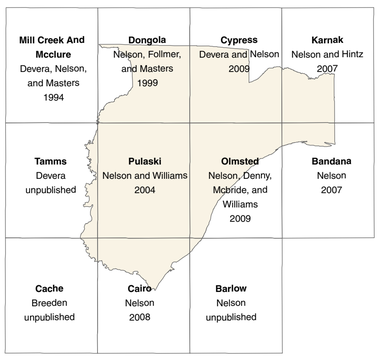
GEOLOGY OF PULASKI COUNTY, ILLINOIS

Prairie Research Institute
ILLINOIS STATE GEOLOGICAL SURVEY

W. John Nelson, Joseph A. Devera, F. Brett Denny, and Jeremy R. Breeden
2022

STATEMAP Pulaski County-G



M1 7.5-minute quadrangle maps in Pulaski County. Full citations for published and released maps are on map sheet 2.

SYSTEM / SERIES

SYSTEM		EXPLANATION[1]	SERIES
Quaternary		sm — Surface mined area	
		af — Artificial fill	Holocene
	unconformity	Qal — Alluvial and lacustrine deposits	
		Qm — Metropolis Formation	Pleistocene
	unconformity	QTm — Mounds Gravel	Plio-Pleistocene
Tertiary		Tw — Wilcox Formation	Eocene
		Tpc — Porters Creek and Clayton Formations	Paleocene
		TKu — Tertiary and Cretaceous, undifferentiated	
Cretaceous	unconformity	Ku — Cretaceous, undifferentiated	Gulfian
Carboniferous / Mississippian Subsystem		Msg — Ste. Genevieve Limestone	
		Msl — St. Louis Limestone	Valmeyeran
		Msm — Salem Limestone	
		Mu — Ullin Limestone	

[1]Loess cover of bedrock units may be up to 25 feet thick on uplands, thinner on slopes (Fehrenbacher 1986).

Symbols

- Type section location
- Horizontal bedding
- 10 — Strike and dip of bedding, number indicates degrees of dip
- Joints
- Pit or quarry
- Pit, quarry, or prospect abandoned

Drill Holes

- Dry oil test hole
- Dry hole; show of oil
- Stratigraphic boring
- CS 109 — Labels indicate samples (s) or core (c). Numeric label indicates total depth of boring in feet. Dot indicates location accurate within 100 feet.

Line Symbols

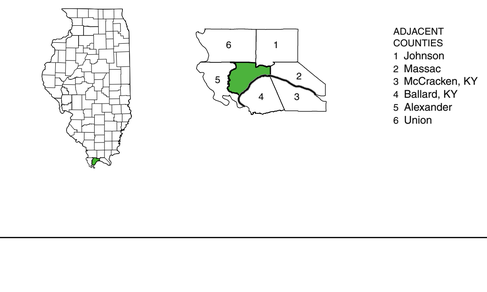
solid where accurately located, dashed where inferred, dotted where concealed

- Contact, accurately located
- Contact, inferred
- Normal fault; ball and bar on downthrown side
- Fault, inferred
- Fault, concealed
- A—A′ — Line of cross section
- Geophysical profile transect (see Olmsted Quad., Nelson et al. 2009)

ROAD CLASSIFICATION
Interstate Route · State Route · U.S. Route · Local road

SCALE 1:48 000
1 · 1/2 · 0 · 1 · 2 · 3 · 4 MILES
1 · .5 · 0 · 1 · 2 · 3 · 4 · 5 KILOMETERS

CONTOUR INTERVAL 25 FEET
SUPPLEMENTAL CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1988



ADJACENT COUNTIES
1 Johnson
2 Massac
3 McCracken, KY
4 Ballard, KY
5 Alexander
6 Union

ILLINOIS
Illinois State Geological Survey
PRAIRIE RESEARCH INSTITUTE

Prairie Research Institute
Illinois State Geological Survey
615 East Peabody Drive
Champaign, Illinois 61820-6918
(217) 244-2414
http://www.isgs.illinois.edu

Base map compiled by Illinois State Geological Survey from digital data (2021 TIGER/Line Shapefiles) provided by the United States Census Bureau. Hillshade and contours from 2012 LiDAR elevation data provided through ILHMP. Transverse Mercator Projection. North American Datum of 1983.

