

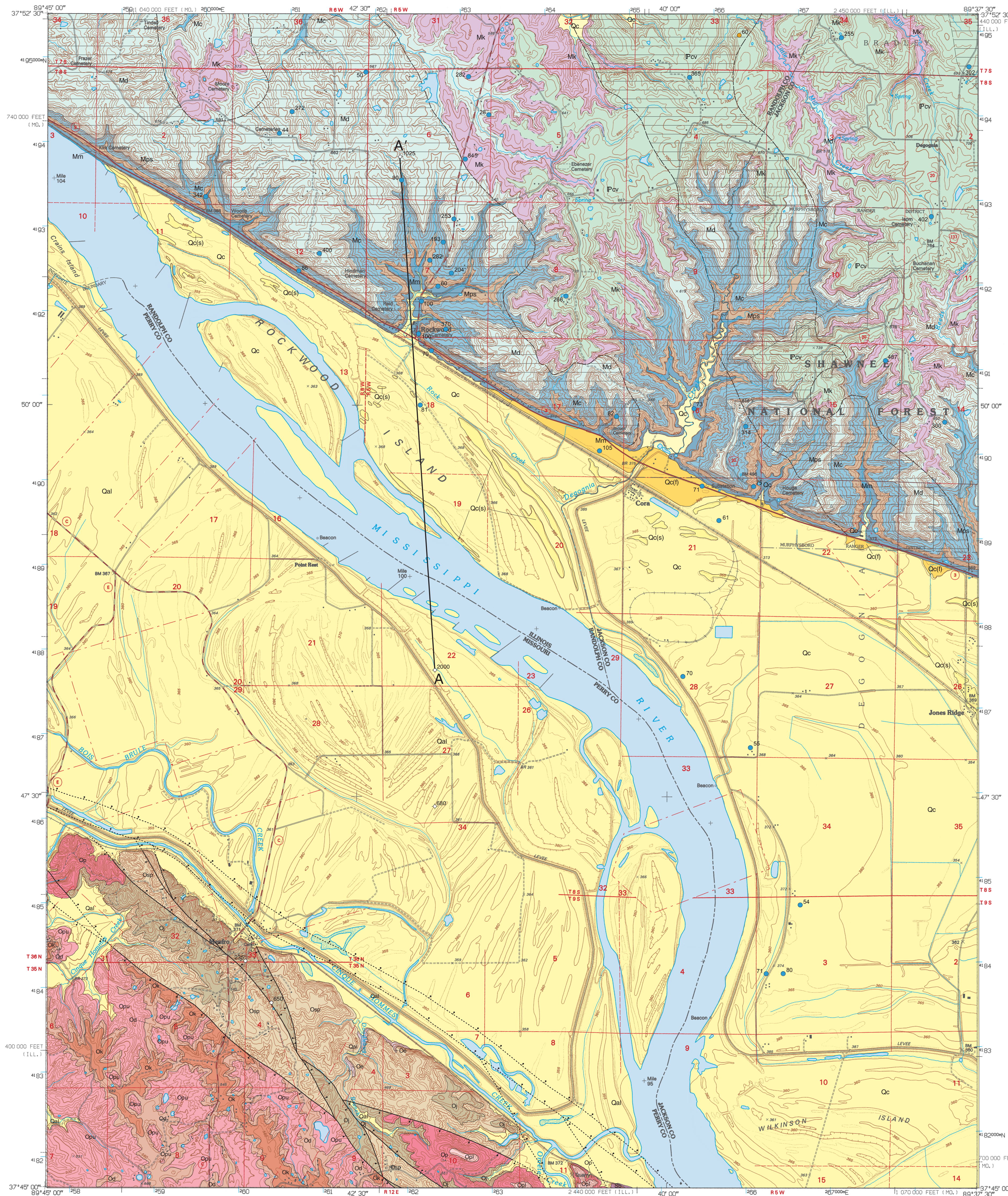
BEDROCK GEOLOGY OF ROCKWOOD QUADRANGLE

RANDOLPH AND JACKSON COUNTIES, ILLINOIS AND PERRY COUNTY, MISSOURI

Russell J. Jacobson, John D. McLeod, and Dewey H. Amos
2005

Illinois Department of Natural Resources
ILLINOIS STATE GEOLOGICAL SURVEY
William W. Shills, Chief

