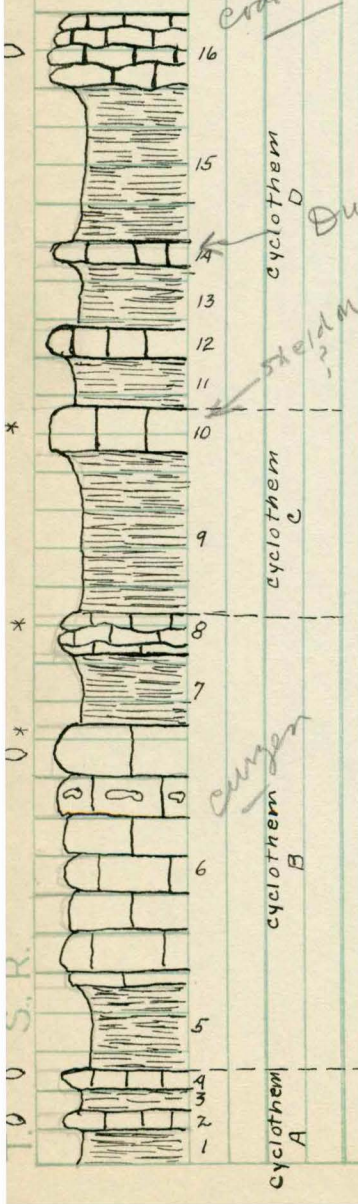
T. 11 S., R. 16 County Shawnee

Sec. 16

Locality description- Type Section of the Topeka northeast of Topeka

Measured by- Date- 3/10/40

Remarks-



Bed No.	Description	Thickness
16	Limestone, thin-beddedm buff, fossiliferous, fusulinids Coal Creek	2'
15	Shale, buff above, black fissile below	4'
14	Limestone, blue, dense, blocky, Derbya, gastropods	0.6'
13	Shale and limestone, thin-bedded, Myalina, brachs.	1.6'
12	Limestone, gray, molluscan fauna, gastropods	0.8'
11	Shale, gray	1.7'
10	Limestone, massive, buff, Osagia	1.7'
9	Shale, greenish gray	4.3'
8	Limestone, algal, Osagia, buff	1'
7	Limestone and shale, thin-bedded, bryozoans	2'
6	Limestone, gray, massive, weathers brown, fusulinids throughout. Osagia present except in lower 1½ foot chert layer 5' above the base.	6.8'
5	Shale. plants, 2" micaceous sandstone at base	2.1'
4	Ls.-gray, massive, weathers brown, crinoidal, fusulinids of the broad type	0.5'
3	Shale, buff	0.5'
2	Ls. - gray, fusulinids, osagia [illegible]	

Section; Greenwood County Section 25, T 25 S,R 11 E.

Measured near the viaduct along U. S. Highway 54.