Geology is based on published geologic maps indicated on inset map M1 and compiled by the authors and Francesca Burkett.

Digital cartography by J.E. Carrell and E.G. Bunse, Illinois State Geological Survey.

This geologic map was funded in part by the USGS National Cooperative Geologic Mapping Program under StateMap award number G21AC10861, 2021. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Government.

This map has not undergone the formal Illinois County Geologic Map map review process. Whether or when this map will be formally reviewed and published depends on the resources and priorities of the ISGS.

The Illinois State Geological Survey and the University of Illinois make no guarantee, expressed or implied, regarding the correctness of the interpretations presented in this document and accept no liability for the consequences of decisions made by others on the basis of the information presented here. The geologic interpretations are based on data that may vary with respect to the accuracy of the geographic location, the type and quantity of data available at each location, and the scientific and technical qualifications of the data sources. Maps or cross sections in this document are not meant to be enlarged.

Recommended citation:
Nelson, W. J., F. B. Denny, J. A. Devera, and J. R. Breeden, 2022, Geology of Pulaski County, Illinois: Illinois State Geological Survey, USGS-STATEMAP contract report, STATEMAP Pulaski County-G, 2 sheets, 1:48,000.

SYSTEM	SUB-SYSTEM	SERIES	STAGE	GROUP	FORMATION	MEMBER (Bed)	GRAPHIC COLUMN	THICKNESS (Feet)	UNIT
QUATERNARY		HOLOCENE			undifferentiated alluvial and lacustrine deposits			20–170	A
		PLEISTOCENE	Wisconsinan		Equality	Peoria Silt			
						Roxana Silt			
			Illinoian		Loveland Silt				
			Pre-Illinoian		Metropolis			0–70	B
TERTIARY		MIO.-PLIO.		EMBAYMENT	Mounds Gravel			18–50	C
		EOCENE			Claiborne			0–90?	D
					Wilcox			0–170	E
		PALEOCENE			Porters Creek Clay			65–190	F
					Clayton			14–30	G
CRETACEOUS		UPPER	MAASTRICHTIAN		Owl Creek			0–15	H
					McNairy			5–160	I
			CAMP.		Post Creek			0–25	J
CARBONIFEROUS	MISSISSIPPIAN	CHESTERIAN	GENEVIEVIAN	MAMMOTH CAVE	Ste. Genevieve Limestone	Spar Mountain Sandstone		250–350	K
		VALMEYERAN			St. Louis Limestone			270–350	L
					Salem Limestone			250–450	M
					Ullin Limestone			400–450	N
		OSAGEAN			Fort Payne		Hartline Chert	100–300	O
					Springville Shale			10–50	P
		KINDER.			Chouteau Limestone			4–6	Q
DEVONIAN		UPPER			New Albany Shale			150–230	R
		MIDDLE	GIVETIAN	MUSCATATUCK	St. Laurent			45–65	S
			EIFELIAN		Grand Tower Limestone	Dutch Creek Sandstone		45–60	T
								0–35	U
		LOWER	EMSIAN	TAMMS	Clear Creek			300 +	V