Illinois Preliminary Geologic Map
IPGM Rockwood-BG



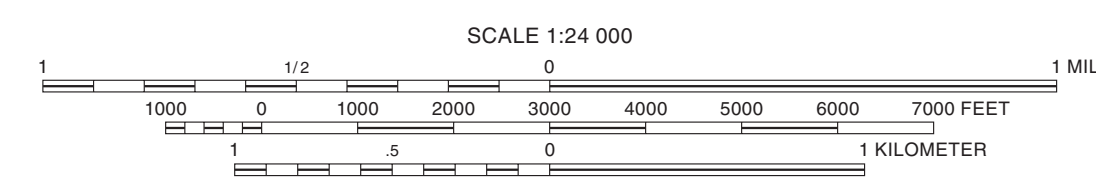
EXPLANATION			
Quaternary	Qal	Quaternary	Holocene and Pleistocene
	Oc(f)	Cahokia Formation (fan facies)	
	Oc(s)	(sandy facies)	
Pennsylvanian	Pcv	Caseyville Formation	Morrowan
	Unconformity		
Mississippian	Mk	Kinkaid Limestone	Chesterian
	Md	Degonia Sandstone	
	Mc	Clore Formation	
	Mps	Palestine Formation	
	Mm	Menard Limestone	
	Unconformity		
Silurian	Sb	Bainbridge Group	Niagaran-Cayugan
	Unconformity		
Ordovician	Ok	Kimmswick Limestone	Mohawkian
	Od	Decorah Formation	
	Opu	Pecatonica Formation (upper)	
	Opl	(lower)	
	Oj	Joachim Dolomite	
	Osp	St. Peter Sandstone	
	Oe	Everton Formation	

- Drill Holes**
from which subsurface data was obtained. Numbers indicate total depth of boring in feet.
- 60 Stratigraphic boring
 - 260 Water well
 - 410 Dry oil test
 - 100 Private well
- Note: Numbers indicate total depth of boring in feet.
- Line Symbols**
dashed where inferred, dotted where concealed
- Contact
 - Normal fault: bar and ball on downthrown side
 - Area of Kinkaid erosion
 - A—A' Line of cross section

Base map compiled by Illinois State Geological Survey from digital data provided by the United States Geological Survey. Compiled from imagery dated 1965. Revised from imagery dated 1993. PLS and survey control current as of 1966. Contours and elevations current as of 1965. Partial field check by U.S. Forest Service 1994. Map edited 1996.

North American Datum of 1983 (NAD 83)
Projection: Transverse Mercator
10,000-foot ticks: Illinois (west zone) and Missouri (east zone) State Plane Coordinate systems (Transverse Mercator)
1,000-meter ticks: Universal Transverse Mercator grid system, zone 16

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SCALE 1:24,000
BASE MAP CONTOUR INTERVAL 20 FEET
SUPPLEMENTARY CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Released by the authority of the State of Illinois: 2005

Illinois geology based on field work by R. Jacobson and J. McLeod, 2004–2005.

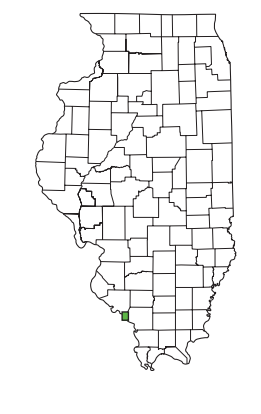
Missouri geology based on Missouri Geology Survey's Geologic Map of the Rockwood 7.5' Quadrangle, Perry County, Missouri by D.H. Amos in 1985.

Digital cartography by M. Jones, Illinois State Geological Survey.
This Illinois Preliminary Geologic Map (IPGM) is a lightly edited product, subject to less scientific and cartographic review than our Illinois Geological Quadrangle (IGQ) series. It will not necessarily correspond to the format of IGQ series maps, or to those of other IPGM series maps. Whether or when this map will be upgraded depends on the resources and priorities of the ISGS.

The Illinois State Geological Survey, the Illinois Department of Natural Resources, and the State 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 accuracy of 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.

