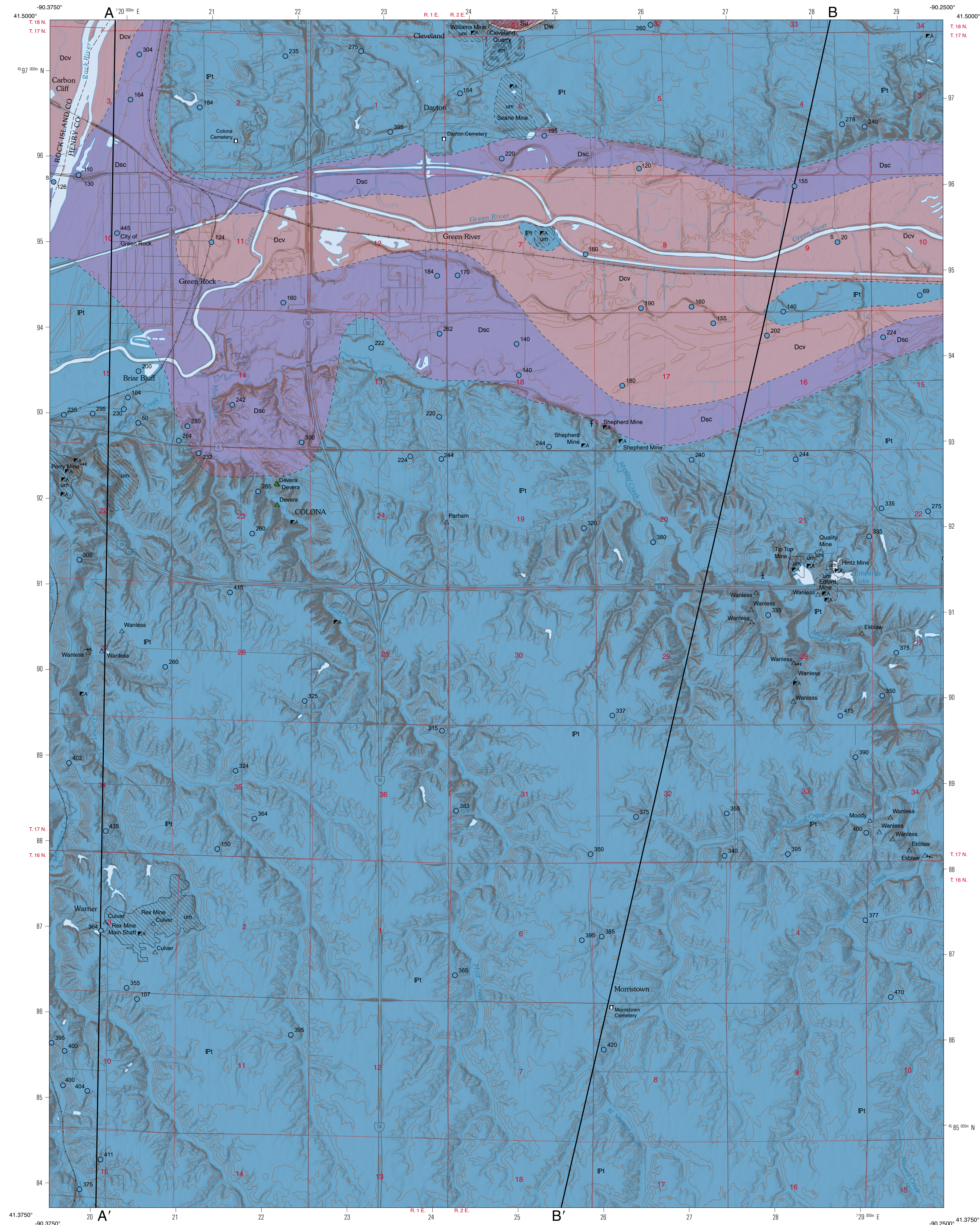


BEDROCK GEOLOGY OF GREEN ROCK QUADRANGLE
ROCK ISLAND AND HENRY COUNTIES, ILLINOIS

Prairie Research Institute
 ILLINOIS STATE GEOLOGICAL SURVEY

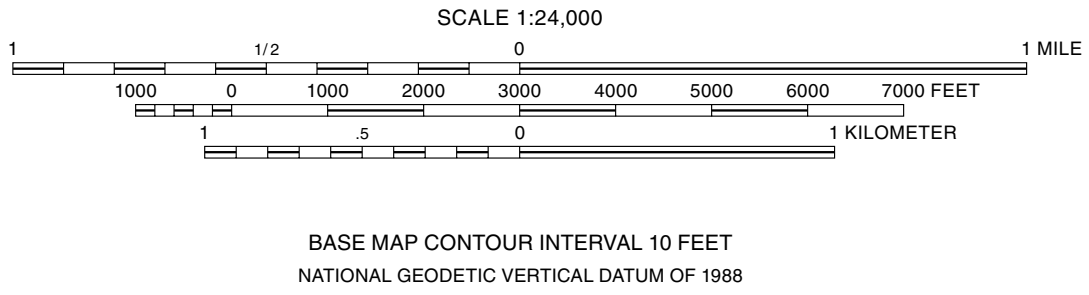
Joseph A. Devera and Joseph M. Krienert
 2022