PLIO., Pliocene; MIO., Miocene; CAMP., Campanian; KINDER., Kinderhookian

A Alluvium is composed of stratified silt, sand, and gravel. Silt is mottled, light to medium gray and brown; sand is mostly light gray to buff and fine to coarse-grained. Sand is mostly unlithified, but some is cemented with iron oxide. The **Equality Formation** occupies bottomlands and stream tributaries to the Cache Valley. It is mostly comprised of clay and silt with minor sand and gravel. Sediment colors vary from greenish and bluish gray to olive and yellowish brown and texture varies from soft and plastic to stiff. Sand and gravel occur as lenses mostly in the lower part of the formation. The next three units discussed are loess, deposited by wind. The **Peoria Silt** is mottled light to medium yellowish gray to yellowish brown and lacks stratification. Modern soil is developed within this unit. The **Roxana Silt** is weakly mottled in medium to dark yellowish brown and in areas can be reddish. Scattered sand grains and granules are present. The **Loveland Silt** is strongly mottled gray, yellowish brown, and orange. It has a high clay content and tends to be stiff. The lower part becomes sandy and contains scattered small pebbles. Loess unites are not mapped.

B Metropolis Formation contains silt, sand, and gravel. Silty sand and sandy silt are strongly mottled in gray, brown, yellow, and orange. Gravel is found mostly near the base of the unit and is composed of rounded to well-rounded, dull gray chert and quartz pebbles derived from the Mounds Gravel. Pebbles have largely lost the glossy brown patina that is characteristic of the Mounds Gravel. This unit typically comprises a series of upward-fining sequences with weakly developed stratification. Portions are calcareous and contain abundant small calcite concretions. This unit underlies terraces along the Ohio River.

C Mounds Gravel is composed of gravel and sand. Gravel is composed mostly of well-rounded chert pebbles that have a distinctive glossy bronze to yellowish brown patina of iron oxide that permeates outer layers of the pebbles. Quartz granules are common in the finer fraction. This unit is crudely stratified, with lenticular bedding and low-angle accretion surfaces. Sand is red to brownish orange, coarse, poorly sorted, and commonly cross-bedded. The Mounds caps uplands south of the Cache Valley, where it is mantled by loess; and underlies Metropolis Formation in lowlands.

D Claiborne Formation (subsurface only) This unit probably overlies the Wilcox Formation in the subsurface in the southern part of the study area, based on geologic mapping in Kentucky. Olive (1971) reports the Claiborne to be as thick as 90 feet in the Barlow and Cairo Quadrangles in Kentucky. No wells in Illinois have samples or descriptions sufficiently detailed to differentiate Claiborne from Wilcox.

E Wilcox Formation is composed of sand silt and clay. Sand can be white, yellow, orange, and red. Grains are fine to coarse sand and granules of chert and quartz. Chert granules are gray, brown, and black, well rounded, and polished. Clay rip-up clasts withing the unit come in many colors including pink, brown, magenta, and ochre. Clay, silt, and sand are commonly interlaminated and in places rhythmically laminated, suggesting tidal action. This study area is the northernmost extent of the Wilcox Formation, and it thickens southward in the Mississippi Embayment. It is the youngest marine deposit of the Mississippi Embayment within Illinois.

F Porters Creek Clay is composed of dark gray, silty, and micaceous clay that breaks with a blocky or conchoidal fracture. Bedding is generally indistinct and marked by sandy layers with iron stains where present. The lower part of the unit becomes increasingly sandy, glauconitic, and burrowed. In Pulaski County, the Porters Creek has been mined to manufacture absorbents.

G Clayton Formation is sandy clay to clayey sand that is greenish gray to nearly black when fresh. Weathered surfaces are an orange-brown color. The sediment is massive, mottled, heavily burrowed, and highly glauconitic. It is commonly iron cemented and contains small limonite concretions. Chert pebbles and occasional cobbles are as large as 8 inches across in the lower part of the unit. Cope (1999) described fossils of bryozoans, annelids, bivalves, gastropods, crabs, lobsters, sharks, rays, ratfish, crocodiles, and turtles in the unit suggest a brackish water environment.

H Owl Creek Formation composed of light greenish gray to brown, medium to coarse-grained, cross-bedded, and glauconitic sand and silt. The upper part of the unit is more clay-rich and finer grained, more glauconitic, and contains abundant *Ophiomorpha* and other burrows. The Owl Creek is interpreted as littoral (shoreline) to shallow subtidal marine.