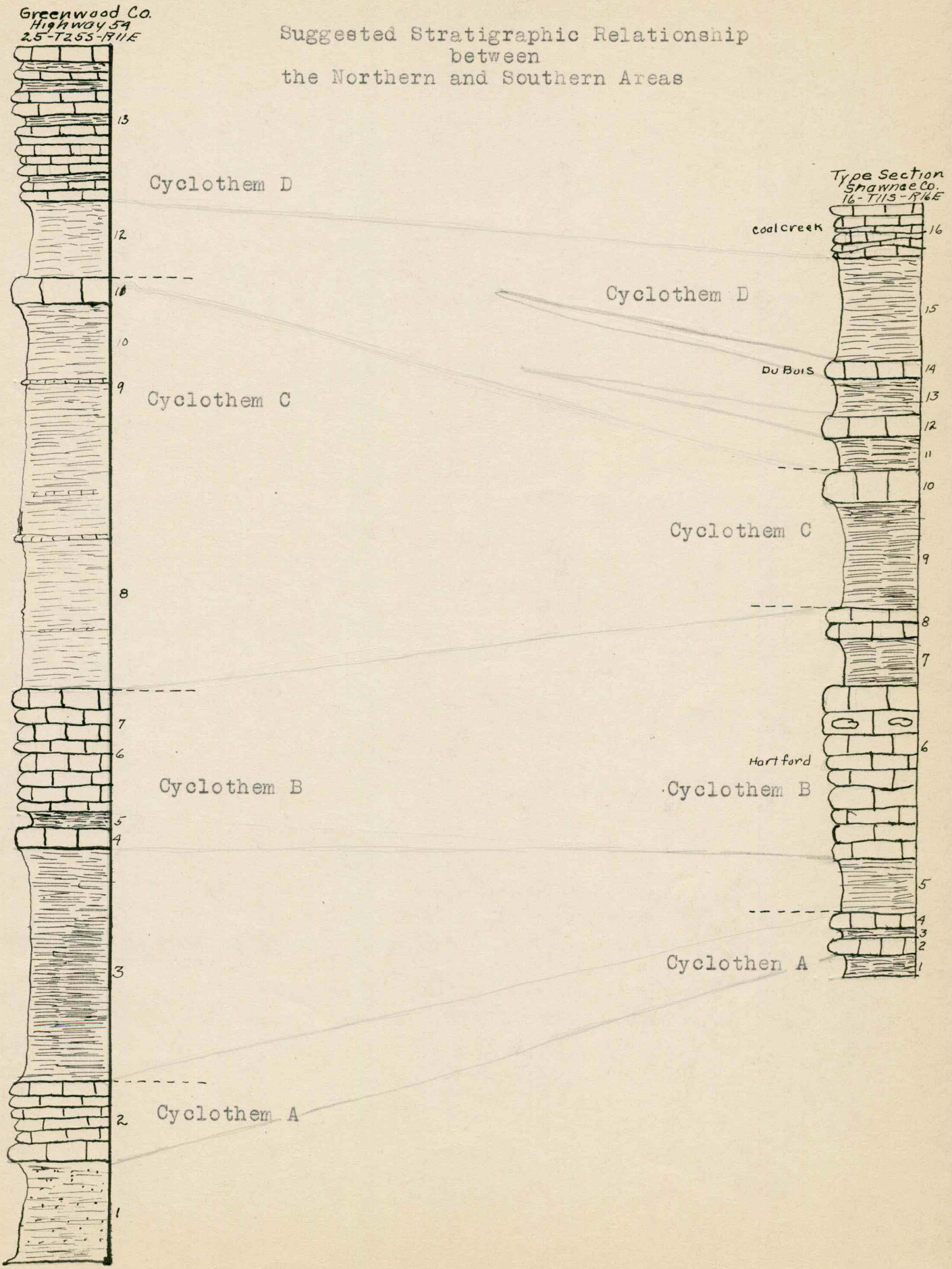
13.	Limestone, fusulinids, Derbya, Dictyoclostus, crinoid stems, bryozoans, Chonetes. Limestones are thin and interbedded with shale CONICK	6'
12.	Shale, yellow, calcareous HOLT	3'
11.	Limestone, gray weathering to brown, molluska, osagia. DU BOIS	1'
10.	Shale, mostly covered TURNER CK	3'
9.	Shale, yellow, calcareous with thin impure limestone beds. Lower limestones contain brachiopods SNEDDON	5'- 6'
8.	Shale, with thin limestone beds JOWER PT	6'
7.	Limestone, gray, osagia at the top, abundant fusulinids in the middle, Derbya, Dictyoclostus, osagia at the base.	3.5'
6.	Limestone, blue-gray, massive, ottonosia, productids, polypora CURZON	1.3'
5.	Shale, calcareous	0.5'
4.	Limestone, blue, massive, crinoids, brachiopods	0.7'
3.	Shale, covered TOWN PT	9'
2.	Limestone, weathers brown, wavy bedding planes, Dictyoclostus, bryozoans, crinoids, ottonosia abundant HARTFORD	3'
1.	Sandy shale, weathers brown, myalina, derbya	4'

