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GEOLOGY OF CYPRESS QUADRANGLE
UNION, JOHNSON, AND PULASKI COUNTIES, ILLINOIS

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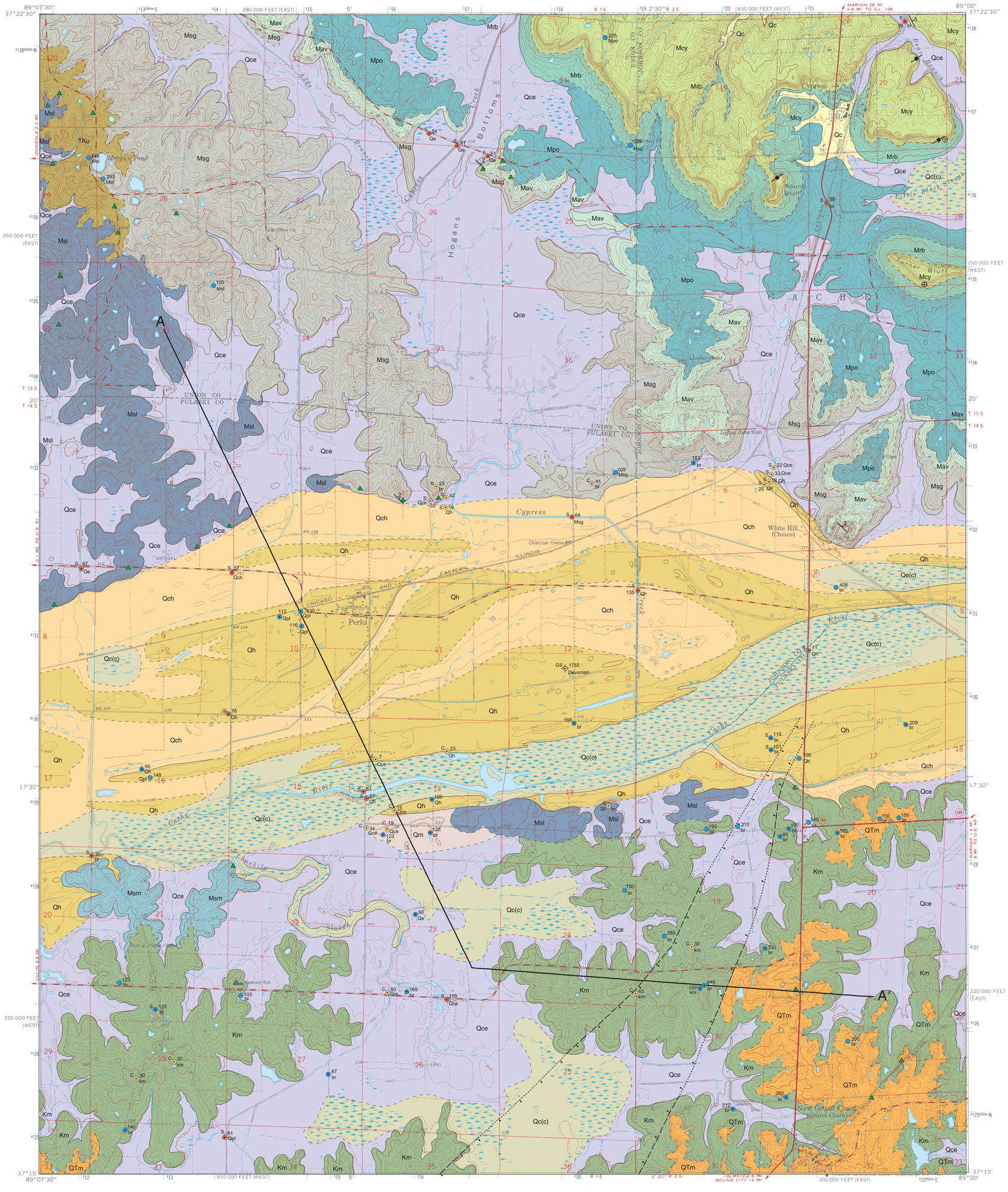
2009