I McNairy Formation comprised of sand, silt, and clay. The sand is white to light gray, buff, orange, and red; very fine to medium-grained, and weakly lithified to cemented by iron oxide. Silt and clay vary from nearly white through all shades of gray to black. Muscovite mica is abundant and characteristic of the McNairy. Sand, silt, and clay are commonly interlaminated; rhythmic planar laminations indicate tidal activity. Thicker sand bodies can be cross-bedded and in many cases, contain rip-up clasts of light-colored clay.

J Post Creek Formation consists of gravel composed of subangular to rounded, white to gray, dull and opaque chert pebbles in a matrix of pyritic clay and coarse sand. This unit is best exposed in Pulaski County at the Post Creek Cutoff where the type section exists in the middle of Sec. 2, T 15 S, R 2 E in the Bandana Quadrangle.

K Ste. Genevieve Limestone is composed of limestone, sandstone, and shale. Limestone is mostly white to light gray, cross-bedded, oolitic and fossiliferous packstone and grainstone. Less common is a dark gray to brownish gray fossiliferous wackestone and lime mudstone. Common fossils are *Platycrinites* and other crinoids, *Orthothetes* and other brachiopods and gastropods. Chert is light gray to bluish gray and when found as float, bioclastic and oolitic in texture. Interbeds of shale and sandstone occur in the upper part of the unit. The **Spar Mountain Sandstone Member** consists of a light gray to greenish gray, calcareous, glauconitic sandstone, or siltstone that grades into a sandy limestone.

L St. Louis Limestone consists largely of limestone that is medium gray, dense lime mudstone that contains abundant chert nodules and breaks with a conchoidal fracture. Thinner intervals of fossiliferous wackestone and packstone and, rarely, oolitic grainstones are present. Fossils include crinoid fragments, bryozoans, *Pentrimites*, the solitary coral *Zaphrentis* sp., and the colonial coral *Acrocyathus proliferus*. Chert in the unit is dark gray to black and vitreous.

M Salem Limestone is light to medium-dark gray, fossiliferous lime mudstone, wackestone, and packstone. Echinoderm, bryozoan, and brachiopod fragments are generally poorly sorted; some are rounded and have oolitic coatings. Layers of cross-bedded, oolitic limestone are present.

N Ullin Limestone contains two types of limestone that intergrade vertically and laterally. The upper Ullin consists of speckled light gray to yellowish gray, medium to coarse-grained packstone and grainstone. The speckled appearance is produced by dark echinoderm fragments in a dull white matrix of fenestrate bryozoan fragments. Tabular-planar and wedge-planar crossbedding is conspicuous and occurs in sets as thick as 5 feet. The other type of limestone, found mainly in the lower Ullin, is not speckled medium-light to medium-dark gray, very fine to coarse-grained skeletal packstone and grainstone. Chert in this unit is white to dark bluish gray and has dull to vitreous luster and contains well-preserved bioclastic texture.

O Fort Payne Formation consists of limestone and bedded chert. The limestone is dark gray or dark olive gray to nearly black, dolomitic lime mudstone to very fine-grained skeletal wackestone and packstone. It is very siliceous and contains 10 to 30% dark-colored, dull to slightly vitreous chert nodules. These commonly occur as small, vesicular, highly angular blebs complexly intergrown with carbonate rock. Wavy partings and laminae of dark gray to black silty shale and siltstone are common, especially near the base. Bedded chert of this unit is bluish gray to dull yellow and orange-brown and porous and vuggy.

P Springville Shale is composed of shale and siltstone. Shale and siltstone are greenish gray to bluish gray, siliceous, unevenly laminated, and mostly noncalcareous. Horizontal burrows and trails are present. This unit coarsens upward from clay-shale at the base to siltstone at the top.

