

NEW STRATIGRAPHIC NAMES FOR EARLY PLEISTOCENE DEPOSITS IN SOUTHWESTERN KANSAS

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ABSTRACT. At a Pleistocene conference held in Lawrence, Kansas on June 28-29, 1956, it was agreed that for the present a two-fold classification of stratigraphic units would be used in Kansas. The following new names as applied to Pleistocene units are defined: Meade group, Ballard formation, Angell and Atwater members and Sanborn group.

A Pleistocene conference was held in Lawrence, Kansas on June 28-29, 1956, at the invitation of Frank C. Foley, Director of the Kansas State Geological Survey. The purpose was to discuss certain disagreements in correlation and in stratigraphic nomenclature. In attendance were members of the State Geological Surveys of Kansas, Nebraska, and Oklahoma, the United States Geological Survey and Claude W. Hibbard of the University of Michigan.

The group agreed that for the present a two-fold classification would be used in Kansas, one classification for southwestern Kansas and another for the remainder of the state, with the exception of the southeastern corner. The revised classification summarized in this paper is to be used in southwestern Kansas. It is probably applicable also in northwestern Oklahoma, but not elsewhere in Kansas. The new agreement on some correlations and principles of nomenclature necessitated changes in the stratigraphic classifications of the Kansas State Geological Survey and of Claude W. Hibbard. A special committee was therefore formed to meet in southwestern Kansas and to review the stratigraphic sequence and select new rock names and type localities. The committee consisted of the Directors of the Kansas, Nebraska and Oklahoma Geological Surveys—F. C. Foley, E. C. Reed, and Carl C. Branson respectively; C. W. Hibbard, University of Michigan; C. K. Bayne and Ada Swineford, Kansas Geological Survey; and S. W. Lohman, T. G. McLaughlin, and A. R. Leonard, United States Geological Survey. The members of the committee, except E. C. Reed, spent July 24 and 25 in Meade and Seward counties, Kansas, examining Cenozoic outcrops.

A later publication of the State Geological Survey of Kansas will revise the Pleistocene stratigraphic classification for the remainder of Kansas. Dr. Frank C. Foley, Director of the Kansas Survey wrote as follows on April 20, 1957: "Since the conference on Pleistocene stratigraphic nomenclature held in Lawrence, Kansas June 28 and 29, 1956, and the field conference in Meade County on July 24 and 25, 1956, it has not been possible as of April, 1957, for the State Geological Survey of Kansas to select names to replace Meade and Blanco as formation names in the stratigraphic column to be used in Kansas other than in the Meade County area. It is hoped that selection of the necessary new names can be accomplished in the near future. When the names are selected it is planned to publish them and so to complete the tentative dual classification."

The accompanying chart (fig. 1) summarizes the new classification adopted for southwestern Kansas by the Lawrence Pleistocene Conference,

KANSAS PLEISTOCENE CLASSIFICATIONS								
SERIES	STAGE	KANSAS CLASSIFICATION MODIFIED AFTER FRYE & LEONARD, 1952	HIBBARD, 1949, 1950, 1955, & 1956	REVISED CLASSIFICATION, 1956				
				KANSAS GENERAL	SOUTHWESTERN KANSAS			
PLEISTOCENE	Wisconsinan	Mankatoan	Jones Ranch L.F. Vanhem formation	Sanborn group Odee formation local basin fillings	Bignell fm.	Sanborn group Kingsdown fm.		
		Caryan			Bignell member (sand and gravel)		terrace deposits	Jones Ranch L.F.
		Bradyan			Peoria member sand and gravel		Brady soil	Vanhem formation
	Tazewellian	Peoria fm.	terrace deposits					
	Sangamonian	Sanborn	Jinglebob L.F.	Sangamon soil	Jinglebob L.F.			
			Cragin Quarry L.F.			Cragin Quarry L.F.		
	Illinoian	Sanborn	Kingsdown formation	Loveland formation	Kingsdown fm.			
			Crete mem.	Crete fm.		Butler Spring (in press) Local Fauna		
	Yarmouthian	Meade fm.	Buried Caliche	Yarmouth soil	Buried Caliche			
	Kansan		Borchers L.F.	Crooked Creek formation	Sappa member	Borchers L.F.		
Pearlette ash mem.		Pearlette ash	Atwater member					
Grand Island mem.		Pearlette ash	Pearlette ash lentil Cudahy Fauna					
Aftonian	Meade fm.	Stump Arroyo mem.	Grand Island mem.	Crooked Creek formation				
		Seger L.F.	Kansan Till		Stump Arroyo mem. Seger L.F.			
		Sanders L.F.	Atchison member		Sanders L.F. Buried Caliche			
Nebraskan	Blanco fm.	Deer Park L.F.	Afton soil	Meade group Ballard formation				
		Missler member	Fullerton mem.		Deer Park L.F.			
		Dixon L.F.	Holdrege mem.		Missler member			
		Meade Gravels mem.	Nebraskan Till	Dixon L.F.				
			David City	Angell member				

Fig. 1.

and the changes from the former Kansas Survey classification and that of Claude W. Hibbard (1949).

