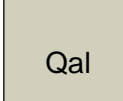


SURFICIAL GEOLOGY OF THE TALLGRASS PRAIRIE NATIONAL PRESERVE, CHASE COUNTY, KANSAS

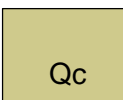
Geology by
Robert S. Sawin
2008

Geologic Unit Descriptions

CENOZOIC



Alluvium Deposits – The valley floor of Fox Creek and many of the narrow, upland tributaries contain floodplain and terrace deposits of gravely silt loam and silty clay. The alluvium in Fox Creek valley is up to 35 feet thick.



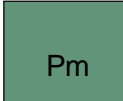
Colluvium/Alluvium Deposits – Colluvium/alluvium fans contain fine- to coarse-grained (angular chert and limestone fragments) material derived from the uplands. These deposits are up to 15 feet thick.

PALEOZOIC



Barneston Limestone
Florence Limestone Member – The Florence limestone caps the highest hills along the northwest edge of the preserve. Up to about 15 feet of lower Florence limestone is present. The Florence is a light-gray to yellow-gray limestone containing several nodular layers of light- to dark-gray chert. Fossils are common. As the Florence weathers, the more resistant chert accumulates on the slopes, and the hilltops become characteristically rounded.

Blue Springs Shale Member – The Blue Springs shale is about 22 feet thick and poorly exposed. The upper part is a gray, yellow, or yellowish-green mudstone that may contain thin, discontinuous layers of limestone. Near the middle, a 1-foot bed of limestone can occur. The lower part of the Blue Springs is a varicolored (yellowish-green, green, red, and purple) mudstone.



Kinney Limestone – The thickness of the Kinney limestone can vary in a short distance, ranging from 9 to 22 feet. The average thickness is about 16 feet. Three zones, an upper and lower limestone with a middle mudstone, are common. The upper limestone is gray and up to 2 feet thick. Fossil fragments (ostracodes) are characteristic; often make up almost the entire rock, giving it a grainy texture. The middle mudstone is gray to green and may contain one or more calcareous zones or thin limestones. Fossils are more common in the middle and upper parts. The lower limestone ranges from less than a foot to over 9 feet thick. This thickening can occur within a very short distance. Where it is thicker, the light-gray to gray limestone is fossiliferous and weathers to large, elongated blocks that accumulate on the slope below the outcrop.

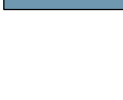
Wymore Shale Member – The Wymore shale is about 27 feet thick. The upper part is a light-yellowish-brown, gray, and green mudstone that contains a thin limestone; the middle is varicolored (red, purple, and green) mudstone and may contain a boxwork limestone; and the lower mudstone is gray, light yellowish brown, and yellowish green.



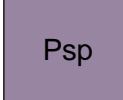
Wreford Limestone – The Wreford Limestone is composed of three members – from top to bottom, the Schroyer limestone; the Havensville shale; and the Threemile limestone. The combined thickness is about 40 feet.

Schroyer Limestone Member – The thickness of the Schroyer limestone is about 13 feet. The upper part is a massive, gray limestone with layers of chert up to 0.5 feet thick. Weathered blocks can have large vugs, and small fossils are common. The middle part is a soft, orange-brown limestone that has a porous, clayey appearance. The lower third is a gray limestone containing layers of chert. Springs sometimes occur at the base of the Schroyer.

Havensville Shale Member – The Havensville shale is about 9 feet thick. It is a light-yellowish-brown, green, and yellowish-green mudstone with interbedded (up to 2 feet) clayey, light-gray, and light-yellowish-brown limestones that are fossiliferous.



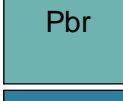
Threemile Limestone – The Threemile limestone is prominent at the preserve, forming a bench or “rimrock” of gray limestone that caps most of the flat-topped hills. The average thickness of the Threemile is 18 feet. Nodular and banded chert (chert layers can be almost 1 foot thick) is more abundant in the upper and lower parts of the unit. Chert is usually absent in the middle-to-upper part, and the limestone weathers to large blocks, which are sometimes vuggy. It is this part of the Threemile that forms the prominent rimrock. Thin mudstone layers may occur within the limestone, and fossils are common throughout the unit. Springs are commonly associated with the Threemile.



Speiser Shale – The Speiser Shale is about 17 feet thick. The upper part is a gray to green, calcareous, fossiliferous mudstone that may contain thin limestone layers. The middle and lower part of the Speiser is a varicolored (red, purple, and green) mudstone.



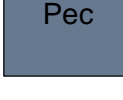
Funston Limestone – The Funston Limestone averages about 20 feet in thickness, but varies from 15 to 24 feet and can generally be divided into an upper and lower limestone separated by a mudstone. The upper limestone contains several mudstone layers, but in general, the upper part is a light-yellowish-brown to light-gray, thin, platy limestone (rarely exposed), and the lower part is a gray, fossiliferous, massive limestone that commonly crops out on the hillsides, often forming a prominent bench. The middle mudstone is black to dark gray. The lower limestone is very light gray to light yellow gray (sometimes nearly white), very fine grained, and weathers into thin plates and blocks with sharp, angular edges. Fossils occur at some localities. Springs from the upper and lower limestones are abundant.



