

Mississippian Stratigraphic Nomenclature Revisions in Kansas

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Abstract

This paper reviews proposed Mississippian nomenclature changes in Kansas and outlines the changes to Zeller (1968) that have been adopted by the Kansas Geological Survey. The Sedalia Dolomite is changed to the Sedalia Formation and the Northview Shale is changed to Northview Formation due to lateral lithology changes. The Short Creek Oolite Member as originally defined and described by Smith and Siebenthal (1907) at the type section in Kansas is reinstated. The Cowley Formation as originally defined and described by Lee (1940) in Kansas is reinstated. The Ste. Genevieve Limestone is placed as the basal formation of the Chesteran Stage.

Introduction

The current accepted stratigraphic guide and chart for Kansas was published 50 years ago (Zeller, 1968). Since then, papers and volumes have been published with proposed changes to the stratigraphic chart, one notable publication being Kansas Geological Survey Bulletin 230, Revision of Stratigraphic Nomenclature in Kansas (Baars, 1994). That volume contained “Revision of Mississippian Stratigraphic Nomenclature in Kansas” by Maples (1994). This paper reports changes to Zeller (1968) that are now formally adopted by the Kansas Geological Survey (KGS).

Sedalia Dolomite—Sedalia Formation

Maples (1994) recommended changing Sedalia Dolomite to Sedalia Formation (fig. 1) because of lithology changes between areas in Kansas. In accordance with the Stratigraphic Code (NACSN, 2005; Article 18 (a)—Change in lithic designation), we adopt the use of Sedalia Formation (fig. 2).

Northview Shale—Northview Formation

Maples (1994) recommended changing Northview Shale to Northview Formation (fig. 1). Because a number of studies (e.g., Weller, 1901; Lee, 1940) have documented different lithologies between areas, we adopt the use of Northview Formation in accordance with the Stratigraphic Code (NACSN, 2005; Article 18 (a)—Change in lithic designation) (fig. 2).

Short Creek Oolite Member

of the Burlington Limestone—Keokuk Limestone

Maples (1994) depicted the Short Creek Oolite Member of the Keokuk Limestone on his stratigraphic chart (fig. 1). Smith and Siebenthal (1907) originally designated and described the type section for the Short Creek Oolite Member in Cherokee County, Kansas. Goebel (1968a, b) did not mention the Short Creek Oolite Member, and it is not shown on the stratigraphic chart of Zeller (1968). Goebel (1968a, b) did not provide any justification for abandonment of the term designated by Smith and Siebenthal (1907) as required by the Stratigraphic Code (NACSN, 2005; Article 20—Abandonment).

The Short Creek Oolite Member is distinct and recognized regionally in Kansas, Missouri, Oklahoma, Nebraska, and Arkansas. The geologic community has accepted and used the term in published peer-reviewed literature both before and after publication of Goebel (1968a, b) and Zeller (1968) (e.g., Moore et al., 1939; Lee, 1940; Weller et al., 1948; Lee, 1956; McKnight and Fischer, 1970; Seevers, 1975; Thompson, 1986; Kammer et al., 1990; Franseen, 2006; Ritter and Goldstein, 2012; Ramaker et al., 2015; Jayne et al., 2016). Therefore, in accordance with the Stratigraphic Code (NACSN, 2005; Article 20 (d)—Reinstatement), we reinstate the Short Creek Oolite Member as originally defined by Smith and Siebenthal (1907) at the type section in Kansas and adopt the way in which it is depicted on the stratigraphic chart of Maples (1994) (figs. 1 and 2).

Cowley Formation

Maples (1994) recommended resurrecting the Cowley Formation of Lee (1940) due to its distinct lithologic character compared to other Mississippian units in Kansas (fig. 1). Goebel (1968b) replaced the use of Lee's (1940) Cowley Formation with the informal term "Cowley facies" (his quotes) but did not provide sufficient justification for abandonment of the term Cowley Formation as required by the Stratigraphic Code (NACSN, 2005; Article 20—Abandonment). The change appears to have been partially due to questions about the age of the Cowley Formation, as inferred from Goebel (1968a), but that is not sufficient justification for abandonment of the term Cowley Formation of Lee (1940) (NACSN, 2005; Article 13—Age; Article 22—Nature of lithostratigraphic units; Article 22 (d)—Independence from inferred geologic history; Article 22 (e)—Independence from time concepts).

