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Illinois Geologic Quadrangle Map: IGQ Paderborn-BG
2002

BEDROCK GEOLOGIC MAP

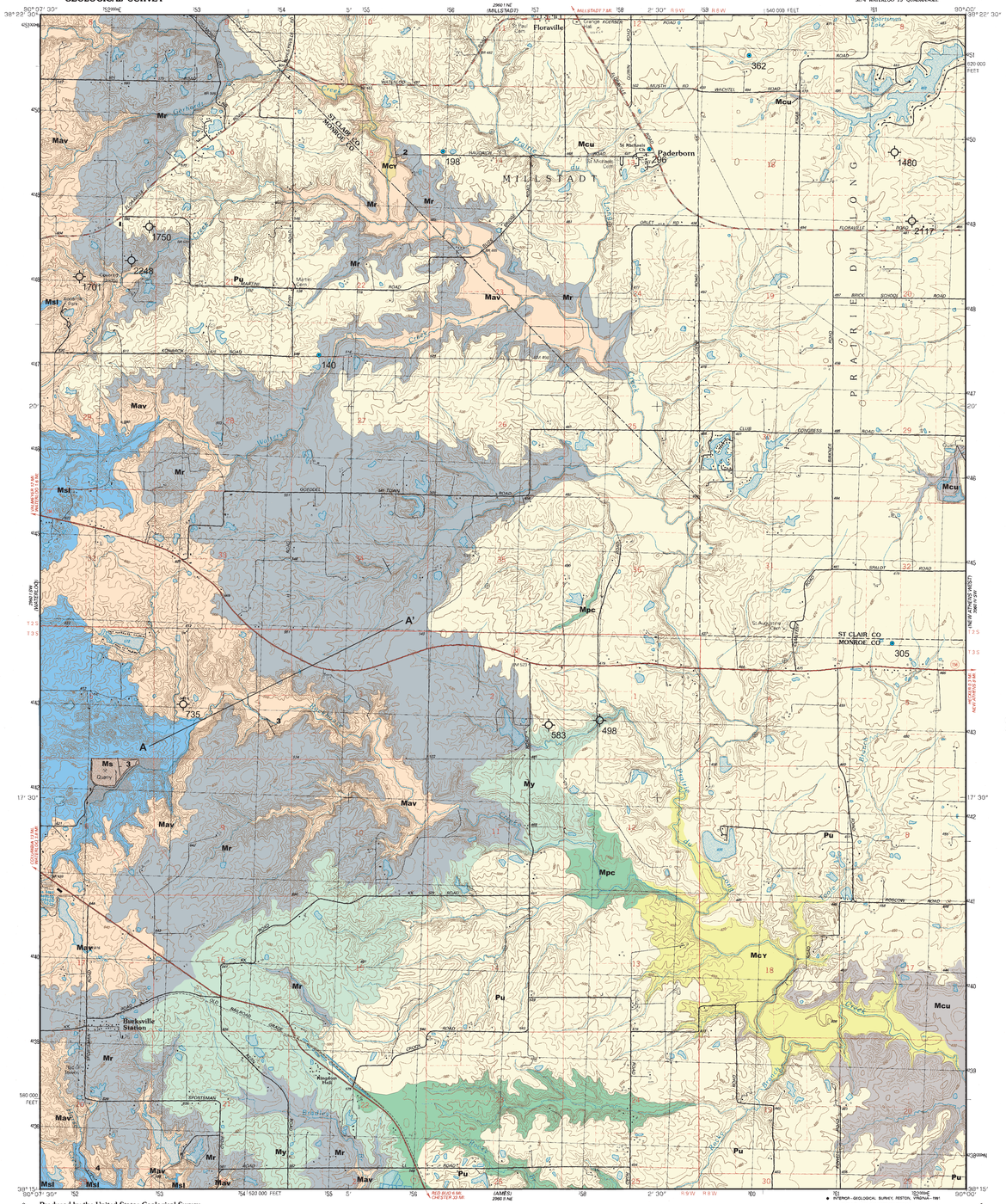
Paderborn Quadrangle
Monroe and St. Clair Counties, Illinois

Draft #1 (August 8, 2002)

Joseph A. Devera

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

PADERBORN QUADRANGLE
ILLINOIS
7.5 MINUTE SERIES (TOPOGRAPHIC)
SE/4 WATERLOO 15' QUADRANGLE



Produced by the United States Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1986. Field checked 1989. Map edited 1990
Supersedes Army Map Service map dated 1974
Projection and 10,000-foot grid ticks: Illinois coordinate system, west zone (transverse Mercator)
1000-meter Universal Transverse Mercator grid, zone 15
1927 North American Datum
To place on the predicted North American Datum 1983, move the projection lines 2 meters south and 9 meters east as shown by dashed corner ticks