Illinois Geologic Quadrangle Map
IGQ Cypress-G



EXPLANATION

Quaternary	Qc	Cahokia Formation	Holocene
	Qc(c)	Cahokia Formation (clay facies)	
	Qce	Cahokia and Equality Formations	Wisconsinan
	Qch	Cahokia and Henry Formations, mapped where Cahokia is 5 feet or thicker	
	Qh	Henry Formation, mapped where Cahokia is thinner than 5 feet	Illinoian
Unconformity			
	Qm	Metropolis Formation	pre-Illinoian
Tertiary	QTm	Mounds Gravel	Pliocene
Unconformity			
	TKu	Tertiary and Cretaceous undivided	Miocene to Campanian
Unconformity			
Cretaceous	Km	McNairy and Post Creek Formations	Maastrichtian and Campanian
Unconformity			
	Mcy	Cypress Formation	Chesterian
	Mrb	Ridenhower Shale and Bethel Sandstone	
	Mpo	Paoli Limestone	
Mississippian	Mav	Aux Vases Sandstone	
	Msg	Ste. Genevieve Limestone	
	Msl	St. Louis Limestone	
	Msm	Salem Limestone	Valmeyeran or Meramecian

Note: Loess deposits, comprising the Peoria, Roxana, and Loveland Silts, cover nearly all upland areas of the Cypress Quadrangle. These units are not shown on the geologic map.

Symbols

- 45 — Strike and dip of bedding, number indicates degree of dip
- Vertical joints
- Horizontal bedding
- Outcrop, not shown in northeast quarter of map where outcrops are numerous

Drill Holes
from which subsurface data were obtained.

- Stratigraphic boring (ISGS)
- Water well
- Engineering boring
- Dry oil test hole

Letters indicate samples (s), geophysical log (g), or core (c).
Numeric label indicates total depth of boring in feet.
Unit label denotes formation at bottom (br, Mississippian bedrock; Qpl, Pearl Formation).
Dot indicates location accurate within 100 feet.

SGC 54 Qe

Line Symbols
Dashed where inferred, dotted where concealed

- Contact
- Normal fault: bar and ball on downthrown side at top of Mississippian bedrock
- A—A′ — Line of cross section

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

Base map compiled by the Illinois State Geological Survey from digital data (Raster Feature Separates) provided by the United States Geological Survey. Topography by photogrammetric methods from aerial photographs taken 1963. Field checked 1966.

North American Datum of 1927 (NAD 27)
Projection: Transverse Mercator
10,000-foot ticks: Illinois State Plane Coordinate system, east and west zones (Transverse Mercator)
1,000-meter ticks: Universal Transverse Mercator grid system, zone 16

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SCALE 1:24,000
1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER

BASE MAP CONTOUR INTERVAL 10 FEET
SUPPLEMENTARY CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Geology based on field work and well-log analysis by J. Devera and J. Nelson, 1998–2005.

Digital cartography by J. Domier, M. Bentley, and M. Widener, Illinois State Geological Survey.

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4		5
6	7	8

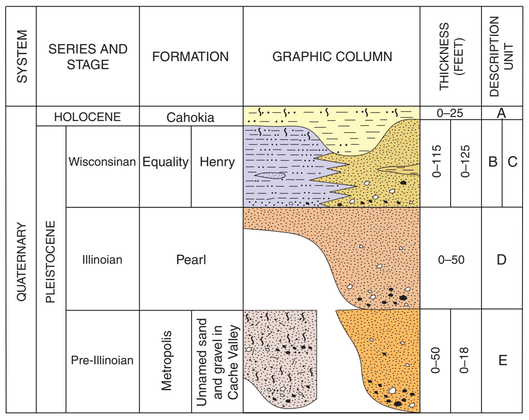
ADJOINING QUADRANGLES
1 Anna
2 Mt. Pleasant
3 Vienna
4 Dongola
5 Karnak
6 Pulaski
7 Olmsted
8 Bandana