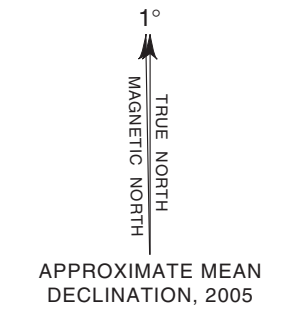


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1	2	3
4	5	6
7	8	

ADJOINING QUADRANGLES:
1 Chester
2 Welge
3 Willsville
4 Belgique
5 Raddle
6 Perryville East
7 Crosswon
8 Altenburg



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

Location and Regional Geology

In this investigation, bedrock in the Illinois portion of Rockwood Quadrangle was mapped for STATEMAP, a geologic mapping program funded by the United States Geological Survey (USGS) and the State of Illinois General Revenue Fund. Missouri bedrock in Rockwood was previously mapped by Amos (1985) and is included here courtesy of the Missouri Geological Survey. Missouri geology was not re-mapped or examined in detail in this mapping effort. Regional bedrock geology in Illinois incorporating the Rockwood Quadrangle was previously mapped by Weller and Weller (1939). Our mapping, conducted in greater detail and at a larger scale, also incorporates subsurface in Illinois and Missouri information not available at the time of Weller and Weller's effort.

Rockwood 7.5 minute Quadrangle is located approximately 8 miles southeast of Chester, Illinois, in the southwestern part of the state. From southwest to northeast, Rockwood incorporates bluffs in the Ozark Plateaus physiographic province in Perry County, Missouri, the Mississippi River and its flood plain, and bluffs and uplands of the Central Lowlands in Randolph and Jackson Counties, Illinois, where up to approximately 350 feet of relief is developed.

The most prominent feature in Rockwood Quadrangle is the Mississippi River and its floodplain, which divides the area into two major geologic provinces: the Ozark Uplift in Missouri, a regional geologic dome cored to the west by Precambrian rocks, and the Illinois Basin, an intracratonic depression filled with southeastward-thickening sequences of Paleozoic sediments. The exposed Missouri portion of Rockwood also lies in part within the Ste. Genevieve Fault Zone, a linear, northwest-trending fault complex that extends at least 120 miles from southmost Illinois into eastern Missouri (Nelson and Lumm 1985). Surface bedrock in the Illinois portion of Rockwood consists entirely of sedimentary rocks of Lower Pennsylvanian (Morrowan) and late Mississippian (Chesterian) age that appear nearly horizontal along strike (NW-SE) and dip gently (less than 3 degrees) northeast into the Illinois Basin. The Mississippi River and its flood plain occupy the majority of the area in Rockwood and obscure much of the geology in the quadrangle, including the contact between disturbed beds of the Ste. Genevieve Fault Zone in Missouri and the nearly horizontal rocks that rim the Illinois Basin.

A southeast-oriented drainage divide through the Illinois portion of the quadrangle separates bedrock in the continuous bluffs and ravines along Highway 3 from ravines and tributaries that drain northward into the valley of Mill Creek. Thick loess (up to 80 feet) mantles some ridges and locally obscures outcrops. Water wells and oil and gas tests were useful for identifying formations beneath loess, as well as providing information about the thickness and character of subsurface bedrock units.

Erosion of late Mississippian, early Pennsylvanian, or Pleistocene age has extensively removed late Chesterian Kinkaid limestone from much of the Illinois portion of the Rockwood Quadrangle. Although late Mississippian and earliest Pennsylvanian erosion is speculative, we found abundant evidence of paleovalley erosion associated with the development of the basal Pennsylvanian Caseyville Sandstone. In addition, Pleistocene glacial scour is developed in the adjacent Raddie Quadrangle (Joe Devera, personal communication), and may be responsible for later erosion and modification of the paleovalley pattern. We noted a number of alluvial deposits that contained glacial erratics, but did not find good exposures of glacial drift (diamicton) in Rockwood.

Stratigraphy

Menard Limestone

The Menard Limestone is the oldest formation exposed in Illinois portion of Rockwood Quadrangle. It is present at about 400 foot elevation along the base of bluffs facing the Mississippi, in ravines and streams draining from these bluffs into the Mississippi River, and at low-water in outcrops along the Mississippi River in the northwest corner of the quadrangle. Drill hole data and exposures near Chester show the formation to be 80 to 100 feet thick in the area (Willman et al. 1975). Outcrops of lower Menard limestones are exposed along the river at low stage in the SW Sec. 2, T8S, R6W. Exposures elsewhere are intermittent at best due to coverage by talus of these slopes in many areas. Some of the better exposures include the ravine in the NW NE NE Sec. 11 and SW SE SE Sec. 2, T8S, R6W; the ravine near the center of the NW NW Sec. 12, T8S, R6W; the south valley wall of the ravine in the south center of Sec. 7, T8S, R5W; the west slope of the mouth of the ravine (just north of highway 3) in the NE NE NE Sec. 21, T8S, R5W; and the west slope of the ravine mouth in the NE SE NE Sec. 22, T8S, R5W.