Fine red dashed lines indicate selected fence and field lines where generally visible on aerial photographs. This information is unchecked

UTM GRID AND 1990 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

KILOMETERS 1 0 1 2
METERS 1000 0 1000 2000
MILES 1/2 0 1
FEET 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10 000

CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
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A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

ILLINOIS QUADRANGLE LOCATION

ROAD CLASSIFICATION

Primary highway, hard surface — Light-duty road, hard or improved surface
Secondary highway, hard surface — Unimproved road
Interstate Route · U. S. Route · State Route

PADERBORN, ILL.
SE/4 WATERLOO 15' QUADRANGLE
38090-C1-TF-024
1990
DMA 2960 I SE-SERIES V863

ACKNOWLEDGMENTS

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Digital Cartography by: F. Brett Denny, Joseph A. Devera, and Gregory A. Shofner

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file:Padbg1.cdr
export file: padbg1.eps

Paderborn Quadrangle
Bedrock Geologic Map
Monroeand and Randolph Counties, Illinois
Illinois Geological Quadrangle Map
IGQ Paderborn -BG, 1:24,000

SYSTEM	SERIES	GROUP OR SUBGROUP	FORMATION		GRAPHIC COLUMN	AVERAGE THICKNESS (FEET)	DESCRIPTION UNIT	Description
Pennsylvanian	Desmoisian and Atokan		Pennsylvanian Undifferentiated			0-85	A	**Pennsylvanian Undifferentiated** A. *Sandstone, Shale, siltstone, limestone and coal.* Sandstone is composed of medium to coarse grained quartz arenite with quartz cement overgrowths and mica. Shale medium gray are interbedded with the basal sandstone. Siltstones are greenish-gray and can be variegated red and dark gray. Pyrite is common along with carbon streaks and abundant mica. Limestone is argillaceous dark gray containing dark gray shale partings and brachiopod remains. In the upper part of this unit coal become more continuous with gray rooted zone or underclay. The basal sandstone is unconformable with the underlying unit.
Mississippian	Chesterian		Chesterian Undifferentiated			90	B	**Chesterian Undifferentiated** B. *Shale and limestone.* Shale is the dominant lithology in this unit. The shales are typically dark gray to medium gray and in part silty. A red shale occurs below the upper limestone bed. The limestone has fossiliferous shale partings but consists of light gray, fossil packstones, and grainstones. The carbonate is dominated by crinoidal debris that are typically cross stratified. The basal contact is sharp but conformable with the underlying sandstone.
			Cypress			55	C	
			Paint Creek			62	D	
			Yankeetown			60	E	
			Renault			50-65	F	
			Aux Vases			80-120	G	**Cypress Sandstone** C. *Sandstone.* This unit is composed of a light gray, fine to medium quartz arenite that is partly shaly. The shale is a minor component but occurs as wavy to flaser bedding in the upper portion of the formation. Middle and lower parts of the unit are dominated by well sorted quartz sandstones that yield cross laminations.
			St. Genevieve Limestone			0-58	H	**Paint Creek Formation** D. *Limestone, shale, and sandstone.* Limestones and shales are highly variable within this formation. The limestones are light gray fossiliferous grainstones to packstones that locally contain oolitic facies and red stained crinoid fragments. The limestones are interbedded with varigated red and green shales. Sandstone is thin bedded and a minor component. They are light gray, fine grained quartz arenites. The basal limestone is a fossil packstone to a shaly fossil wackestone. The lower contact is sharp but conformable.
		Valmeyeran	St. Louis Limestone	*Acrocyathus floriformis* Zone		300	I	**Yankeetown Chert** E. *Sandstone to chert and shales.* The sandstone is calcareous to silicified in nature. It is fine to very fine grained, white, light gray, red, yellow to orange. Thin bedded cherts are composed of silicified silt to fine quartz sand that has been altered by weathering. This unit displays numerous types of primary sedimentary structures i.e. current ripples, linguloid ripples, ladder-back ripples, wave ripples, load structures, and tool marks all preserved as chert. Red and green varigated shales occur in the basal part of the formation where it grades into the underlying limestone.
			Salem Limestone			130	J	**Renault Limestone** F. *Limestone and shale.* The limestone is medium gray shaly in places. It is a crinoidal wackestone to packstone. *Onychocrinus sp.* preserved as a whole articulated crinoid have been found within the shaly zones of this unit. The limestone is dense in certain beds but can contain numerous blastoids of the genus *Pentremites.* The base is unconformable with the underlying sandstone but locally contains a rounded carbonate conglomerate. Clasts from the conglomerate are comprised of lime mudstone, chert, and grainstone pebbles. Sand is a common component in the matrix of the conglomerate. In some areas where the limestone conglomerate is preserved the material is cross bedded.