APPROXIMATE MEAN DECLINATION, 2008

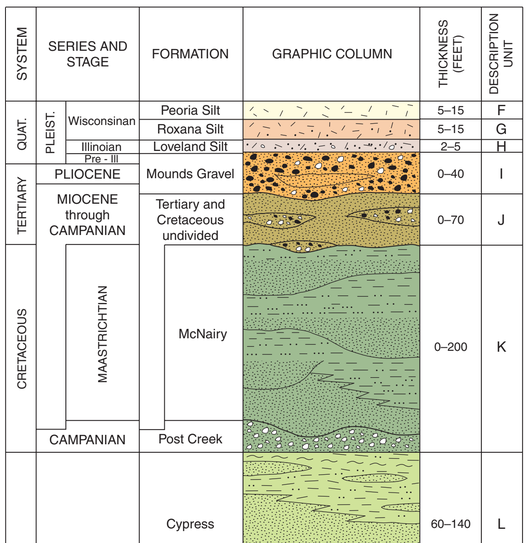
ROAD CLASSIFICATION

- Primary highway, hard surface
- Secondary highway, hard surface
- Light-duty road, hard or improved surface
- Unimproved road
- State Route

CACHE VALLEY



UPLANDS



CACHE VALLEY

A Cahokia Formation Silt and clay; minor sand and gravel. Predominantly silt and silty clay that are mottled in gray, brown, and yellowish brown. Structure is massive, blocky, or granular; rarely laminated. Clay skins, peds, and root traces are common and are features of the modern soil. Also common are pellets, fracture coatings, and small concretions of iron and manganese oxide. Calcite nodules are uncommon. Hughes (1987) determined that the Cahokia is rich in expandable clay minerals. Sand, gravel, and angular fragments of chert, limestone, and sandstone occur near bedrock outcrops in the northern part of the quadrangle. Contact to the Equality Formation is gradational and difficult to identify in the field. Contact to the Henry Formation is a transition from silt above to sand below. The silty clay facies (Qc(c)) is gleyed silty clay, clay, and silty clay loam in medium to dark gray, brownish gray, and olive-gray. These sediments are blocky to massive and plastic and contain a large amount of plant debris. Soil types include Cape, Karnak, Jacob, and Darwin (Fehrenbacher and Walker 1964, Parks and Fehrenbacher 1968, Miles et al. 1979). The silty clay facies occurs in sloughs and undrained depressions within the Cache Valley and some of its major tributaries. The largest tract, along Cache River, represents an abandoned final channel of the ancestral Ohio River.

B Equality Formation Clay, silt, minor sand and gravel. Dominantly clay, silty clay, and silt that are chiefly medium to dark gray to brown and olive, bluish, and greenish gray. Varying degrees of mottling are present. Sediments are massive to finely laminated and interlaminated with gray silt and fine sand. Gastropods, crustaceans, and plant material are present. Weakly developed soil horizons are common, as marked by blocky structure, clay skins, peds, and pellets or small concretions of iron and manganese oxides. Lenses and interbeds of sand and gravel occur near the margins of the Cache Valley where this unit intertongues with the Henry Formation. The Equality fills valleys north and south of the main Cache Valley and is interpreted as lacustrine and fluvial overbank sediments. These valleys are deeply incised into bedrock. The unit is 70 feet thick in Bear Branch near the northeast corner of map and 115 feet thick where Route 169 crosses Limekiln Slough.

C Henry Formation Sand, gravel, and silt. Principally sand that is white to medium gray and yellowish brown; very fine- to coarse-grained. Composition is 80 to 90% quartz grains and 10 to 20% chert and other lithic grains, including mica and bituminous coal. Fine sand is typically subangular to subrounded, whereas coarse sand is subrounded to well rounded. Bedding is seldom observed, but laminae or thin interbeds of silt and clay may be present. Fossils consist of shell fragments and plant debris. Conifer wood from sand at a depth of 60 to 65 feet in the Hayes and Sims No. 3 well near Perks (Sec. 20, T14S, R1E) yielded a late Wisconsin Episode radiocarbon age of 14,016 ± 108 years. Gravel is typically "pea gravel" made up of rounded granules and small pebbles (less than ½ inch). Pebbles are mostly quartz and chert, but include a large variety of sedimentary, metamorphic, plutonic, and volcanic rocks indicative of glacial outwash. The Henry typically forms one or more upward-fining sequences. This unit represents fluvial channel, point bar, and longitudinal bar facies. The lower contact is erosional, but where this unit rests on the Pearl Formation, a detailed sample log is needed to identify the contact.