Basin-wide, three limestone members separated by calcareous shales are recognized (Willman et al. 1975) in ascending order for the Menard: the Walche, Scottsburg and Allard Limestone. The Walche Member thins northward and is not recognized in the Rockwood area. The upper member (the Allard) is the most massive and is likely the portion primarily exposed in the bluff line exposures. In at least one outcrop (NW NE NE Sec. 11, T8S, R6W), however, some shale below the carbonate may represent the unnamed shale below the Allard Member. An oil and gas test in the SW Sec. 6, T8S, R5W (discussed later in this report) suggested a subsurface formation thickness of 80', with an upper 20' limestone (Allard), a middle 30' shale and a lower 30' limestone (Scottsburg).

Contact with the overlying Palestine in this area was not observed because it is typically covered by talus. The contact is locally unconformable where basal Palestine sandstone filled channels eroded into the upper Menard and removed most or all of the 10 to 20 feet of shale characteristic of the top of the Menard in some locations (Willman et al. 1975).

Palestine Sandstone

The Palestine Sandstone unconformably overlies the Menard, and ranges from 40 to 60 feet thick in the quadrangle. Lithologically the Palestine is variable, with areas of thin-bedded shaly sandstone and interbedded sandy shale. Over most of the quadrangle, however, more massive beds of sandstone are developed in the upper 18 to 20 feet of the formation. In the shaly portion of the formation, the sandstones are gray, fine-grained, and somewhat argillaceous, whereas the more massive sandstones (best exposed along the Mississippi bluff) are lighter gray, locally white to tan, and fine to medium-grained and massive-appearing, but internally thin to thick-bedded, with bioturbation and a few zones of thinner interlaminate sandstone with shale and siltstone. The lower argillaceous sandstones are thin-bedded and ripple-laminated, extensively bioturbated, and interbedded with dark gray to gray silt and silty shale laminations and tidally laminated (alternating thick/thin lamina). The upper portion of the formation is generally dark gray to greenish gray silty shale and siltstone and thin interbedded argillaceous sandstones. Remains of fossil trees (*Lepidodendron*) are especially common in the Palestine.

Clare Formation

The Clare Formation overlies the Palestine Sandstone with a conformable, gradational contact. The Clare ranges from about 90 to 100 feet thick. The lower part of the Clare (Tygett and Cora members) is poorly and intermittently exposed over most of the quadrangle. The best exposures include a ravine in the bluff above the Mississippi and Route 3 (west center line of Sec. 2, T8S, R6W), where much of the shale and thin limestones may be seen, and another ravine in the NW NW Sec. 12, T8S, R6W. In the first ravine, the section (from base) consists of 20 feet of dark blue-gray shale, becoming lighter blue-gray upward, with a number of thin argillaceous limestones in upper portion, also becoming silty near the top (possible Tygett). Next there are 4 to 5 feet of thin bedded, argillaceous, fossiliferous limestone, and then about 5 to 6 feet of gray shale overlain by typical Ford Station member limestone. Other exposures of the lower Clare (not as good as the one above) are similar, consisting of medium to dark gray shale that is limy in part, thin argillaceous limestone beds and lenses, and locally thicker limestone beds, all of which are very fossiliferous.

The most persistent limestone exposed is from the upper portion of the formation (Ford Station Member of Swann 1963 and Willman et al. 1975) where we observed around 20 to 25 feet of carbonate overlain by about 10 feet of shale and several thin limestones. The limestones in the Clare are often argillaceous, and sometimes the middle portions of a given bed are especially argillaceous, leading to hour-glass weathering that is typical of (but not unique to) the Clare.