STATEMAP Green Rock-BG



Base map compiled by Illinois State Geological Survey from digital data (2021 US Topo) provided by the United States Geological Survey. Shaded relief derived from lidar data from the Henry County collection (2020) available through ILHMP.
 North American Datum of 1983 (NAD 83)
 Projection: Transverse Mercator
 1,000-meter ticks: Universal Transverse Mercator grid system, zone 15

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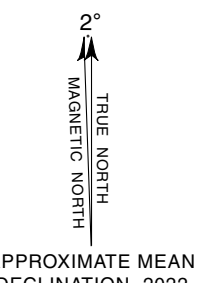
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1	2	3
4	5	
6	7	8

ADJOINING QUADRANGLES
 1 Silvis
 2 Port Byron
 3 Hillside
 4 Coal Valley
 5 Geneseo
 6 Orion
 7 Andover
 8 Cambridge



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

SYSTEM

EXPLANATION

SERIES

Carboniferous

um

Underground mined area

sm

Surface mined area

Carboniferous

Pt

Tradewater Formation

Devonian

Dsc

Sweetland Creek Shale

Dcv

Cedar Valley Limestone

Dw

Wapsipinicon Limestone

Silurian

Su

Silurian undifferentiated

Ordovician

Ou

Ordovician undifferentiated (cross section only)

Desmoinesian-Atokan

Upper Devonian

Middle Devonian

Drill Holes

from which subsurface data were obtained

Water well

Labels indicate samples (S).
Numeric label indicates total depth of boring in feet.

Point Symbols

Shaft mine, abandoned

Drift mine, abandoned

Outcrop from ISGS Field Notes

Outcrop (recent)

Line Symbols

Contact, accurate

Contact, inferred

Line of cross section

Note: Well and boring records are on file at the ISGS Geological Records Unit and are available online from the ISGS Web site.

Outcrop labels indicate last name of observer.