D Pearl Formation Sand and gravel. Sand and gravel are lithologically similar to the Henry Formation, except that pebbles larger than 1 inch across are common in the Pearl. Sediments fine upward and rest with an erosional contact on Mississippian bedrock. The Pearl is interpreted as fluvial channel deposits of Illinoian age. The Pearl is found in the subsurface only.

E Metropolis Formation Silty sand, sand, gravel, and diamicton. This poorly sorted mixture of clay-rich silt, sand, and gravel is strongly mottled in red, yellow, and orange-brown. Gravel is mostly rounded gray to brown chert pebbles derived from the Mounds Gravel. Water-well records near Limekiln Slough in the south half of Sec. 14, T14S, R1E suggest Metropolis underlying loess; three well records in the SW¼ of Sec. 23, T14S, R1E indicate Metropolis underlying Equality Formation. The only available samples are from an ISGS stratigraphic test hole in Sec. 23. The Metropolis comprises Illinoian and older fluvial sediments near the Ohio River between Paducah, Kentucky, and Cairo, Illinois (Nelson et al. 1999). Metropolis in the Cypress Quadrangle may have been deposited in a south-flowing tributary that predates occupation of the Cache Valley by the Ohio River. Hogan's Bottoms may represent the northern part of this tributary, which is cut in half by the Cache Valley.

An ISGS test hole near the south line of Sec. 12, T14S, R1E, penetrated about 18 feet of sand and gravel resting on bedrock that may be older than the Pearl Formation. Pebbles are dominantly brown, glossy chert pebbles derived from the Mounds Gravel; igneous and metamorphic clasts are absent.

UPLANDS

F Peoria Silt Silt is yellowish brown to medium brown with strong gray mottling and has a well-developed subangular blocky structure. Peds, clay skins, and manganese pellets are common in the lower part. The modern soil is developed in this unit (not shown on map).

G Roxana Silt Silt is medium to dark brown and may have faint gray mottling, but is less strongly mottled than the Peoria. Structure is massive, platy, or weak angular blocky. In well samples, the Roxana is typically clay-rich, wet, and plastic compared to the drier, more crumbly Peoria. The Farmdale Geosol in the Roxana is weakly developed (not shown on map).

H Loveland Silt Silt is strongly mottled in yellowish to reddish brown and gray and is clay-rich with common clay coats or clay skins. Fine granular to subangular blocky structure is developed. The lower part may contain scattered sand grains and small pebbles. The Sangamon Geosol, a prominent paleosol, is developed herein (not shown on map).

I Mounds Gravel Gravel is yellowish to reddish brown and composed dominantly of subrounded to well-rounded chert pebbles that range up to about 4 inches in diameter. Pebbles typically have a bronze gloss or patina. Matrix is largely coarse, reddish brown sand. Distribution is poorly known because of thick loess. Description is based mainly on outcrops and well data from adjacent areas.

J Tertiary and Cretaceous strata, undifferentiated Sand and gravel. Sand is red, orange, and brown, fine- to coarse-grained, and contains small rounded quartz and chert pebbles. Gravel is angular to well-rounded pebbles of gray to black, vitreous chert as large as 4 inches, along with quartz granules. Bedding is indistinct and commonly contorted. Bands, nodules, and lumps of dark brown to black iron oxide occur along with iron-cemented sand and gravel. Unit is poorly exposed. It mantles limestone uplands near the northwest corner of the map area.

K McNairy and Post Creek Formations Sand, silt, clay, and gravel. Sand is white to light gray and yellowish, reddish, and orange-brown. It is very fine- to medium-grained and contains plentiful mica. Silt and clay are mostly light to dark gray, micaceous, and interlaminated with sand. No McNairy outcrops were found; the unit description is based on well samples and on outcrops in adjacent areas. The Post Creek Formation, logged as "gravel" or "chert" by water-well drillers, is largely gray to white chert gravel in a matrix of clay and sand.