(17 feet to the top of the Ervine Creek)

actually represent beds of limestone appearing in the Calhoun formation of the area to the south. Cyclothem C which is poorly developed and uncertainly determinable in the type section semms to have expanded greatly to the south into a zone of shales and thin limestone beds that carry some fossils. Cyclothem D which is believed to carry both the Du Bois limestone and the Coal Creek limestone of the type section is much restricted in the development of its lower units in the south. The Du Bois and associated limestones can not be recognized in Greenwood County and is likely that if sections in the intervening counties were available the locality of their disappearance might be determined. The shales lying between the Du Bois and associated limestones seem to have merged to a restricted vertical extent. The Coal Creek limestones may be represented by the thin limestones and shales to the south. Certainly the abundant fauna of that horizon persists. However such an interpretation is questionable in the absence of better control for that part of the column in the intervening area. It is conceivable that the two horizons are not exact equivalents but still represent different units of the same cyclic development.

Figure 1

Suggested Stratigraphic Relationship
between
the Northern and Southern Areas



Section measured in Elk County

Section 11, T 31 S, R 10 E.

Div. | Beds | Foss. | Strat. | Name

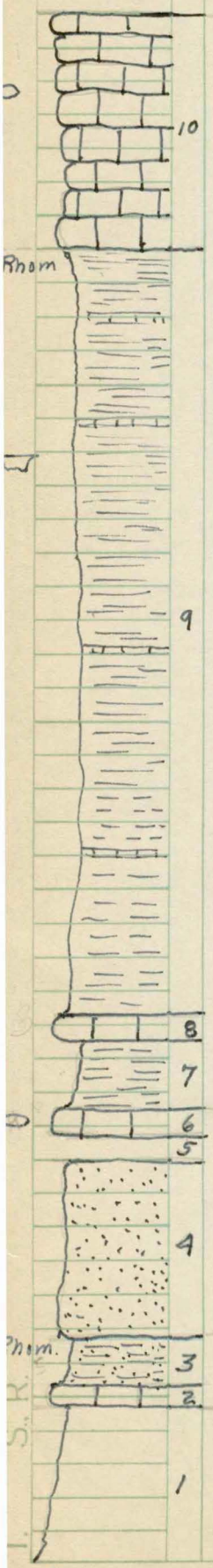
T. 31 S., R. 10 County EIK.

Sec. 11

Locality description-

Measured by- Date-

Remarks-



Bed No.	Description	Thickness
10.	Ls. - gray, weathers brown, abundant fusulinids	7'
9.	Shale, blue with thin fossil limestones. -chonetes, productids - fusulinids Rhompopora at top.	22'-9"
8.	Ls. - gray dense	11"
7.	Shale.	1' 11"
6.	Ls. - gray, fusulinids	1'
5.	Covered	9"
4.	Sandstone - fine, gray to buff. -	5' 4"
3.	Shale - sandy, Rhompopora zone at top.	1'-4"
2.	Ls. - dense, blue-gray.	5"
1.	Covered	41-10"

Ervine Creek.

Section measured in Elk County

Section 31, T29 S, R11 E.

Div. | Beds | Foss. | Strat. | Name

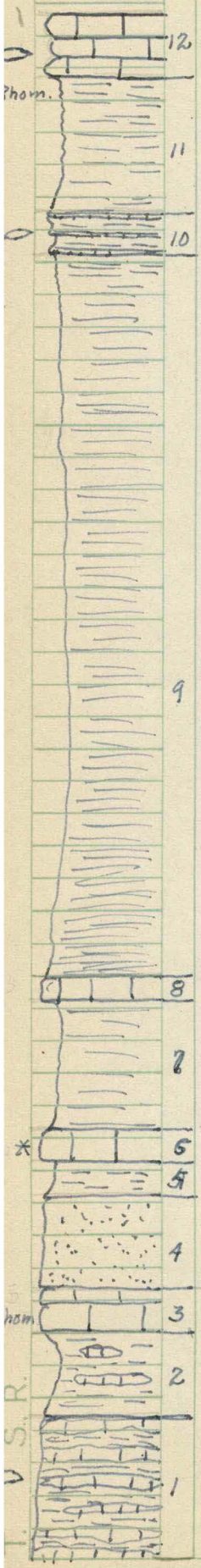
T. 29 S., R. 11 County ELK

Sec. 31

Locality description- ½ mile east Highway 99 on Fall River road.