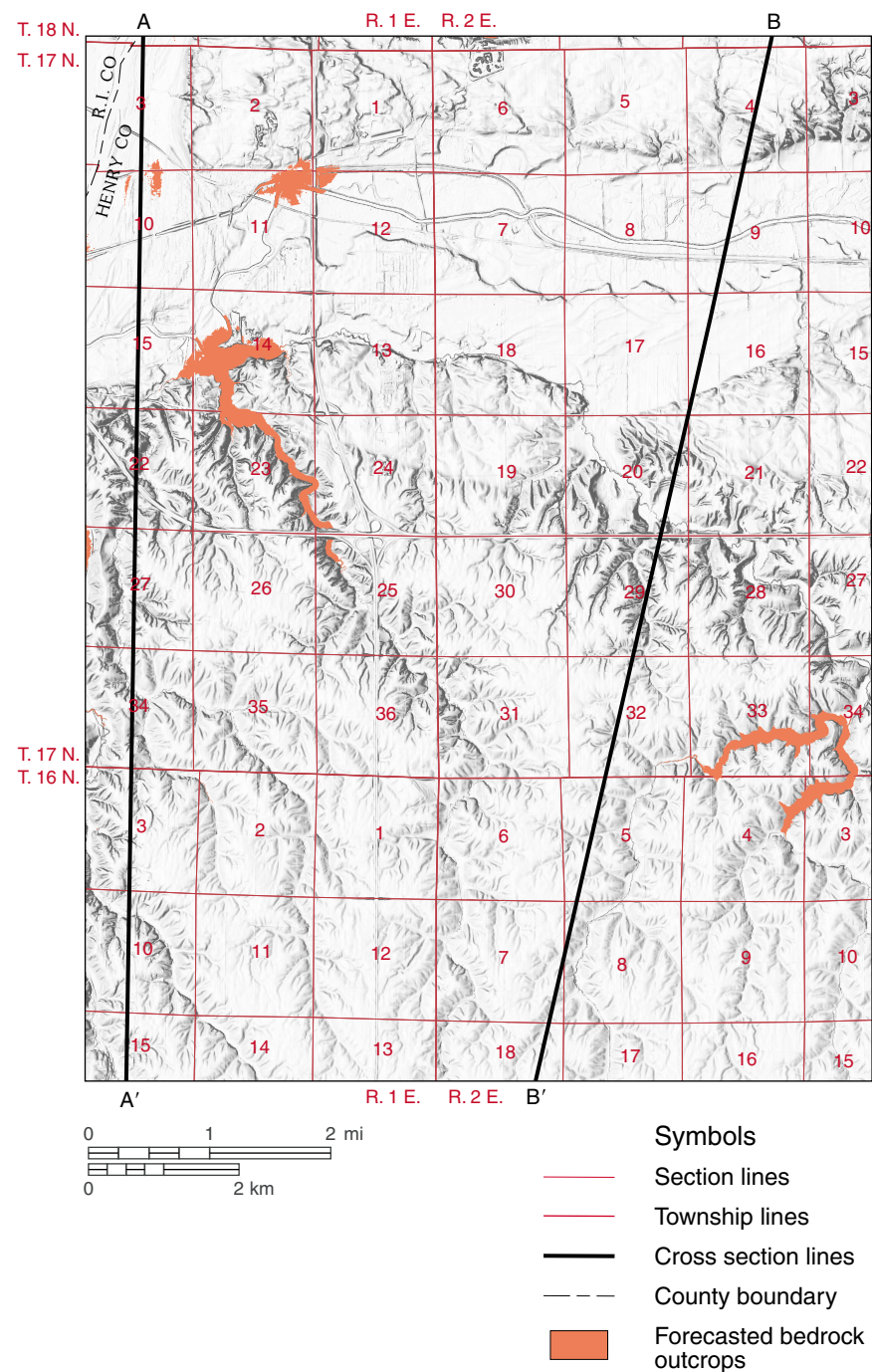
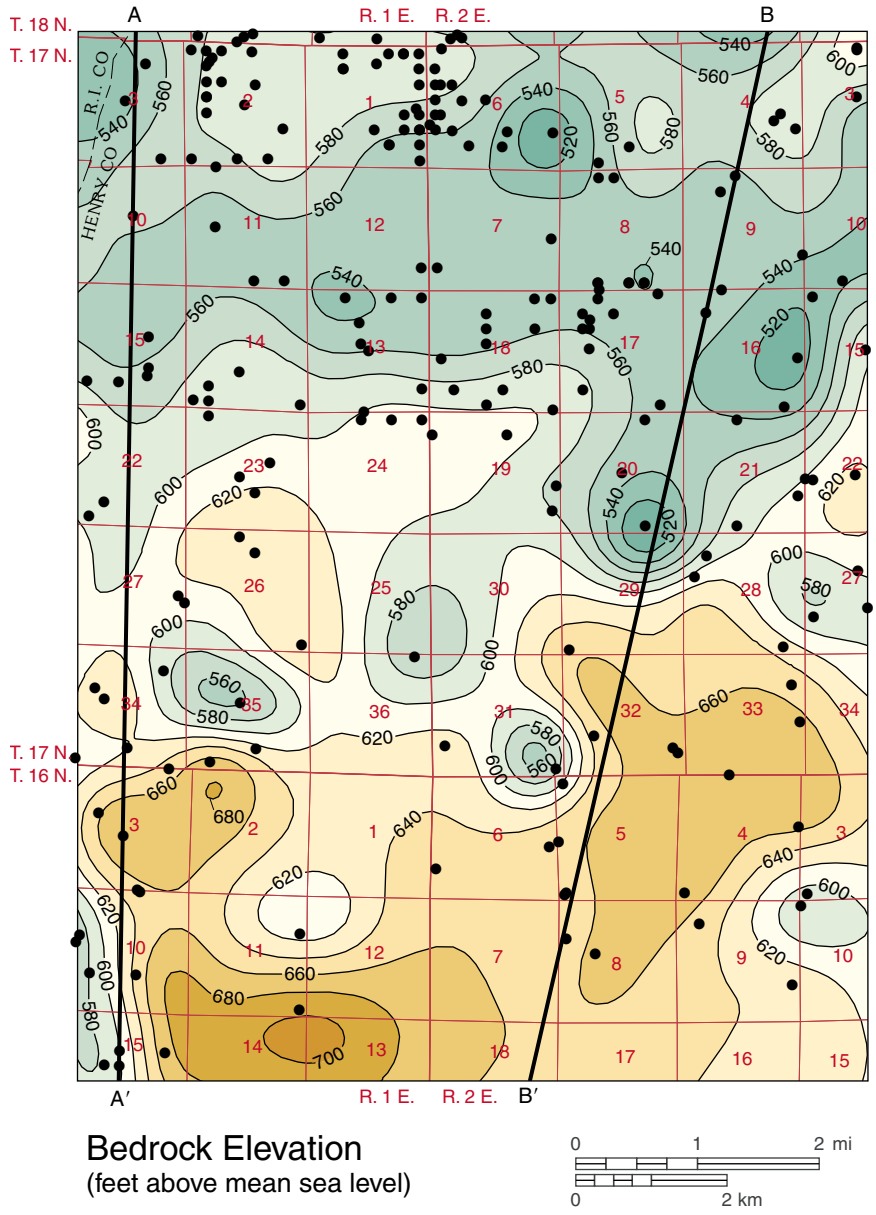


Figure 1 Showing the sparseness of forecasted bedrock outcrops within 5 feet of the land surface, based on the logs of verified water wells. Scale is 1:100,000.