L Cypress Formation Sandstone, siltstone, shale, and mudstone. Sandstone is white to light gray, fine- to medium-grained, subangular, nearly pure quartz with sparkly quartz overgrowths. The upper part has thin, flaggy bedding and ripple lamination with laminae of shale and siltstone. Molds of productid and spiriferid brachiopods are common, along with the trace fossil *Olivellites plummeri*. Shale and mudstone in the upper part are medium to dark gray, while sand is locally red. The cliff-forming lower sandstone has well-developed wedge planar and tabular planar cross-bedding, overturned cross-bedding and slumped bedding, ripple marks, and casts of *Lepidodendron*. It is friable but case-hardened and exhibits liesegang bands and honeycomb weathering. Cliffs as high as 90 feet occur near Cypress, Illinois. The lower contact is erosional in most places, but may be conformable locally.

M Ridenhower Shale and Bethel Sandstone Shale and limestone. The Ridenhower is dominantly shale that is dark gray to olive and greenish gray. It is largely platy clay shale and, less commonly, silty to sandy. Limestone occurs as thin interbeds that are dark gray to reddish gray, coarsely fossiliferous wackestone and packstone. Whole, articulated fossils are common: rugose corals, productid and spiriferid brachiopods, *Archimedes* and other fenestrate bryozoans, blastoids, and *Pterotocrinus* and other crinoids. The Bethel Sandstone is thin and lenticular. Krey (1921, ISGS field notes) described 12 feet of interbedded, poorly exposed sandstone and shale in a gully east of Bethany Church, SW SW SW Sec. 19, T13S, R2E. Sandstone is pink to dark red-brown, fine-grained, well-sorted, and quartzose. Red and variegated shale occurs at or near the base. The lower contact is sharp or gradational.

N Paoli Limestone Limestone and shale. Limestone is largely light gray, cross-bedded crinoidal and oolitic grainstone. Also present is fossiliferous packstone containing rip-up clasts of red and green shale and red or pink echinoderm fragments. Fossils include bryozoans, spiriferid brachiopods, *Pentremites*, and *Talarocrinus*. Limestone near the base is pink to reddish, sandy, and cross-bedded and contains hematitic oolites and scattered large crinoid fragments including *Platycrinites*. Greenish gray, calcareous and fossiliferous shale occurs as thin interbeds. The lower contact is gradational.

O Aux Vases Sandstone Sandstone, shale, and limestone. Sandstone is light gray, tan, greenish gray, and purplish red, very fine- to fine-grained, slightly micaceous, well-sorted quartz arenite. It is commonly calcareous or leached and porous on weathered outcrops. Productid and spiriferid brachiopods are present. Planar and ripple lamination, small-scale cross-bedding, and polygonal mud cracks are present. Shale is greenish to olive-gray, platy and fissile. Lenses or interbeds of oolitic and sandy limestone are present. The lower contact may be gradational to erosional.

P Ste. Genevieve Limestone Limestone, sandstone, and shale. Limestone is mostly white to light gray, cross-bedded, oolitic and fossiliferous packstone and grainstone. Less common is 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, commonly shows bioclastic and oolitic texture. Interbeds of sandstone and shale, similar to that of the Aux Vases, occur in the upper part. Swann (1963) described the Joppa Member at the top of the Ste. Genevieve as 32 feet of interbedded gray to black shale and dark limestone, in a road cut near the southwest corner of Sec. 32, T13S, R2E. These rocks were never well exposed and today are almost entirely covered. No shale is present in the upper 140 feet of the Ste. Genevieve in the quarry at White Hill less than a mile south of the Joppa type locality. The lower part of the Ste. Genevieve is poorly exposed within the map area; the lower contact was not observed.

Q St. Louis Limestone Limestone is dominantly medium gray, dense lime mudstone that contains abundant chert nodules and breaks with conchoidal fracture. Thinner intervals of fossiliferous wackestone and packstone and, rarely, oolitic grainstone are present. Fossils include crinoid fragments, bryozoans, *Pentremites*, the solitary coral *Zaphrentis* sp., and the colonial coral *Acrocyathus proliferus*. Chert is plentiful; it is largely dark gray to black and vitreous. Only a few outcrops were found. The lower contact was not observed.

R Salem Limestone 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. The only outcrop is at the mouth of Limekiln Slough (northwest corner, Sec. 22, T14S, R1E).