Measured by- Date-

Remarks-



Bed No.	Description	Thickness
12.	Ls. - yellow, abundant fusulinids	2'
11.	Shale - yellow, calcareous, abundant Rhombopora	4'
10	Shale - light blue-gray, impure limestone with slender fusulinids.	1'-6"
9.	Shale - blue-gray, platy, fossiliferous	22'-3"
8	Ls. - blue, weathering buff, hard, earthy, fine.	.8'
7	Shale - covered	4'
6.	Ls. - blue weathering buff, hard, earthy, abundant osagio	1'
5.	Shale - dark gray	1'
4.	Sandstone - blue weathering brown, some plant remains	3'
3.	Ls. - blue, weathering brown, fine, sandy, bryozoans numerous, Rhombopora zone.	1'-3"
2.	Shale, blue-gray to nearly black, impure, some limestone nodules.	2"-6"
1.	Ls. - blue, dense, fine, lenticular and interbedded with yellow shale. - very fossiliferous - Hustedia - composita, fusulinids.	4'-6"

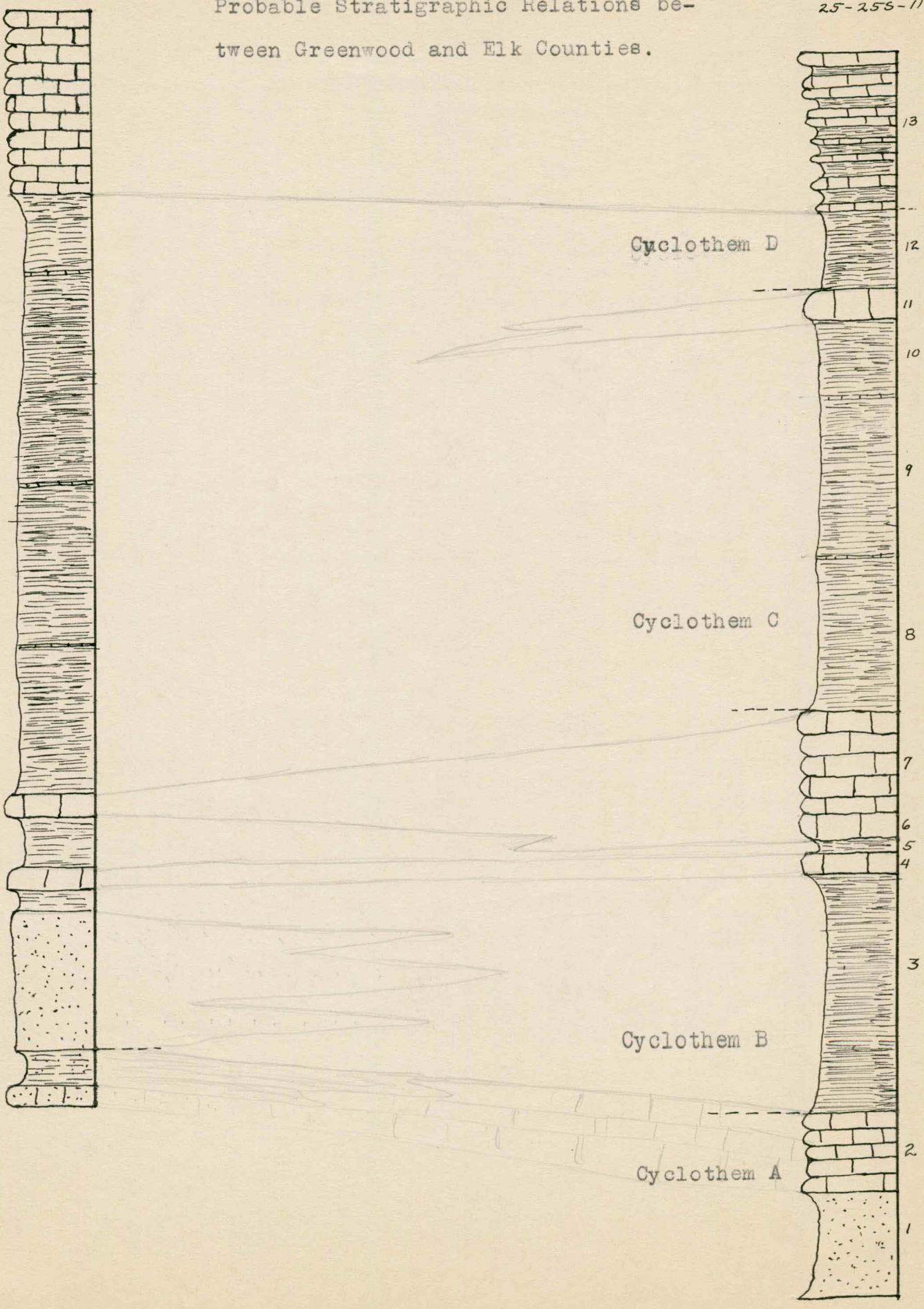
Sections measured in Elk County

The sections measured in Elk County show the presence of two distinct rhombopora zones. The upper zone immediately underlies the fusulinids- bearing limestones of the upper Topeka and overlies the extremely fossiliferous beds of thin limestones and shales that carry an abundance of Chonetes granulifer. The lower horizon lies below a sandston in the basal part of the section. The Calhoun formation has thinned in this locality