Bedrock Elevation
 (feet above mean sea level)

720
 700
 680
 660
 640
 620
 600
 580
 560
 540
 520
 500

Symbols
 Well boring
 Section lines
 Township lines
 Cross section lines
 County boundary

Figure 2 Bedrock topography of the Green Rock Quadrangle. Scale is 1:100,000.

SYSTEM	SERIES	GROUP	FORMATION	MEMBER OR BED	GRAPHIC COLUMN	THICKNESS (FT)	UNIT
QUATERNARY	PLEISTOCENE AND HOLOCENE		Surficial deposits			0-180	A
PENNSYLVANIAN	DESMOND LESIAN	Raccoon Creek	Tradewater	Seville Ls. Rock Island Coal		140+	B
	ATOKAN						
	MORROWAN		Muscataine (Caseyville)			0-60	C
DEVONIAN	UPPER DEVONIAN	New Albany	Sweetland Creek			0-60	D
	MIDDLE DEVONIAN	Muscatatuck	Cedar Valley	Rapid Solon		54-75	E
			Wapsipiconic	Pinicon Ridge Otis		52-80	F
SILURIAN		Silurian undifferentiated				330-400	G
ORDOVICIAN			Maquoketa			100+	H

along some bedding planes. This formation is discontinuous in areas where either nondeposition or erosion has occurred. The shale can be as much as sixty feet thick. Contacts of this unit above and below are unconformable.

E Cedar Valley Formation is a fine-grained argillaceous limestone that has shaly partings and contains a diverse fauna: brachiopods, bryozoans, echinoderm debris and corals. In the upper parts of this formation at the contact with Pennsylvanian the limestone can contain red stained argillaceous crinoidal wackestones and packstones. Greenish gray shaly beds are also present. The lower part of this limestone contains numerous fossils: colonial tabulate corals *Favosites* and colonial rugose corals *Hexagonaria*, brachiopods *Independatypa*, *Pentamerella*, *Orthospirifer*, gastropods bellerophonids, platycerids, sponges stromatoporid mounds, *Astreospongia*, crinoids and blastoids. Occasional placoderm plates and bone fragments can be found. Bedding ranges from thin to massive. Basal bed disconformable with underlying unit.

F Wapsipiconic Formation in the study area only the Otis Member of the Wapsipiconic was observed in the Cleveland Quarry where the southern edge occurs in the northern boundary of the quadrangle. It is a light gray to greenish gray, fine to coarse-grained crystalline, slightly argillaceous, poorly fossiliferous limestone and dolostone. The limestone and argillaceous dolostones are typically unfossiliferous. Collapse breccias are common in this unit. Most of the formation is known from drill hole data and quarry exposures. The upper contact can contain paleo-karst filled with dark gray shales of the Pennsylvanian. The lower contact of the Wapsipiconic is unconformable with the underlying rocks.

G Silurian undifferentiated is a gray-brown weathers yellowish gray, dolostone. It is dominated by framework or mound facies, boundstones and fossil moldic wackestones. This unit is exposed only at the Cleveland Quarry. Fossils are common including: crinoids *Eucalyptocrinites*, *Siphonocrinus*, Cystoids *Caryocrinites*, *Megacystites*, corals *Favosites* and rugose corals, brachiopods, bryozoans, nautiloids, gastropods, and trilobites *Bumastus ioxus*, *Calmene niagarensis* and *Cheirurus*. These rocks are high-quality, pure microcrystalline dolostone that is locally vuggy. Bedding is thick to massive and irregular in places with the appearance of scattered reef debris. This unit has reef flank facies and reef core facies. In the lower part is an interval of yellowish to gray dolostone that is mounded crinoidal dolostone and cherty dolostone. Mound facies have massive boundstone cores. Lateral to the mounds is inter-mound flat lying dolostones which are composed of sparsely fossil-moldic, dense to vuggy dolostone. Only the upper part of this formation is present in the Cleveland Quarry. Drill hole data shows that the Silurian ranges from 330 to 400 feet thick. The Silurian is in sharp contact and unconformably overlies the Ordovician Maquoketa Formation.

H Maquoketa Formation is a bluish green shale that can be locally calcareous with silty, lime-mudstone lenses. The upper part is a soft gummy shale with thin dolostone beds. More carbonate rock occurs in the middle part of the unit as gray to brown thin bedded dolostone. The lower part of the formation is composed cyclic green shale and silty, thin dolomitic beds. Phosphatic nodules and pyrite nodules occur in the lower part of the formation. This unit is only known from drill hole data. The base of the unit is a brown to dark brown shale with thin dolomitic mudstones.