Introduction

This map shows geologic formations at or near the ground surface in the Cypress Quadrangle. In the uplands, the map portrays bedrock and partly lithified materials of Pleistocene and older age. Not shown are the unlithified surficial materials, including wind-blown silt (loess), residuum or weathered bedrock, and colluvium. In the lowlands, the map depicts the formations at the surface and at shallow depth. For example, the map symbol Qch indicates Cahokia Formation (Holocene alluvium) more than 5 feet thick overlying the Henry Formation of Pleistocene age.

Several sources of information were used to prepare this map. Outcrops in bluffs, stream banks, and human-made excavations were examined and described. Field notes made by previous ISGS geologists, especially F.F. Krey, supplement our own observations. However, only the northeastern quarter of the map area has plentiful outcrops. All pertinent well records in ISGS files were consulted, along with the logs of 15 test boreholes made by Hughes (1987). We examined samples from several wells for additional control. Finally, the ISGS drilled seven test holes to depths of 30 to 50 feet and one hole 169 feet deep in the Cache Valley, from which split-spoon samples were taken.

Deep Drilling

The only deep borehole in the map area having a reliable record is the Herren oil test hole east of Perks (Sec. 12, T14S, R1E), drilled to a total depth of 1,755 feet. An electric log, a microlog, and samples (cuttings) are on file; cuttings were examined by John Nelson (225 to 1,100 feet) and Elwood Atherton (1,100 to 1,755 feet). Following is a summary of the formations penetrated. Only the St. Louis Limestone and Salem Limestone are shown on the map and column.

Mississippian

Thickness	
65+ feet	**St. Louis Limestone** Light to medium-dark gray lime mudstone and lesser amounts of skeletal wackestone and packstone containing echinoderms and bryozoans; as much as 10% chert.
315± feet	**Salem Limestone** Light to medium-dark gray, mainly bioclastic limestone ranging from lime mudstone to coarse grainstone. Most of the rock is skeletal wackestone and packstone. Echinoderm, bryozoan, and brachiopod fragments generally are poorly sorted, but some are rounded and have oolitic coatings. A small amount of chert is present. The lower contact is uncertain because of poor samples.
395± feet	**Ullin Limestone** The upper 250 feet has poor-quality samples: light to medium-gray, obscurely granular limestone with echinoderm and bryozoan fragments. The lower part is light to medium-dark brownish gray, cherty limestone with obscure, fine to medium granular texture and few fossils. Lower contact is gradational.
200 feet	**Fort Payne Formation** Dark brownish gray lime mudstone is argillaceous, silty, and cherty. The lower 80 feet is dark brownish gray to black dolomitic siltstone that is glauconitic and very cherty.
44 feet	**Springville Shale** Gray to greenish gray siltstone in the upper part, grading to dark olive-gray calcareous shale in the lower part.
4 feet	**Chouteau Limestone** Grayish brown, sublithographic limestone.
8 feet	**Hannibal Shale** Dark greenish gray to black, slightly calcareous shale.

Devonian

144 feet	**New Albany Shale** The upper 66 feet is black, pyritic shale that contains *Sporangites* and has high electrical resistivity. The lower 78 feet is dark gray, brownish gray, and black shale that is silty, slightly pyritic, and contains siltstone laminae.
43 feet	**St. Laurent Formation** Medium to dark brownish gray limestone that is very fine-grained to sublithographic, silty, and cherty.
44 feet	**Grand Tower Limestone** White to light gray, very fine- to medium-grained limestone that is quite sandy. The basal Dutch Creek Sandstone Member is about 15 feet of white, fine to coarse-grained calcareous sandstone to very sandy limestone containing a small amount of black asphaltic(?) material.
268+ feet	**Clear Creek Formation** Light gray to brownish gray calcareous dolomite and dolomitic limestone that is mostly very fine-grained and contains abundant light gray chert. Some layers are silty to finely sandy and contain euhedral quartz grains. A little black asphaltic(?) material was observed at 1,502 to 1,512 feet.

Structural Geology

The Cypress Quadrangle lies near the southwestern margin of the Illinois Basin and at the northern edge of the Mississippi Embayment. Mississippian bedrock of the Illinois Basin dips northeast at about 100 feet per mile, or less than 1°. The Cretaceous McNairy Formation dips southward in the southern third of the quadrangle. Its eroded edge, just south of the Cache Valley, marks the edge of the Embayment.