to a very few feet. The probable relationships with the Greenwood section are indicated in Figure 2. The limestone of Cyclothem A shows a change of facies to the south and is replaced by the sandy phase of the lower rhombopora zone. As previously stated, this may rightfully belong to the upper Calhoun shales. The Hartford limestone as a lithologic unit is becoming much restricted in thickness in this locality. Shale units are becoming much more dominant as the formation is traced to the south. The upper fossiliferous limestones and shales still persist.

Sections measured in Chautauqua County near the Oklahoma boundary show an increased thickness of the formation as a whole and a dominance of the shale units as shown in the following section. The Hartford limestone is represented by less than a foot of brown fusulinid limestone. The upper fossiliferous bed appear to be the only zone which has persisted in the section from the north.

Figure 2.

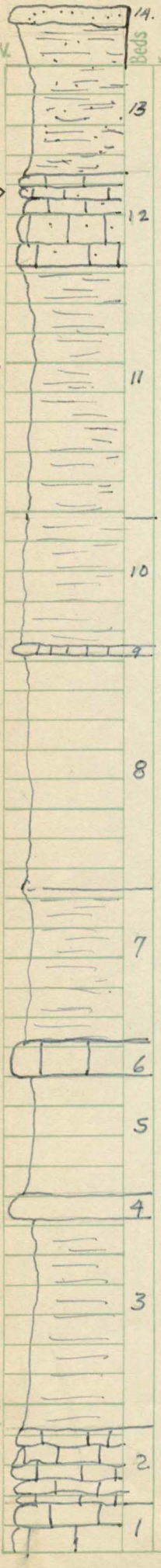
Probable Stratigraphic Relations between Greenwood and Elk Counties.



Section measured in Chautauqua County

Section 10, T 35 S, R 9 E.

South of Hewins near the Oklahoma boundary



Div. Beds Foss. Strat. Name

T. 35 S., R. 9 County Chautauqua

Sec. 10

Locality description- Road Section. South of Hewins.