A Cahokia, Peoria, Equality, and Glasford formations were not mapped but mantle the bedrock in the Green Rock Quadrangle. These formations are comprised of clay, silt, sand, gravel and diamicton which contains igneous, metamorphic, and sedimentary erratics. Clay is gray to bluish gray and yellow gray and occurs in low lying terraces and in at the mouths of the north flowing ravines. Sand is light gray can be layered with clay; the grains range from fine to coarse dominated by quartz. The quartz is subrounded to rounded. Sorting is poor. Gravels are sub-angular to subrounded and comprised of chert nodules, quartz, igneous, and metamorphic rocks. Diamicton is a gray clay rich unit with silt and sand that can be interstratified with the clay and glacial erratics. Some areas the sand can be well developed and chokes the north flowing streams. The surficial material is unconformable with the underlying bedrock.

B Tradewater Formation contains shale, siltstone, sandstone with lesser amounts of limestone, coal, and chert. Shale is typically dark to medium gray but in some areas above the Rock Island Coal it is bluish gray. Most of the shales near the Rock Island Coal are carbonaceous both above the coal and lateral to the coal. The shales are fissile to non-fissile claystone and dominantly weathers in platelets. Black fissile shale is also observed and contains pyrite. Some of the claystone weathers orange. Siltstone is gray contains clay and is thin bedded grades upward into a fine, grained sandstone. The siltstone is laminated with mica common and has a wavy or crenulated appearance. Sandstone is typically a gray to tan fine grained sublitharenite that is found in coarsening upward sequences (shale to siltstone to sandstone). The sandstone is either cross bedded or tabular that contains mica and found at various levels in the unit. The Rock Island Coal Bed is lenticular and discontinuous bed that seems to occur in channels. The thickness of the coal varies from a few inches to 3 feet thick. Fossils associated with the coal are *Lepidodendron*, *Cordaites* and *Calamites* trees. The Seville Limestone is a dark gray, dense, argillaceous carbonate rock that overlies the Rock Island Coal, and it is also lenticular. Lateral to the limestone is calcareous shale that contains *Conostichus* and *Asterosoma* trace fossils. Locally, the Seville Limestone contains a bluish gray to white chert that has thin layers of carbonaceous material. This chert has been referred by archeologists as the "Moline Chert". The contact is sharp to gradational in places with the sandstone unit below.

C Muscatine (Caseyville) formation is dominated by shale but also contains sandstones and siltstones with minor amounts of coal and limestone. The shale is dark gray, weathers in platelets, and occurs above and below sandstone beds. The lower sandstone is only locally found in water wells; it unconformably overlies the Cedar Valley Formation. It is confined to a narrow width of less than one mile. The sandstone is light gray, fine grained, well sorted, quartz arenite. It is thin to medium bedded and cross bedded in places. In some areas the sandstone can be fine to medium grained. The basal part of this unit is unconformable and may extend down into channels, caves and sinkholes within the Devonian carbonate rocks below. Some of the channels or paleo-canyons are dominated by shales that has large broad leaf fossils of *Lesleya* sp. *Calamites* and the three-lobed leaves of *Megalopteris* are also found in these Lower Pennsylvanian shales.

D Sweetland Creek Shale is dominated by greenish gray to dark gray shale. It is fissile and slightly calcareous and can be silty in places. The shale is massive to finely laminated. Fossils are scarce but the brachiopod *Lingula* can be common

Introduction

The Green Rock Quadrangle is east of the Quad Cities area just east of the Coal Valley Quadrangle. It is located primarily in Henry County, Illinois, with a minor portion, in the northwestern-most corner of the quadrangle, in Rock Island County, Illinois. The Green River flows east to west in the northern part of the study area. The Green River like the Rock River is an underfit stream due to erosion from glacial ice, melt water from the Illinoisan and Wisconsin Episodes. The bedrock is mantled with Illinoian glacial drift as a result there are very few bedrock exposures. The only exposures seen occur in the larger north flowing ravines like Mud Creek and Mineral Creek that flow into the Green River. Much of the geology on this map is based on the verified water wells. The topography yields low relief in the southern half of the quadrangle whereas, the northern half shows slightly more relief. The highest point on the quadrangle is 762 feet above sea level. Total relief in the study area is 190 feet with the lowest point being 570 feet on the Rock River in the northwestern corner of the map.

The oldest rocks occur below the alluvium in both the Green and Rock Rivers which is the Upper Middle Devonian, Cedar Valley Formation. The Tradewater Formation is the youngest bedrock unit exposed in Mud and Mineral Creeks. The most important find in this quadrangle is the presence of the Upper Devonian shales of the Sweetland Creek Shale which occurs in sixteen water wells on the Green River flood plain. The current State geologic map of Illinois shows only Middle Devonian carbonate rock in this area Figure 3, (Kolata et al. 2005). This information will update the State geologic map showing more extensive Upper Devonian rimming the Cedar Valley Formation in the Green River bottoms.