Q Chouteau Limestone is light olive gray and sublithographic limestone that is 4-6 feet thick in this study area.

R New Albany Shale (subsurface only) is comprised of shale. The upper part is dark brownish gray to black and weathers silvery gray. It is hard, brittle, highly fissile, and pyritic. The lower part is mottled olive to brownish gray, less fissile, slightly calcareous and contains siltstone laminae.

S St. Laurent Formation (subsurface only) is composed of limestone, shale, and siltstone. Limestone is mostly medium to dark gray and brownish gray, argillaceous and silty, lime mudstone to fine-grained skeletal wackestone and packstone. These rocks contain nodules of bluish gray, semi-vitreous chert, dark gray wavy shale partings, horizontal burrows and trails, black coated stylolites, and glauconite grains. Shale and siltstone occur in the middle part of the formation and are medium to dark olive gray, calcareous, and glauconitic.

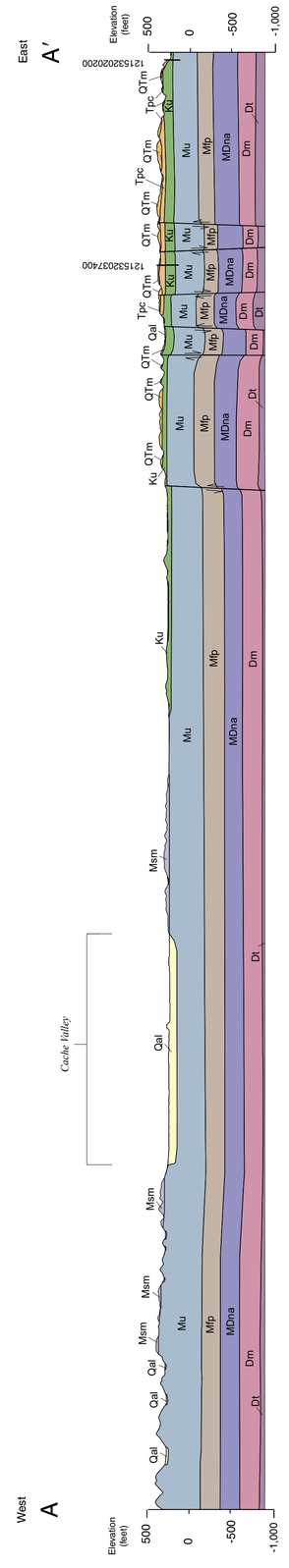
T Grand Tower Limestone (subsurface only) is comprised of limestone and minor sandstone. Limestone includes light gray, coarse-grained crinoidal grainstone and medium olive gray to brownish gray lime mudstone, wackestone, and packstone. Sandstone resembles that of the Dutch Creek Member.

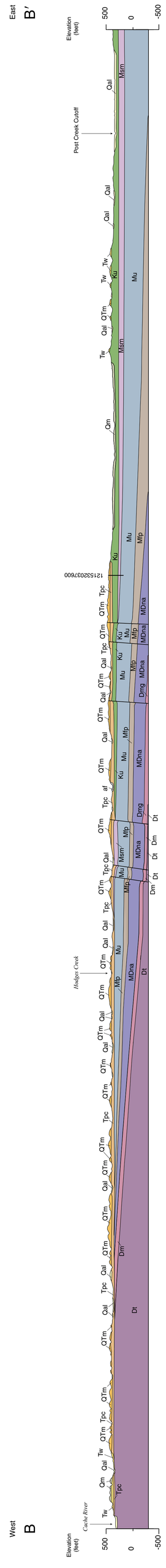
U Dutch Creek Sandstone Member (subsurface only) is a light gray, fine to medium-grained, well sorted, well rounded quartz arenite. The cement is calcite and the calcareous sandstone intergrades with sandy limestone.