The Ford Station carbonate (lower 2/3 of this member) consists of limestones that are light gray, grading downward to medium and darker gray, argillaceous micrites and wackestones. The lower portions of the main limestone beds contain lenses and zones of dark gray to black chert. The basal portion of these 20-25 feet of carbonates consists of limestone that is thin, dark gray and very argillaceous with shale interbeds. Exposures of the basal Ford Station carbonate are best developed along the bluff face overlooking the Mississippi (when not covered by Degonia float blocks). Ravines within this main bluff still expose the carbonate but exposures are not as good. Erosion and paleokarst below the Degonia has locally removed the Ford Station and its carbonate in a few areas, such as portions of the NW trending main ravine, and sides in the NE NE of Sec. 12, T8S, R6W, and parts of a SE trending ravine in the south center of the SW Sec. 8 T8S, R5W.

An in-house sample study and borehole log of an oil and gas test (discussed later under "Oil and Gas") in the SW Sec. 6, T8S, R5W encountered 93' of Clare and included, in ascending order, a basal shaly unit (30') and a lower limestone (11') (Cora and Tygett), a medial shaly unit (15'), an upper limestone (15') (Ford Station) and an upper shale (21'). The upper and lower shaly units are poorly exposed slope-formers and field mapping relied on the presence of the limestone units to suggest their occurrence.

The Clare is very fossiliferous, with abundant bryozoans (branching as well as fenestrate, and including *Archimedes*) and brachiopods (*Spirifer* and *Composita*), which in the shaly portions (especially in the Cora Member near base) consist mostly of productids. Gastropods and solitary corals are also common. Echinoderm remains (crinoids and blastoids) are especially common, comprising grainstones with bryozoan remains. Several locations in the basal limestones of the Ford Station member contain large blastoid calyces up to golf ball size or larger.

Degonia Sandstone

Overlying the Clare, the Degonia Sandstone is the most prominent formation in the Illinois portion of the quadrangle. The thickness of the formation is typically around 100 feet, although locally it may thin to around 90 feet or thicken to over 110 feet. The Degonia unconformably overlies the Clare Formation in most areas, especially the eastern portion of the quadrangle. Locally, however, in the northwestern part of Rockwood we observed a conformable to gradational contact between the lower shales and siltstones of the Degonia and thin sandstones with the underlying Clare shales and thin limestones.

Overall the Degonia Sandstone appears to consist of two sandstone bodies with the lower unit (about the lower half to third of the formation) consisting of a thin to thick-bedded sandstone, that is locally shaly to silty (especially at its base and top), with abundant shale and siltstone interbeds. Where the two sandstone bodies are distinct (best seen in the south part of Sec. 36, T7S, R6W and Sec. 31, T7S, R5W along stream valley walls and cuts) they are separated into thin to medium bedded sandstone with zones of interlaminate, ripple laminated argillaceous sandstone and siltstone. The upper sandstone unit is often more massive-appearing, forming cliffs or bluffs that are typically 50 feet thick or more. In some areas (especially along the watershed of Degonia Creek in the eastern part of the mapped area), the lower sandstone becomes more massive and less shaly and silty, and appears to merge with the upper sandstone body, forming major bluffs that may exceed 80 feet in thickness in a few areas.

The sandstone that comprises most of this formation is typically white when fresh, and yellow to yellow orange when weathered, fine to medium grained, with well-developed cross-bedding (sometimes faint on the massive appearing shear bluffs). In the lower half of the thicker bluffs we have observed abundant cross bed sets that have exposed bedding plane surfaces exhibiting abundant ripple marks. One of the best locations to observe thick Degonia bluffs (and cross bedding and ripples) is in the SE NE NW and SW NW NE of Sec. 10, T8S, R5W. Honeycomb weathering is common on the bluffs and overhangs of the massive Degonia Sandstone as well.

The upper and lower portions of the Degonia are often shaly, consisting of greenish to greenish blue to gray and dark gray shales, siltstones and interbedded thin shaly, ripple marked sandstones. Near the contact with overlying Kinkaid Limestone the thin interbedded sandstones are highly bioturbated. In the areas where the lower contact with the Clare is more gradational and conformable-looking (such as in some ravines in northwestern part of Sec. 1, T8S, R6W and SW of Sec. 36, T7S, R6W) the basal interval consists of gray, argillaceous, calcareous, sandstone, interlaminate with gray micaceous, ripple laminated, micaceous, bioturbated sandy siltstone and shale.