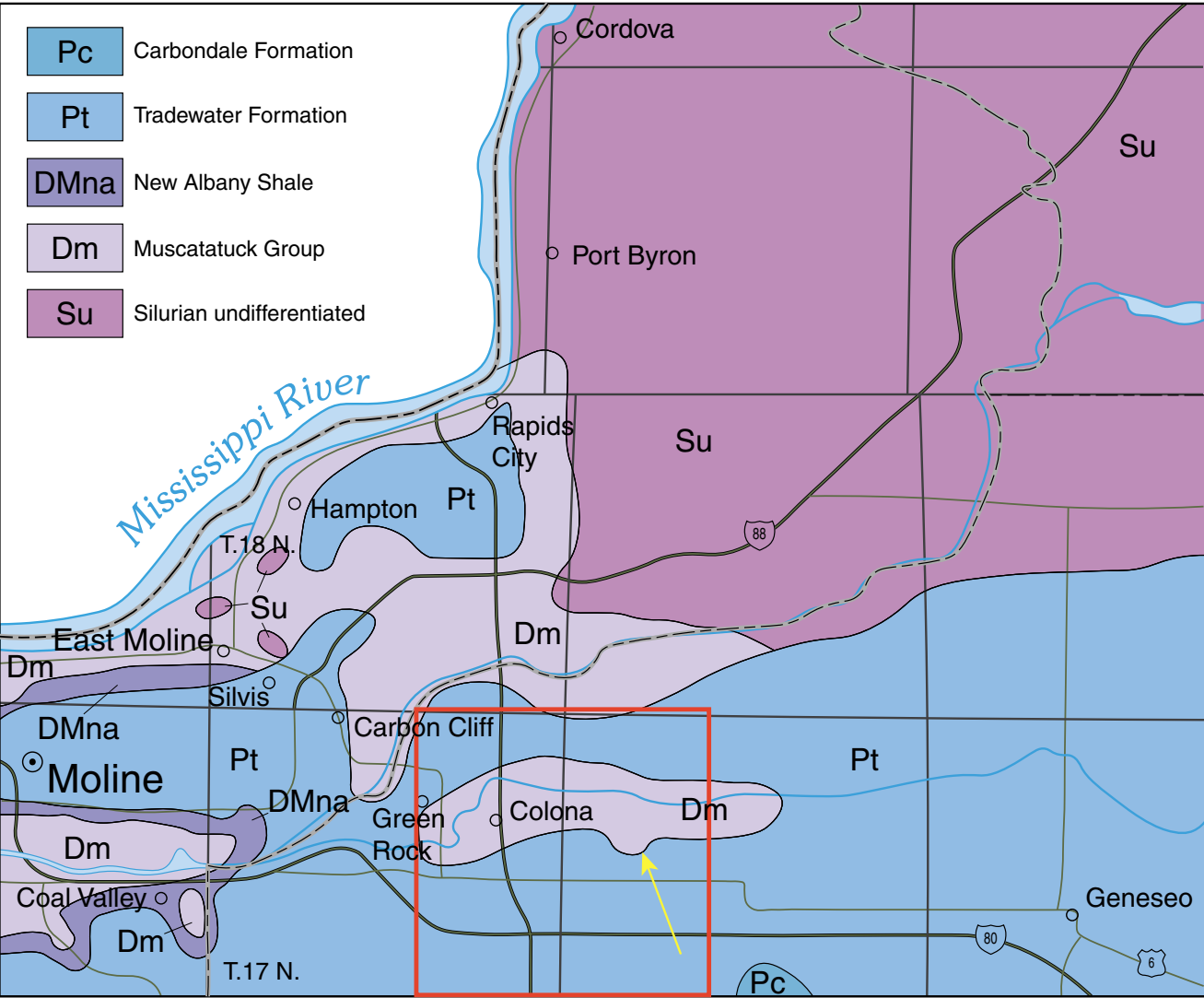


Figure 3 The area in the red square on the State Geologic Map will change based on the Green Rock Bedrock map. The Upper Devonian was found in 16 verified water wells. This would rim the Middle Devonian shown at yellow arrow. Modified from Kolata et al. 2005.

Amos Worthen, a geologist who worked in the late 19th Century, had few complementary words to say about the Green River. He writes it is "a slow, lazy, stagnant stream, oozing along amid a deposit of black, greasy looking mud-green with its coat of August scum, a very Styx of a stream, on whose filthy, scummy surface intermittent fevers and agues seem to play, like half-concealed, restless ghosts." (Worthen 1873). He did document the coal that was mined in Mineral Creek of the study area. This coal, now known as the Rock Island Coal, "outcrops and is mined extensively on Mineral creek" (Worthen 1873). Worthen also notes as the author has stated that this area has a "scarcity of outcrops." Between the swampy lowlands and the glacial cover, one is hard pressed to find an outcrop (Figure 1).