V Clear Creek Formation is comprised of limestone and chert. Limestone is light gray to brownish gray, dolomitic lime mudstone. It is generally silty, and the upper part is sandy. The chert is dull white to light bluish gray, soft and porous, and slightly calcareous.

Symbology

- Limestone
- Sandstone
- Shale
- Conglomeritic Sandstone
- Silty Shale
- Dolomite
- Argillaceous Limestone
- Cherty Limestone
- Dolomitic Limestone
- Ripple Marks
- Chert
- Calcareous
- Group Clasts
- Root casts
- Clay





Horizontal scale: 1 inch = 4,000 feet
Vertical scale: 1 inch = 1,000 feet
Vertical exaggeration: 4×

af Artificial fill
Qal Alluvial and lacustrine deposits
Qm Metropolis Formation
QTm Mounds Gravel
Tw Wilcox Formation
Tpc Porters Creek Formation
Ku Cretaceous, undifferentiated
Msg Ste. Genevieve Limestone
Msl Saint Louis Limestone
Msm Salem Limestone
Mu Ullin Limestone
Mfp Fort Payne Limestone
MDna New Albany Shale
Dm Muscatatuck Group
Dt Tamms Group

References

Devera, J.A., and W.J. Nelson, 2009, Geology of Cypress Quadrangle, Union, Johnson, and Pulaski Counties, Illinois: Illinois State Geological Survey, Illinois Geologic Quadrangle Map, IGQ Cypress-G, 2 sheets, 1:24,000.

Devera, J.A., and Nelson, J.W., Masters, J.M., 1995, Geologic map of the Mill Creek and McClure Quadrangles, Union and Alexander Counties, Illinois: Illinois State Geological Survey, IGQ15 Mill Creek McClure-G, 1 sheet, scale 1:24,000.

Fehrenbacher, J. B., Jansen, I. J., and Olson, K. R., 1986, Loess Thickness and Its Effect on Soils in Illinois: University of Illinois at Urbana-Champaign, College of Agriculture, Agricultural Experiment Station Bulletin 782, 14 p.

Nelson, W.J., 2007, Geology of Bandana Quadrangle, Pulaski and Massac Counties, Illinois: Illinois State Geological Survey, Illinois Geologic Quadrangle Map, IGQ Bandana-G, 1:24,000, report, 8 p.

Nelson, W.J., 2008, Geology of Cairo Quadrangle, Alexander and Pulaski Counties, Illinois: Illinois State Geological Survey, Illinois Geologic Quadrangle Map, IGQ Cairo-G, 2 sheets, 1:24,000.

Nelson, W.J., F.B. Denny, J.H. McBride, and L. Williams, 2009, Geology of Olmsted Quadrangle, Pulaski County, Illinois: Illinois State Geological Survey, Illinois Geologic Quadrangle Map, IGQ Olmsted-G, 2 sheets, 1:24,000, report, 10 p.

Nelson, J.W., Foller, L.R., Masters, J.M., 1999, Geologic map of the Dongola Quadrangle, Alexander, Pulaski, and Union Counties, Illinois: Illinois State Geological Survey, IGQ19 Dongola-G, 1 sheet, scale 1:24,000.

Nelson, W.J., and J. Hintz, 2007, Geology of Karnak Quadrangle, Johnson, Pulaski, and Massac Counties, Illinois: Illinois State Geological Survey, Illinois Geologic Quadrangle Map, IGQ Karnak-G, 2 sheets, 1:24,000, report, 8 p.

Nelson, W.J., and L. Williams, 2004, Geology of Pulaski Quadrangle, Pulaski County, Illinois: Illinois State Geological Survey, Illinois Preliminary Geologic Map, IPGM Pulaski-G, 1:24,000.

Olive, W.W., 1971, Geologic map of parts of the Cairo and Barlow Quadrangles, Ballard County, Kentucky: Reston, Virginia, U.S. Geological Survey, Geologic Quadrangle Map GQ-855, 1 sheet, 1:24,000.