			Warsaw Shale	Cross Section Only		90 -110	K	**Aux Vases Sandstone** G. *Sandstone and siltstone.* The sandstone is a white to light tan, well sorted, fine grained, friable quartz arenite. It is calcareous locally and case hardened. The upper part is thin bedded to rhythmically laminated. Laterally, the upper part grades into a greenish siltstone that contains abundant carbonized plant remains. The middle portion contains large cross beds which make up the main thickness of the unit. The lower unit has stacked ripple-laminated sheets that show a westerly paleoflow. The basal contact is uncomformable with the limestone below and the next unit lower in the sequence so, this sandstone is seen overlying two units below. A carbonate conglomerate also locally occurs below this sandstone. It contains rounded pebbles of lime mudstone, chert, and grainstone however, without sand in the matrix.
			Burlington-Keokuk Limestones			190-200	L	**Ste. Genevieve Limestone** H. *Limestone.* This unit is poorly exposed in this quadrangle, it is a gray to light gray, grainstone that contains the allochems: oolites, peloidal grains and fossil grains. The unit is cross bedded within grainstone facies. Chert is not common but is present. The basal contact is conformable.
								St. Louis Limestone I. *Limestone, dolomite and chert.* Light gray to medium gray lime mudstone to fossil wackestones are the dominant lithologies of this unit. Beds of carbonate breccia are present along with boundstone facies. Yellowish dolomite beds are common. Bioturbated greenish lime mudstones occur in thin beds. Dark gray chert is common in this formation. The lower part contains plant debris and oncolites and a local scour surface however, overall this unit interfingers with the limestone below.
								Salem Limestone J. *Limestone, dolomite* . The limestone is dominated by white to light gray fossil grainstone facies separated by rhythmically laminated, argillaceous and dolomitic beds. At least three cycles of grainstone/well-laminated lime mudstone were seen in the Waterloo Quarry within the quadrangle. The base of the unit was not observed.
								Warsaw Shale: K. *dolomitic limestone, siltstone, and mudstone.* Medium-gray, crinoidal, bryozoan wackestones and packstones that contain a few brachiopods. Dolomites are gray-brown, thinly bedded, and contain chlorite-rich shale clasts. The upper half of the unit is dominated by shaly limestone and dolomite beds. The lower half contains bluish gray mudstones up to 20 feet thick interbedded with thin lime-mudstones. Conularids and gastropods occur in the shaly portion of this unit and brachiopods, bryozoans, and echinoderms are very common in the limestones and dolomites. Siltstones are calcareous and fossiliferous and thinly bedded in the lower part. The basal contact is poorly exposed but thought to be sharp and conformable with the underlying carbonate beds.
								Burlington and Keokuk Limestone: L. *limestone, chert, siltstone, and shale.* Light gray to white crinoidal grainstones dominate and are interbedded with nodular and bedded light gray to black cherts. The cherts, which comprise at least 25 percent of the lowermost beds are white when weathered, and some have bioclasts of crinoids and brachiopods. Sandy limestones weather light brown, are cross-bedded, and contain brachiopod and crinoid molds. The unit is characterized by alternating layers of light gray to white crinoidal grainstones with beds of argillaceous and sandy limestones. Large spirifers are common along with crinoids, bryozoans, and corals. Siltstones are dark gray with a greenish tint and are calcareous. The unit is conformable with the underlying unit.

Data Type

Line symbols are solid where observed, dashed where inferred, dotted where concealed

Contact
Line of cross section
Strike and dip of bedding: number indicates degree of dip
Horizontal bedding
Vertical joints
456 Water Well with depth of boring in feet
645 Oil Well with depth of boring in feet

Desmoinesian Atokan	Pu	Pennsylvanian Undif.	Pennsylvanian
	Unconformity		
Chesterian	Mcu	Chesterian Undif.	Mississippian
	Mcy	Cypress Formation	
	Mpc	Paint Creek Formation	
	My	Yankeetown Formation	
	Mr	Renault Limestone	
	Mav	Aux Vases Sandstone	
	Unconformity		
Valmeyeran	Msg	Ste. Genevieve Limestone	
	Msl	St. Louis Limestone	
	Ms	Salem Limestone	
	Mw	Warsaw Shale	
	Mkb	Burlington and Keokuk Limestones	

Geology of the Paderborn Quadrangle

The Paderborn Quadrangle is located in the southeastern part of the St. Louis Metro-East area and it is bisected by Prairie du Long Creek which flows south near the central to east central part of the quadrangle. On the west side of the creek are rolling hills of Chesterian (Upper Mississippian) bedrock and on the east side of the creek flatter topography is created by Pennsylvanian siliciaclastics. The rolling physiography west of the creek is due to gently dipping strata of alternating limestones and sandstones of the Chesterian Series. Attitude of the Chesterian rocks yield a northwest strike (20 to 40 degrees) and an eastward dip of 2 to 4 degrees. Whereas, nearly flat Pennsylvanian shales and sandstones unconformably overlie Chesterian rocks on the east side of Prairie du Long Creek.