The Rexroad formation was included in the Blanco formation of the former State Geological Survey of Kansas classification. The position of the Rexroad formation was discussed at the Pleistocene conference but decision on it was deferred. It is now recognized as older than the Meade group. The

age of the unit is currently carried as late Pliocene by the United States Geological Survey and I consider the Rexroad formation of late Pliocene age.

MEADE GROUP, NEW NAME

The Meade group in northern Kansas, includes all Pleistocene deposits above the base of the David City formation and below the Crete formation. In Meade County the Meade group includes all deposits above the Rexroad formation and below the Kingsdown formation.

BALLARD formation, new name.—The type locality of the Ballard formation is selected in an area where the Rexroad, Ballard and Crooked Creek formations occur in a continuous geological exposure, with the Pearlette (volcanic) ash (lentil) present in the Crooked Creek formation. In this area the formations are separated by erosional unconformities. The Ballard formation takes its name from the Louise Ballard Ranch which is shown on the Meade County Platt Book as having included the present Big Springs Ranch.

The area selected for the type locality of the Ballard formation is on the Big Springs Ranch in sections 7 and 18, T. 32 S., R. 28 W., Meade County, Kansas. This does not affect the type locality of the Missler member, which was originally designated as secs. 6 and 7, T. 32 S., R. 28 W. (Hibbard, 1949).

Type section of the Ballard formation, from Hart Draw, a tributary of Spring Creek in the S¹/₂ NW¹/₄ sec. 18, to the center of NW¹/₄ of sec. 18, T. 32 S., R. 28 W., measured August 15, 1956, by C. K. Bayne and C. W. Hibbard.

	Thickness in feet
Topsoil	1.0
Crooked Creek formation	
Atwater member	
17. Silt, tan to buff, contains caliche nodules near top	7.5
Stump Arroyo member	
16. Sand, gravel and cobbles	17.0
Ballard formation	
Missler member	
15. Clay, silty, brown, mollusks present (Sanders fauna)	1.5
14. Silt, clayey (weathers to gray), contains many mollusks and vertebrates (Sanders fauna)	1.6
13. Silt, buff-gray, contains much nodular caliche	1.0
12. Silt, buff-gray	8.0
Angell member	
11. "Mortar bed" (limey sand and gravel lower one foot more loosely cemented)	1.8
10. Sand and gravel	5.5
Rexroad formation	
9. Clay, reddish gray, contains mollusks	3.0
8. Caliche	0.5
7. Sand, fine and medium	2.0
6. Caliche	0.2
5. Silt, sandy, light reddish gray mottled yellowish tan	4.3
4. Caliche, hard and massive	0.5
3. Silt, light gray, containing many mollusks (Rexroad fauna)	2.5
2. Silt, reddish gray, containing some fine sand	2.0
1. Silt, light reddish gray, containing many caliche nodules	7.5
Bed of Hart Draw, from base of cut upward	

The section was continued on the east side of the next draw to the west in approximately the center of the NW $\frac{1}{4}$ sec. 18, T. 32 S., R. 28 W., Big Springs Ranch. The Stump Arroyo member is exposed in part, but an interval is covered with slope wash and vegetation on the east side.

	Thickness in feet
Topsoil	1.0
Crooked Creek formation	
Atwater member	
22. Silt, gray-white, contains much caliche	1.75
21. Silt, gray	5.5
20. Clay, reddish brown	1.0
19. Silt, gray	4.5
18. Pearlette volcanic ash lentil, clean	1.0

Section measured on the west side of this draw, in approximately the center of the NW $\frac{1}{4}$ sec. 18, T. 32 S., R. 28 W.