A pair of faults outline a downthrown block in the southeastern part of the map area. These faults are part of the Olmsted Fault Zone, which is better defined in the adjacent Olmsted Quadrangle to the south (Bexfield et al. 2005). Water-well records in the Cypress Quadrangle indicate the top of Mississippian bedrock (base of Cretaceous) is downthrown about 100 feet between the two faults.

Economic Geology

Stone

Limestone has been produced from the Ste. Genevieve Formation in the quarry at White Hill for at least 85 years. The white, high-calcium rock is used for making agricultural lime, aggregate, road material, and hydrated lime for concrete. Where thickly bedded, oolitic Ste. Genevieve Limestone makes attractive building or facing stone. Extensive areas of the Ste. Genevieve are covered only by loess. The St. Louis and Salem Limestones also are potential sources of aggregate and are quarried for this purpose elsewhere in southern Illinois. These formations are at or close to the surface both north and south of the Cache Valley.

The Cypress Sandstone formerly was quarried near the northeast corner of Sec. 20, T13S, R2E. The well-indurated quartz sandstone probably was used for decorative facing. In this area, the sandstone has tabular bedding and is easily cut into rectangular blocks suitable for building, stone facing, and landscaping. The rock is attractive, durable, and very plentiful.

Viticulture

The leading viticultural region in Illinois has been established in eleven counties of southern Illinois. In November 2006, the "Shawnee Hills American Viticultural Area" (SHAVA) was the first American Viticultural Area to be established in Illinois. This title allows wineries within the boundaries of SHAVA to use the term "estate bottled" on their labels. The Cypress Quadrangle lies within this designated area, which has highly favorable conditions for growing grapes.

Key factors for good viticulture that exist in the northern half of the Cypress Quadrangle include (1) slope: for accelerated cold air drainage during the winter months, water drainage, and drying of precipitation and dew in the summer months; (2) aspect or orientation of the slope: in this case, southerly exposure to the sun; (3) elevation: hillsides or higher elevations are better for grape vines because of temperature inversions; cold air movement downhill is one of the most important factors for frost prevention to the vines during winter; and (4) climate.

Additionally winemakers also must consider factors that affect taste. French and Australian wines have numerous estate bottled labels that use the term "limestone," which refers to one dimension of the terroir. A terroir is "a group of vineyards (or even vines) from the same region, belonging to a specific appellation and sharing the same type of soil, weather conditions, grapes and wine making savoir-faire, which contribute to give its specific personality to the wine." One of the important dimensions of terroir is soil type and the parent material of the soil. Limestone as a parent material for the soil seems to be a desired choice for many wine producers. In Burgundy, France, the oolitic limestone has been linked to the ideal soil type for Chardonnay and Pinot Noir. South Australia's Limestone Coast is Australia's foremost wine region, especially for red wine. Its soil type is terra rossa, a red soil caused by weathering of limestone.

The physiographic expression of the land surface is rugged to rolling hills on the northwest side of the Cache River Valley. In the northwest quarter of the Cypress Quadrangle, a large area of bedrock is composed of the Ste. Genevieve and St. Louis Limestones. The soils are composed of terra rossa where limestone is near the surface. The Ste. Genevieve Limestone is a calcium-rich limestone that has been used for agricultural lime in order to "sweeten" acidic soils. Mapped areas where limestone is close to the surface may be important to the southern Illinois fledgling wine industry. It may be an additional factor to consider when applying the term "estate bottled" within the Shawnee Hills American Viticultural Area.

Gravel

The Mounds Gravel has been quarried in many small pits in southern Illinois and has been used for surfacing township and county roads. The brown chert gravel also can be screened and used as decorative gravel for landscaping.

Oil and gas

The only petroleum test hole on record in the Cypress Quadrangle is the deep drilling hole previously described. This hole was drilled in 1955; no shows of oil or gas were reported; the hole was plugged and abandoned. The nearest producing oil fields are near Marion in Williamson County, about 25 miles north of Cypress.

The Cypress, Aux Vases, and Ste. Genevieve Formations account for more than half of the oil production for the entire Illinois Basin. Because these formations crop out in the Cypress Quadrangle, any hydrocarbons they once might have contained escaped at the surface long ago. The possibility for Devonian or deeper production exists but cannot be evaluated at this time due to lack of information.

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