Measured by- Date-

Remarks-

Bed No.	Description	Thickness
14.	Sandstone - brown - ferruginous	
13.	Shale - sandy, largely covered	5'-3"
12.	Ls. - upper 6" gray, crystalline, fusulinids and Osagia lower massive, weathering brown, sandy.	3'-1"
11.	Shale - poorly exposed, very fossiliferous, chonetes	8'-6"
10	Shale - blue	4'-4"
9	Ls. - gray - fusulinids.	5" exp.
8	Covered	8'
7.	Shale, brown, calcareous, largely covered.	5'-2"
6.	Ls. - gray, crystalline, osagia	13"
5	Covered	4'-2"
4	Ls. - brown, weathered, fusulinids	1'1"
3	Shale - gray, mostly covered	7'
2.	Ls. - thin, wavy beds, buff, crystalline	2'-7"
1.	Ls. - massive, gray, crystalline, osagia	21" exp

Section measured in Atchison County

15- T 5 S - R 19 E.

Div. | Beds | Foss. | Strat. | Name

T. 5 S., R. 19 County Atchinson.

Sec. 15

Locality description-

Measured by- Marshall. Date-

Remarks-

Bed No.	Description	Thickness
?14.	14. Limestone - gray, massive, robust fusulinids	8"
13	13 Covered -- thickness not recorded.	
12	12. Limestone - medium, gray, massive, very fossiliferous	10"
11	11. Limestone - thin bedded, fossiliferous.	7.5"
10	10. Shale, light green, silty, plants, brown to gray at top	2'-5"
9	9. Limestone - brown, massive, oolitic, molluscan.	1'-6"
8	8 Shale - gray with impure limestone members. Upper 19.6" gray shale; middle 8.7" argillaceous limestone; upper 31.7" greenish gray plastic shale.	5'
7	7. Limestone - massive, dark gray limestone, weathers brown, black chert (1" to 2" in diameter) near middle.	2'-5"
6	6. Limestone - gray, weathers brown, shale partings, Basal 10" - bryozoans, echinoid spines, brachs; 6" of short, fat fusulinids; 7" algae, fusulinids scarce; upper, - red brown, massive ls with large brachs.	2'
5	5. Shale - black to chocolate	8" to 10"
4	4. Limestone - brown, carbonaceous, nodular	3"
3	3. Shale - green, plastic	7'-9"
2	2. Limestone - massive, brown. Fusulinids at base - brachiopods.	3'-4"
1.	1. Shale - blue gray resting on micaceous sandy shale.	5'-6'

Section measured on Doniphan County

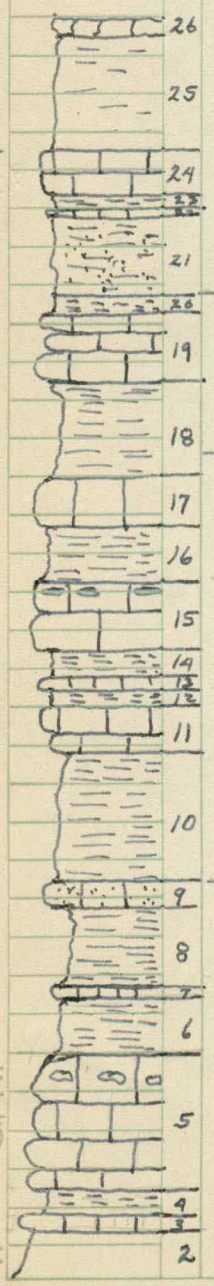
Div. | Beds | Foss. | Strat. | Name | T. S., R. County Doniphan.

Sec.

Locality description- Section along Creek.