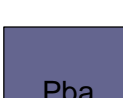
Blue Rapids Shale – The Blue Rapids Shale varies in thickness from 14 to 24 feet, but averages about 17 feet. The gray, green, and light-yellowish-brown, calcareous mudstone may contain a thin limestone layer or boxwork limestone in the lower part of the unit.



Crouse Limestone – The Crouse Limestone is about 11 feet thick, but ranges from 7 to 15 feet. The upper part is a yellow-gray, clayey limestone that weathers into thin plates, a characteristic of this part of the Crouse. The lower part is a gray or light-yellowish-brown, fossiliferous, and weathers rubbly, platy, or blocky. Below the upper limestone is a green mudstone, and below it, a black, fissile shale. The lower limestone is only 2 to 4 feet thick, but forms a prominent bench with large, detached blocks of limestone scattered along the outcrop. Springs occur at the base of the lower limestone.



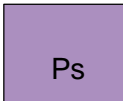
Easy Creek Shale – The thickness of the Easy Creek Shale is about 23 feet. The Easy Creek consists of an upper light-green, calcareous mudstone, a prominent limestone near the middle, and a lower varicolored (green, red, and purple), calcareous mudstone that contains a boxwork limestone near its base. The limestone, locally termed the “Easy Creek limestone” is gray, silty, and fossiliferous (algal-coated bivalves and brachiopods are characteristic), and can be over 2 feet thick. It weathers rubbly, but at some localities it is blocky and can resemble the lower limestone in the Crouse. Springs are sometimes associated with the “Easy Creek limestone.”



Bader Limestone – The Bader Limestone is about 26 feet thick and is composed of three members – from top to bottom, the Middleburg limestone; the Hooser shale; and the Eiss limestone. The Middleburg limestone is gray to light gray or light yellowish-brown, fossiliferous, and weathers rubbly, platy, or blocky. Below the upper limestone is a green mudstone, and below it, a black, fissile shale. The lower limestone is light gray, massive, fossiliferous, and is usually about 3 to 4 feet thick. Springs sometimes occur from the Middleburg.

Hooser Shale Member – The thickness of the Hooser shale is about 5 feet. This calcareous mudstone is gray to gray green; near the base it is red.

Eiss Limestone Member – The Eiss limestone varies from 13 to 18 feet thick, but averages about 15 feet. It can be divided into an upper and lower limestone, and middle mudstone. The upper limestone is a massive, gray limestone that forms a prominent bench and outcrop. It is about 2 feet thick, becomes characteristically vuggy when weathered, and may contain fossils and siliceous nodules. Gypsum nodules are common in the subsurface. The middle mudstone is gray to gray green and fossiliferous. The lower limestone is light gray, clayey, fossiliferous, and weathers rubbly. Outcrops of the lower limestone are rare. Springs from the upper limestone are common.



Stearns Shale – The Stearns Shale is about 12 feet thick, but ranges from 8 to 14 feet. It is a varicolored (green, red, purple, and gray), calcareous mudstone that may contain thin limestones or boxwork limestone.



Beattie Limestone – The Beattie Limestone is composed of three members – from top to bottom, the Morrill limestone; the Florena shale; and the Cottonwood limestone. The total thickness is about 21 feet.

Morrill Limestone Member – The Morrill limestone is about 5 feet thick. It is a light-gray to yellow-brown limestone that contains thin mudstone partings. The Morrill weathers irregularly to blocky. In some areas it is massive and forms a prominent outcrop, while in other places it is inconspicuous.

Florena Shale Member – The thickness of the Florena shale is about 11 feet. The Florena is a light-gray-green mudstone. The lower part is very fossiliferous (chonetid brachiopods are characteristic).

Cottonwood Limestone Member – The Cottonwood limestone is about 5 feet thick. The fossiliferous, massive, light-gray to yellow-white limestone has a blocky appearance. Abundant wheat-grain-shaped fusulinids in the upper part are characteristic of the Cottonwood. Scattered chert nodules and thin mudstone partings may be present.