As reported in Goebel (1968a, b), Thompson and Goebel (1968) used microfossils to show that the "Cowley facies" is equivalent to lithologic units from the Chattanooga Shale into the St. Louis Limestone. Subsequent work (e.g., Watney et al., 2001) corroborates the same time span for the "Cowley facies" (Cowley Formation of Lee, 1940), although the upper and lower boundaries have not yet been clearly defined.

The term Cowley Formation as proposed by Lee (1940) has been used by the geologic community since publication of Maples (1994) and appears in numerous peer-reviewed publications up to the present (Rogers et al., 1995; Montgomery et al., 1998; Watney et al., 2001; Watney et al., 2005; Watney et al., 2008; Mazzullo et al., 2009; Mitchell and Simpson, 2015). Montgomery et al. (1998) specifically pointed out the confusion with regard to stratigraphy and depositional history that has resulted from use of Goebel's (1968b) informal "Cowley facies" as a unit designation and, therefore, used the original term Cowley Formation and description as proposed by Lee (1940). In accordance with the Stratigraphic Code (NACSN, 2005; Article 20 (d)—Reinstatement), we reinstate the Cowley Formation as originally defined and described by Lee (1940) in the subsurface of Kansas and adopt the way in which it is depicted on the stratigraphic chart of Maples (1994) (figs. 1 and 2).

Meramecian Stage Boundaries

Maples (1994) proposed changes to the Meramecian Stage boundaries based on work by Maples and Waters (1987, 1988). Those authors moved the Ste. Genevieve Limestone from the Meramecian Stage to the Chesteran Stage based on conodont and foraminiferal zones that placed the biostratigraphic boundaries at approximately the St. Louis Limestone–Ste. Genevieve Limestone boundary and on related faunal similarity with younger Chesteran units. Thompson (2001) adopted the change and placed the Ste. Genevieve Limestone as the basal formation of the Chesteran Stage for Missouri, which is where the Ste. Genevieve type section is located. To be consistent with the change in boundary placement that has been made for other North American areas, including at the type section, we accept the change and move the Ste. Genevieve Limestone to the base of the Chesteran Stage (figs. 1 and 2).

Period	Stage	Formations/Members (Goebel, 1968a, c)	Formations/Members (This report)	Stage	Period	
MISSISSIPPIAN	Chesterian	unnamed unit(s)	Shore Airport Formation	Chesterian	MISSISSIPPIAN	
		Ste. Genevieve Limestone	Ste. Genevieve Limestone			
	Meramecian	St. Louis Limestone	St. Louis Limestone	Stevens Mbr. Hugoton Mbr.		Meramecian
		Salem Limestone	Salem Limestone			
		Warsaw Limestone	Warsaw Limestone			
		Keokuk Limestone	Keokuk Limestone	Short Creek Oolite Mbr.		
	Osagean	Burlington-Keokuk Limestone	Burlington-Keokuk Limestone	Elsley Fm.		Osagean
		Burlington Limestone	Burlington Limestone			
		Fern Glen Limestone	Reed Spring Ls. Mbr. St. Joe Ls. Mbr.	Reed Spring Ls. Mbr.		
			Pierson Limestone			
Kinderhookian	Gilmore City Limestone	Gilmore City Limestone	Northview Formation	Kinderhookian		
	Sedalia Dolomite (Northview Shale)	Sedalia Formation				
	Chouteau Limestone (Compton Limestone)	Compton Limestone				
	Boice Shale	Hannibal Shale				
DEVONIAN		Chattanooga Shale	Chattanooga Shale		DEVONIAN	

Figure 1. Mississippian stratigraphic nomenclature proposed by Maples (1994). Figure from Maples (1994). (Note: Goebel [1968c] reference in figure corresponds to Goebel [1968b] in this paper.)

Summary of Formally Adopted

Mississippian Stratigraphic Nomenclature Revisions

The following changes are adopted by the Kansas Geological Survey, and the stratigraphic chart of Zeller (1968) is modified accordingly (fig. 2).