Measured by- Date-

Remarks-



Bed No.	Description	Thickness
26.	Ls. - not in place - fusulinids	
25.	Mostly covered.	2'-9"
24.	Ls. - light gray, massive, very fossiliferous	1'-3"
23	Shale - light green	1"
22.	Ls. - platy, brown, laminae in relief	3"
21.	Siltstone - micaceous, gray-brown, plants, gastropods, ostracods	2'
20.	Shale, green.	6"
19	Ls. - argillaceous, green, gastropods in lower part.	1'-8"
18.	Shale - green.	2'-6"
17.	Ls. - light gray, Derbya, weathers buff.	1'-3"
16.	Shale - calcareous, green, very fossilliferous, echinoids, brachs, bryozoans.	1'-6"
15.	Ls. - light gray, black chert six in. from top.	1'-8"
14.	Shale - calcareous, fossils, fusulinids.	10"
13.	Ls. - light gray - fossils, fusulinids.	4"
12.	Shale - buff, fusulinids	5"
11.	Ls. - light gray, fusulinids, and brachs.	1'
10.	Shale, blue, micaceous.	3'-4"
9.	Ls. - sandy - fish teeth, platy.	10"
8.	Shale	2'
7.	Ls - cone in cone	4"
6.	Ls. and Shale, nodular, very fossiliferous.	1'4"
5.	Ls. - brown, massive, black chert near top.	3'3"
4.	Shale - buff to gray, calcareous.	8"
3.	Ls. - light gray. - fossils	5"
2.	Shale - green, marine fossils in upper part	16"
	Black Shale - base covered.	