In the eastern part of Rockwood Quadrangle, the Degonia is conformably and locally overlain by the Kinkaid Limestone. In an approximately mile-wide zone, however, a paleovalley incised into the Kinkaid and Degonia (including the Degonia shaly zones and some of the upper massive sandstone) and is filled with Lower Pennsylvanian Caseyville sandstone. The upper Degonia sandstones are so similar to those of the overlying Caseyville sandstones that only the presence of abundant quartz pebbles in the Caseyville has been helpful in distinguishing the two formations when the Kinkaid Limestone is absent.

Kinkaid Limestone

The Kinkaid Limestone is largely confined to the eastern half of the mapped area, with one small isolated outlier near the northwestern corner (SE Sec. 35., T7S, R6W and NE Sec. 2, T8S, R6W, Randolph County).

Although up to 90 feet of Kinkaid is present just to the east of the Rockwood Quadrangle (in quarries in the NW Sec. 6, T8S, R4W), pre-early Pennsylvanian, or Pleistocene erosion has removed much of the formation. The thicknesses observed are quite variable, but range from less than 10 feet to over 50 feet, with 20 to 40 feet being more common. The formation conformably overlies the Degonia Sandstone but has an irregular unconformable contact with overlying lower Pennsylvanian Caseyville Formation.

The Kinkaid is dominated by limestone, but shale beds up to a few feet thick may locally occur. The limestone is commonly light to dark gray in color, ranging in texture from mudstone and wackestone to crinoidal grainstone. Most beds of limestone are a foot or less in thickness, locally with shaly partings. Chert is common, especially in the upper portions of the formation where mapped. The unit contains typical shallow-water upper Mississippian marine invertebrates, including branching and fenestrate bryozoans, brachiopods, echinoderm remains (including crinoids and blastoids) and some mollusks.

Over much of the state (to the east-southeast of Rockwood) the Kinkaid consists of up to 3 members: the lower Negli Creek (predominantly limestone), the middle Cave Hill (mostly shale with some limestone) and the upper Goreville (predominantly limestone). By contrast, it is up to nearly 100 feet thick in southern and southeastern Illinois. In quarries there, about 80 to 90 feet of Kinkaid, representing the Negli Creek and Cave Hill are present. Likewise in the Rockwood Quadrangle, the Goreville Member is absent.

Caseyville Formation

Sandstones (and some shale and siltstones) of the Pennsylvanian Caseyville Formation unconformably overlie strata of Mississippian age from Kinkaid Limestone to Degonia Sandstone in roughly the eastern half of the mapped area with localized paleovalley development. The formation ranges in thickness from 40 to a little over 100 feet. We observed approximately 40 to 60 feet of Caseyville outside of the paleovalley area and from 80 to over 100 feet within the paleovalley trend.

Caseyville in the Rockwood area represents the Pounds Sandstone member of the formation (Weller 1940), the uppermost of three sandstone intervals (Wayside, Battery Rock, Pounds). As mapped by ISGS geologists, the Caseyville is an overlapping wedge that pinches out to the northwest.

The Caseyville Formation consists mostly of pebbly bluff-forming sandstone with some siltstone and shale beds, especially in the upper portions of thicker sections. Many of these lower sandstones appear medium to thick-bedded and massive and are often cross-bedded. They may also display honeycomb weathering, liesegang banding, and form steep bluffs and overhangs in several areas, especially in the thick sections within paleovalleys.

Above the bluff-forming, pebbly, massive sandstones, the Caseyville consists of thinner bedded sandstones (sometimes finer-grained and not having as many quartz pebbles) and dark silty shales and siltstones, which are poorly exposed except in steep, active ravines. Most of the shales are medium to dark gray and grade into, and are interbedded with, siltstones and thin-bedded sandstones. In at least one of these upper Caseyville exposures (SW SE SW NE Sec. 4, T8S, R5W), we observed thin argillaceous micaceous sandstones and gray micaceous shales and siltstones near the top of the unit. These younger beds display many characteristics of the overlying Tradewater Formation observed just a few miles north and northeast of here. They may represent the top of the Caseyville, or the transition to Tradewater, or basal Tradewater strata. However, not enough of this interval was observed to confirm the basal Tradewater and thus only Caseyville was recognized on our map.