Previous work

Worthen, 1873 and 1882 was the first to mention coal mines and limestone potential. Previous geologic maps dealing with this area include W. H. Norton (1889), S. Weller (1906), H. B. Willman (1967), D. R. Kolata (2005). A surficial geologic map of Henry County published by R. C. Anderson and X. Miao (2011) shows the paucity of bedrock exposures in the study area. Only bedrock exposures of Pennsylvanian are on this map. The Silurian outcrops occur in the Cleveland Quarry and just west of the quarry which is just to the north of the Green Rock Quadrangle in the Port Byron Quadrangle. Notes from the Illinois State Geological Survey archives are in areas of coal exposure these include H. E. Culver (1922, 1924), D. M. Moody (1958), W. Parham (1959), H. R. Wanless (1930), S. E. Ekblaw (1930). The publication of mined-out areas in the Green Rock Quadrangle published by Obrad and Chenoweth (2012) shows the locations twenty-six known coal mine locations.

Recent work is the Bedrock Geology of the Silvis and Coal Valley Quadrangles by F. Delpomdor (2021). These quadrangles lie to the west and northwest of the study area. Concurrent mapping to the north is the Bedrock Geology of the Port Byron Quadrangle by J. A. Devera (2022).

Stratigraphy

The oldest rock penetrated in the Green Rock Quadrangle is the Maquoketa Formation (Upper Ordovician). The Maquoketa shale occurs in a Municipal water well at 435 feet below the surface. The City of Green Rock, Illinois drilled the well. The Silurian occurs in water wells only and does not occur at the surface, except for a small area in the southernmost part of the Cleveland Quarry. In sec. 31, T18N, R2E, man-made outcrops of dolostone occur in the quarry. The Silurian attains a thickness between 330 to 400 feet throughout the study area. It is primarily composed of dolostone. A large unconformity occurs between the Silurian and Middle Devonian in this area; no Lower Devonian is known.

Devonian
The lower Middle and upper Middle Devonian occur in a water well with a total depth of 411 feet below the surface. A water well drilled on Mr. Collins Farm in sec. 15, T16N, R1E contained both Middle Devonian limestones. In this well, the Wapsipiconic Formation is fifty-two feet thick with a 20-foot-thick shale between the Wapsipiconic and overlying Cedar Valley Formation which is thirty-four feet thick. The total Middle Devonian section is 106 feet thick in the southeastern corner of the quadrangle. In most wells that penetrate the Middle Devonian the Wapsipiconic is recognized by the driller's notes as a white limestone whereas, the Cedar Valley is called a brown limestone. The Wapsipiconic Formation has a space to rare fauna that differs from the Cedar Valley, which has an abundant fauna. The Middle Devonian Wapsipiconic Formation occurs at the surface in the Cleveland Quarry above the Silurian dolostone in the northernmost part of the quadrangle. No exposures of the Cedar Valley Formation occur in the Green Rock Quadrangle.

The Sweetland Creek Shale subcrops below the alluvium in sixteen water wells along the Green River and with the confluence with the Rock River in the northwestern part of the study area. Typically, the notes of water well drillers talk about a dark gray or black shale above the Middle Devonian limestone. No fossils are known from this shale which is a hard fissile black shale. A large unconformity between the Upper Devonian shale and the overlying Pennsylvanian occurs throughout the quadrangle.

Pennsylvanian

The only outcrops seen in the study area are shales, siltstones, and sandstones with minor amounts of coal and limestone. The lower Pennsylvanian Muscatine (Caseyville) formation rarely occurs in the water wells. It is a fluvial sandstone and so it is laterally discontinuous. In water wells descriptions show it as a clean gray sandstone. Exposures of Tradewater Formation crop out in Mud Creek and Mineral Creek. In sec. 24, T17N, R1E, a three-to-four-foot coal found by Walter Parham in 1959 occurs in a small north trending ravine. This is the Rock Island Coal that has four feet of alternating shale above and limestone capped by alternating chert and shale, Figure 4, (Parham 1959). The limestone is a dark gray argillaceous lime-mudstone whereas, the shale is dark gray to bluish gray and the chert has a bluish to white cast. This chert is locally known as the Moline Chert by archeologists. Twenty-five to thirty feet above the coal is a thin bedded, shaly sandstone. In Mineral Creek above the Rock Island Coal, a white to light gray quartz arenite weathered with a red rusty stain. This sandstone is medium bedded and tabular (Wanless 1930). Some of the sandstones occurring above the Rock Island Coal are also micaceous. There are numerous mines that drift into the sides of Mineral Creek. These slope and drift mines are in the Rock Island Coal interval below the Seville Limestone Member of the Tradewater Formation.

Fossils found in the limestone above the Rock Island Coal contain crinoid stems, chonetid, and compositid brachiopods and small fusulinid foraminifera and conodonts. This carbonate rock is the Seville Limestone. The Pennsylvanian ranges from 0 to 140 feet thick. Figure 1 shows that the Pennsylvanian exposures are in Mineral Creek or Mud Creek. All of these are in the Tradewater Formation. The bedrock topography in Figure 2 also shows that east-west down cutting into the bedrock confined to the Green River Valley was the result of glacial meltwater in the northern part of the study area. The bedrock highs are in the southern portion of the quadrangle.