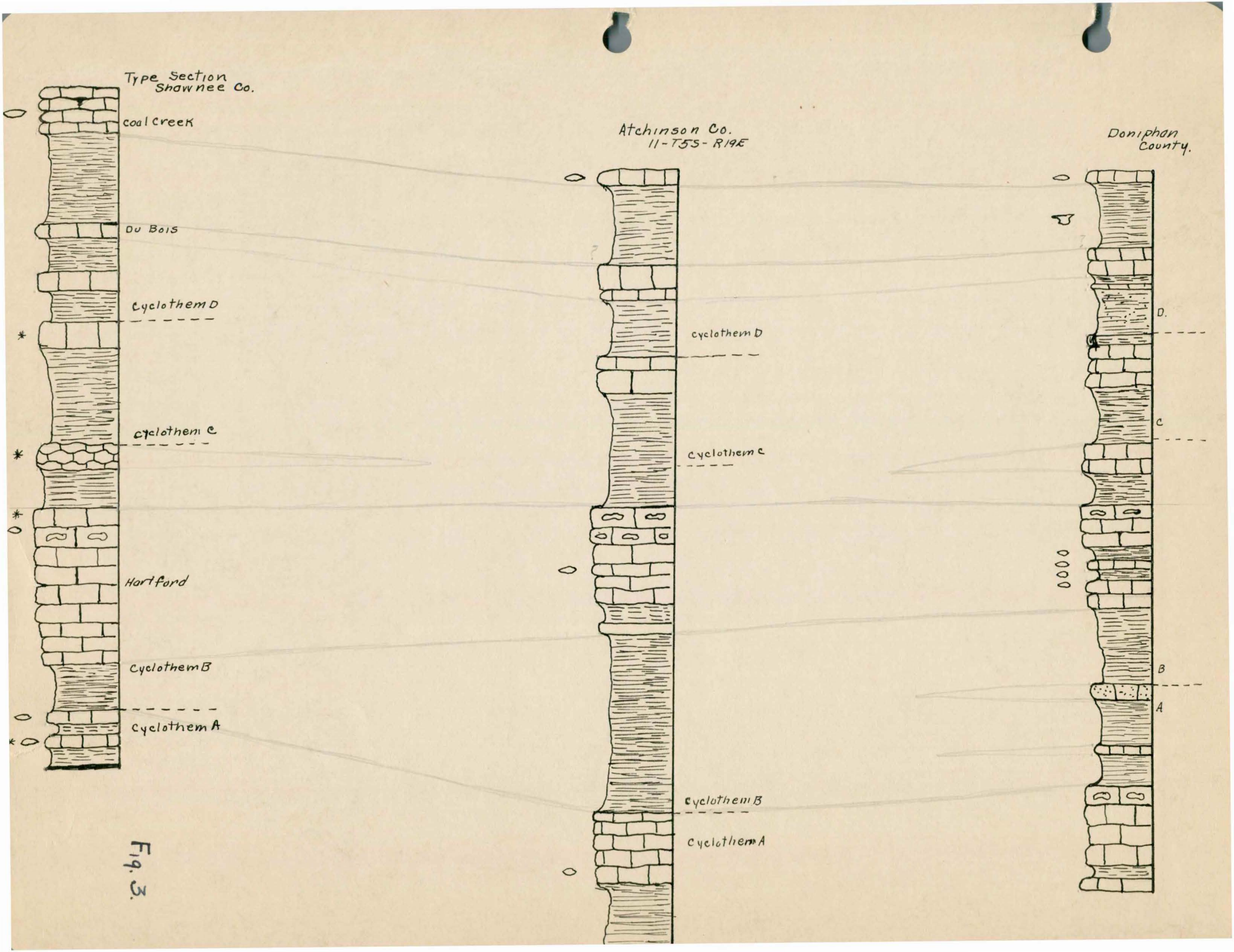

Type Section
Shawnee Co.
coal creek
Du Bois
Cyclothem D
Cyclothem C
Hartford
Cyclothem B
Cyclothem A
Atchinson Co.
11-T55-R19E
Cyclothem D
Cyclothem C
Cyclothem B
Cyclothem A
Doniphan
County.
D.
C
B
A

Fig. 3.

Section that were measured in the northern part of the state have a more certain correlation with the type section than those measured in the south. The relation between sections in Atchison and Doniphan counties and the type section is shown in Figure 3. Cyclothem A which may be a part of the upper Calhoun shales becomes more dominant to the north and the limestone members thicken considerably. The Hartford limestone of Cyclothem B shows considerable thinning in anorthward direction and is said to disappear from the Iowa section. Correlation of the DuBois is extremely uncertain in the Atchison and Doniphan sections. The correlation is made upon stratigraphic position rather than the peculiar lithology which is characteristic of the "middle limestones" such as the DuBois. The Coal Creek limestone appears to persist and form a distinct stratigraphic unit. Its presence in the Doniphan section, however, is based entirely upon the presence of float material.

Summary

The observations here given are by no means adequate to bring the problem of the Topeka formation to a satisfactory solution. Sections which have been utilized are often incomplete and too distant, one from the

other to be completely dependable. Many localities previously visited should be again examined in a more careful and detailed study. Intensive search for units of cyclic sedimentation should be made in outcrops throughout the area and a careful check upon those units made. A few phases, however, are suggested as a result of the brief attention here given to the problem.

1. The Hartford limestone reaches its maximum development in the area of the type section and appears to thin both northward and southward.

2. There is a thickening of the formation to the south and to a less extent to the north. Thickening is accompanied by a change in lithology to a dominance of shales to the south and a thinning of the Calhoun beds. The actual thickness of the Topeka formation in parts of these areas is questionable since the relation of the Calhoun shales to the basal member is somewhat obscure.

3. Two thin limestones which have been described as a part of or immediately below the Hartford in the type section appear to be of a different cycle (Cyclothem A) than the Hartford itself. These become more pronounced stratigra phic units to the north and also to the south as far as Elk County where they merge into the pandy phase of the lower Rhombopora zone. Additional study should be made of these members to determine whether they are a part of the underlying Calhoun

shales or perhaps an unnamed member of the Topeka.

4 The DuBois limestone appaers to be absent from the area to the south of the outcrop of the type section. In northern Kansas, if present, it has lost much of its characteristic lithology. It seems likely that any such conclusions regarding the DuBois are based upon hurried and incomplete study of the outcrops in that section. Further checking should add important information of the DuBois in that area.

5 The Coal Creek limestone persists in the northern area. It seems likely that a near stratigraphic equivalent is pres- in the area to the south as far as the southern boundary of the state.

40-12

15-35-9E

Howard

Severy

10-35-9E

Severy

H-C

Iowa Pt.

Iowa Pt.

Wolf R.

Calhoun

Errine Cr.

8-34-10E

11-31-10E

11-31-10E

3-30-11

6-30-11E

Curzon-Hartford

Iowa Pt.

31-29-11E

30-25-11E

32-26-11E

Howard

Severy

Wolfer

Calhoun

Errine Cr.

25-25-11E

1-23-12E