Quaternary Deposits

Mapped unconsolidated deposits of Quaternary age in Illinois include sandy and fan facies in the Mississippi River valley and undifferentiated alluvial deposits of the Quaternary Cahokia formation. The sandy and fan facies were mapped based on geomorphic expression on the flood plain. The Gremaud oil and gas test in Missouri (discussed below) logged 140' of alluvium in the flood plain. Quaternary deposits unconformably overlie all bedrock formations in the quadrangle but are not included on the stratigraphic column. Surficial loess was noted but not mapped.

Structural Geology

Mapped Chesterian outcrops in the Illinois portion of Rockwood quadrangle demonstrate a regional strike of approximately north 40 degrees west and regional dip of less than 3 degrees to the northeast into the Illinois Basin. No evidence of faulting was observed. The boundary between disturbed beds in the Ste. Genevieve fault zone and the near-horizontal beds of the Illinois Basin is concealed, however, and it is possible two other structures exist beneath the Mississippi River alluvium.

In the Rockwood quadrangle, a low-angle unconformity is developed between the Pennsylvanian Caseyville and underlying Kinkaid limestone (Joe Devera personal communication). Pennsylvanian sediments become older eastward and were accompanied by local erosion of the Kinkaid in north-south paleovalleys.

Economic Geology

Oil and Gas

Only one oil test is known within the Illinois portion Rockwood Quadrangle, the John C. Andrews #1 Frazer located in the SW NE NW Sec. 6, T8S, R5W. It was drilled in 1952 to total depth of 1025' into the Mississippian Ste. Genevieve Limestone and abandoned as a dry hole with no recorded shows. Several other tests in Illinois were drilled within

a mile of the quadrangle, the deepest of which was the M.C. Trumbell #1 Bennett, a 2950' Ordovician Kimmiswick test in the NW NW NE Sec. 26, T8S, R5W (Raddie Quadrangle). This well, drilled in 1939, recorded several instances of bitumen in Ordovician formations (Maquoketa, Kimmiswick, and Decorah).

Two oil tests were drilled in the Missouri portion of Rockwood, the deepest of which was the Murphy Oil #1 Gremaud, drilled in the C SE SW Sec. 22, T36N, R12E in 1967 to a total depth of 2000' into the Devonian Bailey Formation. There were no recorded tests or shows.

Oil and gas potential in the Illinois portion of the Rockwood quadrangle is constrained by the lack of discernable structure in the shallow Upper Chesterian units. It is possible, however, that the broad Mississippi River floodplain masks an extension of the Ste. Genevieve fault zone beneath the alluvial sediments that could trapped hydrocarbons that migrated up dip from deeper units in the Illinois Basin. Seismic reflection and drilling would be required to explore this unknown portion of the basin.

Coal

No coal was encountered by the authors during this investigation, although abundant plant remains are found locally in the Palestine and Degonia, consisting of casts of *Lepidodendron* logs and branches. In the Degonia of southwestern Illinois, thin coal beds were noted by Swann (1963). Although we observed no such beds, a local landowner at Rockwood reported that a small coal mine was once operated in the bluff near Tower Rock (comprised mostly of Degonia Sandstone), but it could not be verified.

Limestone

Limestone is not currently quarried in commercial quantities in the Rockwood Quadrangle. However, in the adjacent Raddie Quadrangle in NW Sec. 6 T R 4 W, there is an active quarry in the Caseyville Sandstone and Kinkaid Limestone. Approximately 50 feet of Kinkaid is quarried and crushed for gravel (the Caseyville is spoil). There are several areas in the northeast part of Rockwood Quadrangle where similar deposits of Kinkaid could be quarried. These deposits would have to be first carefully delineated, however, due to local erosion of the Kinkaid.

The Cora and Ford Station limestones of the Clare Formation are a possible future limestone resource. Although it has not been quarried in this quadrangle, a Works Progress Administration (WPA) project quarried the Ford Station Member during the 1930s in the nearby Chester Quadrangle to the northwest.

The Menard Limestone contains another undeveloped resource. Although the formation is 80-100' thick in the quadrangle, it appears to contain thick shale units over most of the quadrangle which might limit its use.