Topsoil	0.5
Crooked Creek formation	
Atwater member	
18. Pearlette volcanic ash lentil	6.0
17. Silt, sandy, yellow mottling, containing mollusks (Cudahy fauna)	2.5
Stump Arroyo member	
16. Sand and gravel, base not exposed	

A much thicker deposit of the Pearlette volcanic ash occurs in the next draw west in NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 18. Another good exposure of the Pearlette ash occurring in this area is in the NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 7, T. 32 S., R. 28 W. At this exposure the Cudahy fauna is present at the base of the ash, and the top of the Stump Arroyo member can also be seen. From the topography of the area it appears that these isolated exposures of Pearlette ash were laid down in a single basin and were continuous.

ANGELL member, new name.—The best exposure of the Angell sand, gravel and cobble member of the Ballard formation on the Big Springs Ranch occurs in the Sanders Gravel pit, SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 7, T. 32 S., R. 28 W. The name is derived from the old Angell Schoolhouse which was located in the southeast corner of the NE $\frac{1}{4}$ sec. 31, T. 32 S., R. 29 W. The school district, No. 15, was named after Mr. A. V. Angell, one of the early and leading citizens of that community.

Type section of the Angell member, from the base of the Sanders gravel pit and measured northeast toward U. S. Highway 54, by C. K. Bayne and C. W. Hibbard, August 15, 1956.

Crooked Creek formation	
Stump Arroyo member, sand gravel and cobbles	
Ballard formation	
Missler member	
5. Clay, reddish brown, limy	0.7
4. Silt, reddish gray, some nodular caliche	9.1
3. Caliche	1.8
2. Silt, tan-gray, containing caliche nodules	13.3

Angell member

- | | |
|--|------|
| 1. Sand, gravel and cobbles, cross bedded at base and cemented in part | 13.7 |
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Rexroad formation at base.

A good exposure of the cemented Angell member can be seen in the northwest corner of the NE $\frac{1}{4}$ sec. 24, T. 32 S., R. 29 W., along the south bank of Spring Creek, which is approximately one mile southwest of the type locality. At this locality the Rexroad formation is exposed and contains both vertebrate and invertebrate fossils.

ATWATER member, new name.—Type section of the Atwater member of the Crooked Creek formation is in the N $\frac{1}{2}$ sec. 21, T. 33 S., R. 28 W., on the east side of Crooked Creek, Meade County, Kansas. The member consists of sandy silt, silt, silty clay, and clay which contains the Pearlette ash lentil, when present; also a massive caliche is generally present at the top of the member. This member overlies the Stump Arroyo sand and gravel member. The name is derived from the old Atwater Post Office which was first located in the center of the S $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 34, T. 33 S., R. 29 W., and later moved to the SE $\frac{1}{4}$ sec. 21, T. 34 S., R. 29 W. The following stratigraphic section at the type locality is modified after Frye, 1942, p. 71.

Topsoil	Thickness
Crooked Creek formation	in feet
Atwater member	
9. Silt, sand and some clay, tan to buff brown, contains some caliche nodules. The surface at the top of the bluff is covered with a rubble of caliche	14.8
8. Silt, sandy, gray to tan	5.4
7. Clay, with some silt and sand, light gray, massive. Breaks with a conchoidal fracture when dry (Borchers fauna at base)	4.5
6. Silt, clay, and some sand, gray, massive, containing a few calcareous nodules (Borchers fauna at top)	6.4
5. Pearlette volcanic ash, pearl gray, lenticular, somewhat impure	3.1
4. Clay, silt, and some sand, tan gray, and brown gray, massive, (Cudahy fauna occurs in top 12 inches and base of ash)	9.5
3. Silt, red brown to reddish, containing caliche nodules	6.0
Stump Arroyo member	
2. Sand, coarse gravel and some silt, brown	2.8
1. Sand, coarse, reddish to light tan, and well sorted, containing white quartz pebbles, grading upward into finer more poorly sorted sand, and gravel at top	10.1

Ogallala formation

SANBORN GROUP, NEW NAME

The Sanborn group in southwestern Kansas includes the Kingsdown and Vanhem formations, as well as the isolated basin fillings termed the Odee formation (Hibbard, 1949).

The committee is most grateful to the many landowners of Meade and Seward counties, Kansas, who gave us free access to their ranches to examine

geological exposures; also, to many residents who made available the early records and maps which were used in the selection of the new names here proposed. We wish to thank George V. Cohee, Chairman, Geologic Names Committee of the United States Geological Survey, for confirming the availability of the new names. I am indebted to Frank C. Foley and Charles K. Bayne for reading the manuscript and offering valuable suggestions.

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