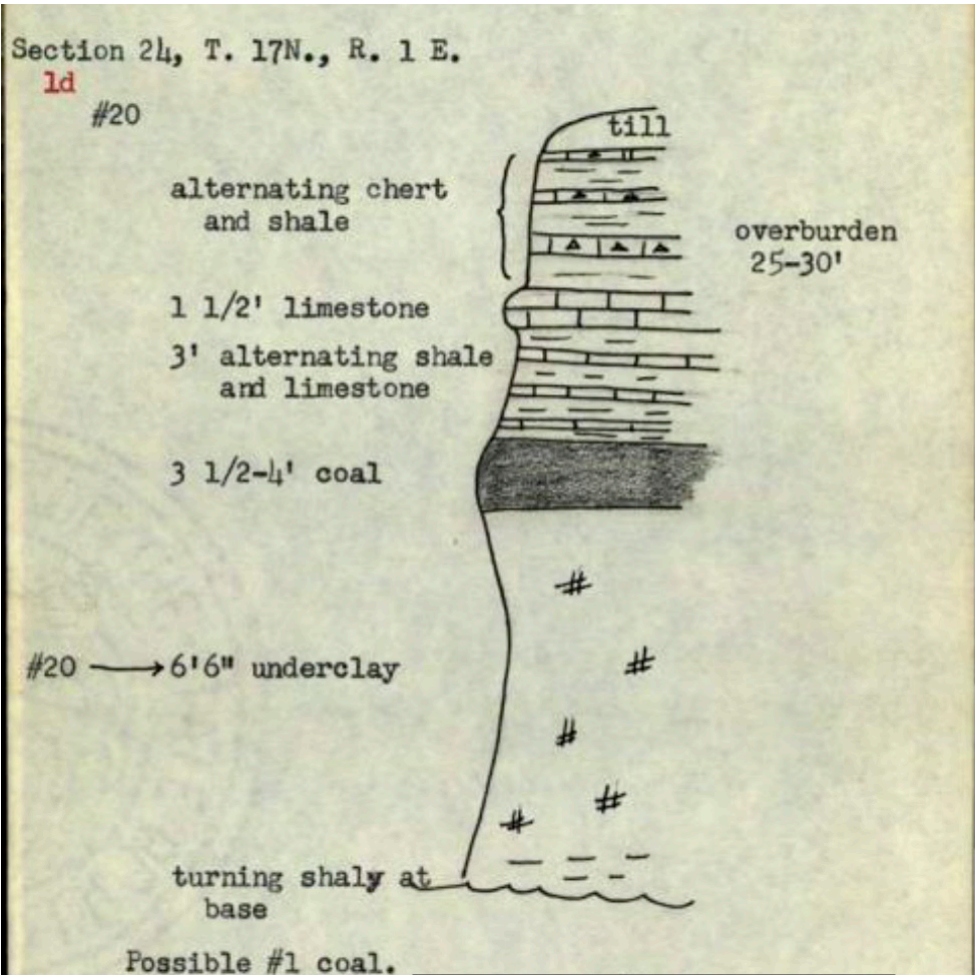


Figure 4 Walter Parham's note of Summer 1959, at east central side of sec. 24, T17N, R1E showing the Rock Island Coal well exposed in a small north trending ravine. Also depicting the Seville Limestone and the Moline Chert.

Economic Geology

Coal

At least twenty-six known mines are in the Green Rock Quadrangle by Obrad and Chenoweth (2012) all mines are stratigraphically located in the Rock Island Coal Member of the Tradewater Formation. Many of the mines were small and coal was mined for local consumption. No production numbers are known from the smaller mines in this quadrangle. Locations of these smaller mined are only generally known for example, Worthen noted in his 1882 publication that the "Mauch Chunk mines operated about 6 miles west of Geneseo, taking coal from 2.0 to 3.5 feet thick, by tunneling into the hill just above the level of Mineral Creek." The largest coal mine in the quadrangle was the Warner Coal Company, Rex Mine. It was mined from 1923 to 1945 and a total of 460,858 tons of coal was produced from this mine. For more details on the coal mines in the quadrangle the reader is referred to Obrad and Chenoweth (2012). There are no active coal mines in the study area.

Limestone

No limestone quarries occur in the quadrangle although, areas of potential Middle Devonian limestone can occur in the Green River Valley (see Figure 1).

Sand and Gravel

Two sand and gravel pits occur north of the Green River bottoms in the northern upland. These pits are in Partland sands of the Henry Formation. Sand and gravel resources in Rock Island and Henry Counties are abundant because of thick glaciofluvial deposits, mapped as the Henry Formation (Anderson and Miao 2011).

Acknowledgments

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