Ground Water

Numerous water wells have been drilled in Illinois portion of Rockwood Quadrangle. In the interior of the Mississippi River flood plain, water is easily obtained from wells less than 100' deep that are completed in alluvial sediments. Along the toe of the bluffs and in the uplands, wells are often drilled into the Menard Limestone or deeper to produce water from Chesterian formations below the Mississippi River water table. Although several permeable sandstone formations are at or near the surface in the quadrangle (Caseyville, Degonia, Palestine), they are only sporadically useful as aquifers.

Acknowledgments

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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.

We thank the USGS for their support of our mapping program, numerous landowners in Rockwood Quadrangle who allowed access to their land during field work, Jane Dornier and Mark Jones of the ISGS for cartographic support, and Jeff Jaques of the Missouri Geological Survey, who provided valuable Missouri oil and gas well data. Also from the ISGS, Bracken Wimmer digitized the logs used in the cross section; W. John Nelson logged samples and picked tops in the Frazer well; and Joseph H. Devera provided valuable regional geologic information.

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SYSTEM	SERIES	FORMATION	MEMBER	GRAPHIC COLUMN	THICKNESS (FEET)	UNIT	DESCRIPTION	
PENNSYLVANIAN	MORROWAN	Caseyville			40-100	A	A Caseyville Formation Sandstone, with minor shale and siltstone; sandstone generally white to tan, yellow-orange to yellow when weathered, clean, fine to coarse grained and quartzose with disseminated and concentrated rounded quartz pebbles and more rarely, blocky chert gravel; most shales medium to dark gray and grade into and are interbedded with siltstones and thin-bedded sandstones.	
			Kinkaid	Cave Hill		0-50	B	B Kinkaid Limestone Limestone with thin gray shale partings and a medial gray shale bed; limestone commonly light to dark gray, ranging in texture from lime mudstone and wackestone to crinoidal grainstone; most limestone beds one foot or less thick, separated by thin shaly partings; chert is common, especially in the upper formation; limestone contains abundant marine invertebrates, including branching and fenestrate bryozoans, brachiopods, echinoderm remains (including crinoids and blastoids) and some mollusks (gastropods and a nautiloid cephalopod).
				Negli Creek		0-50	B	
MISSISSIPPIAN	CHESTERIAN	Degonia			90-110	C	C Degonia Sandstone Sandstone, with lesser shale and siltstone; sandstone white when fresh and yellow to yellow orange when weathered, fine to medium grained, quartzose, exhibiting prominent cross-bedding (sometimes faint on the massive-appearing shear bluffs); upper and lower portions of the Degonia often shaly, consisting of greenish to greenish blue to gray and dark gray shales, siltstones and interbedded thin shaly, ripple marked sandstones.	
					90-100	D	D Clare Formation Shale with variable amounts of limestone; shale medium to dark gray, limy in part; limestone thin-bedded and lens-forming, argillaceous, with locally thicker limestone beds, all very fossiliferous with echinoderms, bryozoans, and brachiopods; limestone light gray, grading downward to medium and darker gray argillaceous lime mudstones and wackestones; then to lenses and zones of dark gray to black chert in thin, dark gray and very argillaceous limestone with shale interbeds.	
		Ford Station			90-100	D		
					90-100	D	E Palestine Sandstone Sandstone, locally with areas of thin-bedded, shaly sandstone, and interbedded sandy shale; uppermost formation locally contains dark gray to greenish gray silty shale and siltstone and thin interbedded argillaceous sandstones; more commonly, uppermost Palestine dominated by massive sandstone, gray, white to tan, and fine to medium grained, massive-appearing but internally thin to thick bedded, with bioturbation and a few zones of thinner interlaminate sandstone with shale and siltstone; lower 20 feet of the formation dominated by argillaceous sandstones, gray, fine-grained, thin-bedded, ripple laminated, extensively bioturbated, and interbedded with dark gray to gray silt and silty shale interlamination.	
			Palestine		40-60	E	F Menard Limestone Limestone, thin-bedded, with shaly partings, and interbedded shale; limestone argillaceous, dark brownish gray to dark gray to tan, dense and ranges from lime mudstone that are sometimes lithographic, to wackestones, and crinoidal grainstones, contain local chert zones and nodules, and have bedding planes that often are uneven and hummocky; shale often calcareous, dark gray and fossiliferous with beds and nodules of limestone; very fossiliferous, containing brachiopods, corals, echinoderms, and bryozoans.	
	Menard		80-100	F				