The strike locally changes from northwest to north-south to northeast as the formations wrap around the subtle extension of the Waterloo Anticline mapped by Weller (1939) and Denny, (c. 2001). This is mainly seen in the central western and southwestern part of the quadrangle.

A series of tributaries flow east to Prairie du Long exposing Chesterian and older units, these include (from north to south) : Gerhardt, Kopp, Walters, Rockhouse, and Rocky Branch Creeks. These creeks provide exposures of St. Louis Limestone, Ste. Genevieve Limestone, Aux Vases Sandstone, Renault Limestone, Yankeetown Sandstone, Paint Creek Formation, and Cypress Sandstone. The youngest Chesterian units can be observed in the southeastern part of the quadrangle in Prairie du Long Creek. Here, exposures of what Stuart Weller (1939) called Okaw Formation are present below Pennsylyanian strata. This formation is currently referred to as the Okaw Group which contains the Golcanda, Hardinsburg, and Glen Dean Formations (Willman et. al.1975).

No faults were seen during mapping. However, complexities exist in the stratigraphy of the area for example, an incised paleovalley is well exposed along Rockhouse Creek. The Aux Vases Sandstone is 80 to 100 feet thick on the east side of Section 4, T. 3 S., R.9 W., and thins to 20 feet thick on the west side of the same Section. The Waterloo Quarry, owned by the Columbia Quarry Company has part of their limestone operations in the western part of Section 4. The Aux Vases Sandstone unconformably overlies the St. Louis Limestone. The Ste. Genevieve Limestone is missing in this part of the quadrangle. A thin carbonate conglomerate found at the quarry, at the base of the Aux Vases, has rounded limestone clasts which contain conodonts that occur in the Ste. Genevieve and St. Louis formations (personal com. Rod Norby). The conglomerate is evidence of sea level drop and fluvial erosion prior to deposition of the Aux Vases. A series of these low stand events have been recognized by the author throughout the Chesterian Series. A second conglomerate can be observed above the Aux Vases, a pre-Renault low stand event. This stratigraphically higher conglomerate contains rounded limestone clasts as well as chert, and sand grains probably from ancient outcrops of St. Louis, Ste Genevieve, and Aux Vases.

Another complexity of stratigraphy in this quadrangle is that "windows" of Chesterian rocks occur below the Pennsylvanian in the eastern part of the mapped area. Where small streams cut below the Pennsylvanian strata and expose portions of upper Mississippian rocks. This can be seen in Section 29, T. 2 S., R. 8 W., which yields shales, limestones and sandstones of Golcanda, Hardinsburg, and Glen Dean formations that are mapped as undifferentiated Chesterian strata on the map. In Section 36, T. 2 S., R. 9 W. the Paint Creek Formation occurs unconformably below the Pennsylvanian. Difficulties arise when the Chesterian formations are composed of sandstones, which tend to look like Pennsylvanian sandstones as in Section 18, T. 3 S., R. 8 W. Here, the Cypress Sandstone is overlain by Pennsylvanian sandstones.

Economic Geology

Limestone

The Columbia Quarry Company operates an active quarry called the Waterloo Quarry in the Paderborn Quadrangle. They produce limestone from the St. Louis and Salem formations. The quarry is located is Sections 4,5, and 8 of T.3 S., R. 9 W., within the northwest corner of the southwest quarter of the quadrangle.

Another small quarry located in the southeast quarter of Section 29, T. 2 S., R. 8 W., produced limestone from Chesterian rocks. These include the Haney Member of the Golcanda Formation and the Glen Dean Limestone.

Coal

No coal has been mined in the Paderborn Quadrangle.

Oil and Gas

No oil and gas production has been reported from the study area.

References

Denny, F. B., (in press) Geologic Map of the Waterloo Quadrangle, Illinois State Geological Survey IGQ series.

Weller, S., and J. M. Weller, 1939, Preliminary Geological Maps of the Pre-Pennsylvanian Formations in Part of Southwestern Illinois, Report of Investigation No., 59, Illinois State Geological Survey 15p.

A - A' Geologic Cross-section, Paderborn Quadrangle, Illinois