1. Because of lateral lithologic changes between different areas, the Sedalia Dolomite is changed to Sedalia Formation on the updated stratigraphic chart of Zeller (1968).
2. The Northview Shale is changed to Northview Formation on the updated stratigraphic chart of Zeller (1968) because of lateral lithology changes between areas.
3. The Short Creek Oolite Member of the Burlington Limestone–Keokuk Limestone as defined and described by Smith and Siebenthal (1907) is reinstated and appears on the updated

Zeller, 1968		KGS Nomenclature, 2017		ICS Nomenclature	
	CHESTERAN STAGE		CHESTERAN STAGE		SERPUKHOVIAN STAGE *
Ste. Genevieve Limestone		Ste. Genevieve Limestone			UPPER MISS. SERIES
	MERAMECIAN STAGE		MERAMECIAN STAGE		MIDDLE MISSISSIPPIAN SERIES
St. Louis Limestone		St. Louis Limestone			
Salem Limestone		Salem Limestone			
Warsaw Limestone		Warsaw Limestone			MISSISSIPPIAN SUBSYSTEM
Keokuk Limestone		Short Creek Oolite Mbr. Keokuk Limestone			
— ? — Burlington Limestone		— ? — Burlington Limestone			
Reeds Spring Ls. Mbr.	OSAGIAN STAGE	Reeds Spring Ls. Mbr.	OSAGIAN STAGE	OSAGIAN STAGE	TOURNAISIAN STAGE
Fern Glen Limestone		Fern Glen Limestone			
St. Joe Limestone Mbr.		St. Joe Limestone Mbr.			LOWER MISSISSIPPIAN SERIES
Gilmore City Limestone		Gilmore City Limestone			
Sedalia Dolomite (Northview Shale)		Sedalia Formation (Northview Formation)			
Chouteau Limestone (Compton Limestone)		Chouteau Limestone (Compton Limestone)			MISSISSIPPIAN SUBSYSTEM
Boice Shale		Boice Shale			
Chattanooga Shale	KINDERHOOKIAN STAGE	Chattanooga Shale	KINDERHOOKIAN STAGE	KINDERHOOKIAN STAGE	CARBONIFEROUS SYSTEM
Misener Sandstone Mbr.		Misener Sandstone Mbr.			
	DEVONIAN SYSTEM		DEVONIAN SYSTEM		DEVONIAN SYSTEM

Figure 2. Mississippian nomenclature changes to Zeller (1968) that are formally adopted by the KGS. Left column: Zeller (1968). Center column: This paper, changes are highlighted in red. Right Column: International Commission on Stratigraphy (ICS) nomenclature; stage boundary with asterisk has not been ratified by the ICS/International Union of Geological Sciences (IUGS).

- stratigraphic chart of Zeller (1968) as proposed by Maples (1994).
- The Cowley Formation as defined and described by Lee (1940) in the subsurface of Kansas is reinstated and appears on the updated stratigraphic chart of Zeller (1968) as proposed by Maples (1994).
 - The Ste. Genevieve Limestone is placed as the basal formation in the Chesteran Stage on the updated stratigraphic chart of Zeller (1968) to be consistent with the change in boundary placement in other areas of North America, including at the Ste. Genevieve type section in Missouri.

KGS Stratigraphic Nomenclature Committee

This paper was completed by current members of the Kansas Geological Survey's Stratigraphic Nomenclature Committee, which was re-established in July 2005 to address stratigraphic issues and establish formally accepted stratigraphic nomenclature for Kansas. The Stratigraphic Nomenclature Committee is the official arbiter of stratigraphic nomenclature and issues in Kansas, subject to review by the state geologist. More information about the committee and Kansas stratigraphic nomenclature is available at <http://www.kgs.ku.edu/General/Strat/index.html>.

The Kansas Geological Survey recognizes Zeller (1968) as the current accepted guide and chart for Kansas. Nomenclature changes will follow the North American Stratigraphic Code (2005), and changes will conform to international stratigraphic nomenclature standards as they apply to Kansas.

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