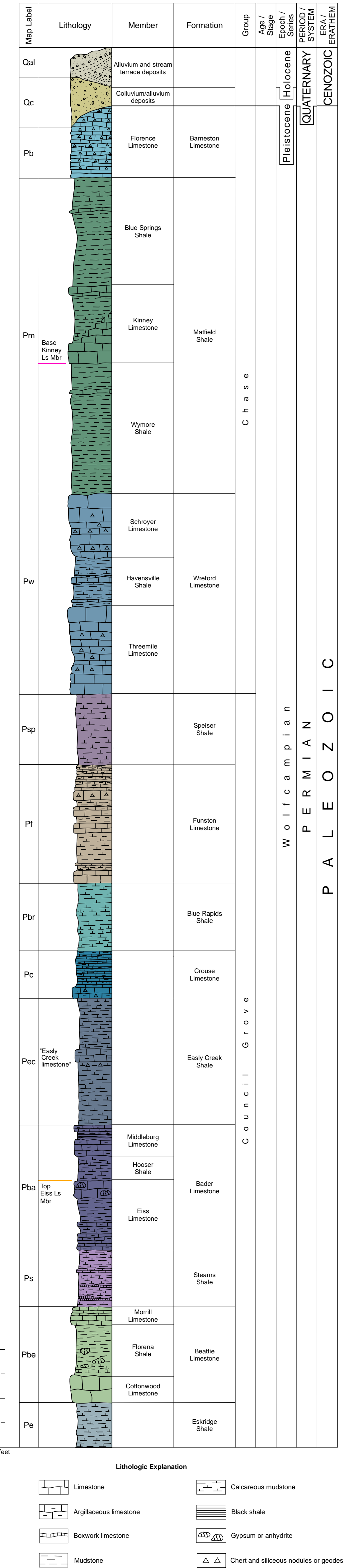


Eskridge Shale – The Eskridge Shale is the lowermost bedrock unit exposed at the preserve, where it crops out along Fox Creek at a few localities. Maximum exposed thickness is 14 feet of light-gray-green mudstone.

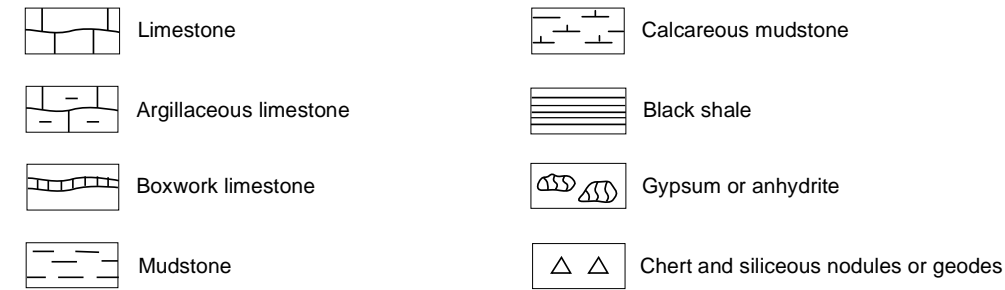


MAP M-119A

Computer compilation and cartography by John W. Dunham, Nathaniel E. Haas, and Darren J. Haag



Lithology Explanation



Elevation contours are presented for general reference. They are taken from U.S. Geological Survey Topographic Vector Contour (TVC) files compiled from base maps at a scale of 1:24,000. In some places the contours from the TVCs may be more generalized than the base data used for compilation of geologic outcrop patterns. Outcrop patterns on the map will typically reflect topographic variations more accurately than the associated contour lines. Repeated fluctuation of an outcrop line across a contour line should be interpreted as an indication that the mapped rock unit is maintaining a relatively constant elevation along a generalized contour.

Roads and highways shown on the base map as represented by data from the Kansas Department of Transportation (KDOT) and other sources. U.S. Department of Agriculture – Farm Service Agency (USDA-FSA) National Agriculture Imagery Program (NAIP) imagery also was used to check road locations.

Shaded relief is based on U.S. Geological Survey digital elevation models (DEMs) with 1/3 arc-second resolution. The 1/3 arc-second data, in ESRI GRID format, were converted to a hillshade, a multidirectional shaded-relief image using angles of illumination from 0°, 22.5°, 70°, and 315° azimuths, each 45° above the horizon, with a 4x vertical exaggeration.

This map was produced using the ArcGIS system developed by ESRI (Environmental Systems Research Institute, Inc.).

The Kansas Geological Survey does not guarantee this map to be free from errors or inaccuracies and disclaims any responsibility or liability for interpretations made from the map or decisions based thereon.

Suggested reference to this map:
Sawin, R. S., 2008, Surficial geology of the Tallgrass Prairie National Preserve, Chase County, Kansas: Kansas Geological Survey, Map M-119A, scale 1:12,000.

Supplemental references:
Sawin, R. S., 2008, Methodology and data used to construct the surficial geology (M-119A) and water-bearing units (M-119B) maps of the Tallgrass Prairie National Preserve, Chase County, Kansas: Kansas Geological Survey, Open-file Report 2008-09, 15 p.

Sawin, R. S., and West, R. R., 2008, Lithology and paleontology of the stratigraphic units cropping out at the Tallgrass Prairie National Preserve, Chase County, Kansas: Kansas Geological Survey, Open-file Report 2008-15, 7 p.

Computer compilation and cartography by John W. Dunham, Nathaniel E. Haas, and Darren J. Haag. For information regarding the purchase of copies of this map and other maps and publications offered by the KGS, please call:

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