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ILLINOIS STATE GEOLOGICAL SURVEY
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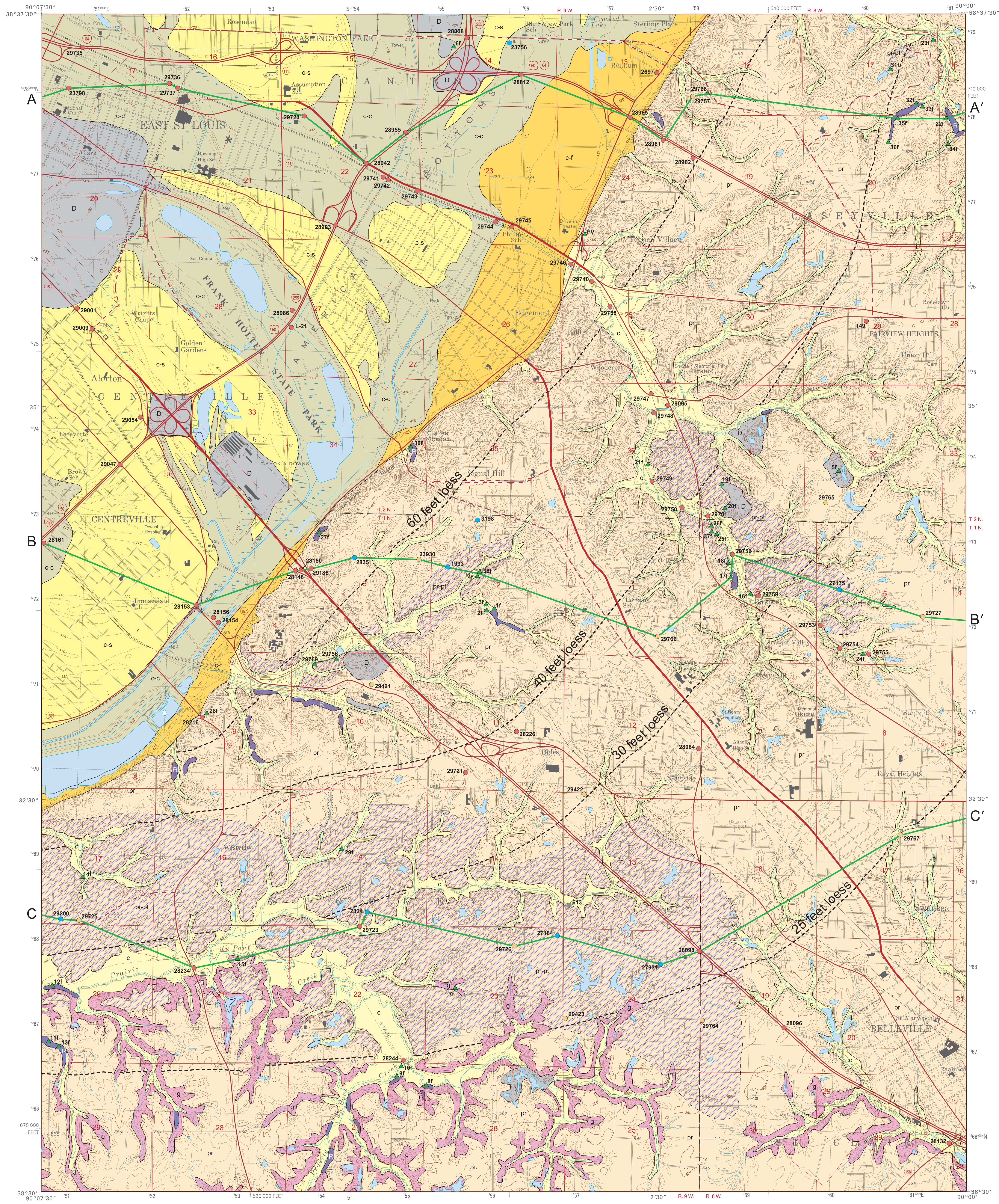
SURFICIAL GEOLOGY OF FRENCH VILLAGE QUADRANGLE

ST. CLAIR COUNTY, ILLINOIS

David A. Grimley and E. Donald McKay, III

2004

Illinois Geologic Quadrangle Map
IGQ French Village-SG



QUATERNARY DEPOSITS

Description	Unit	Interpretation
HUDSON EPISODE (~12,000 years before present (B.P.) to today)		
Areas of filled earth and/or removed earth	Disturbed Ground — D	Man-made material; includes former gravel pits, shale pits, coal mines, and major areas of construction fill
Silt with lesser amounts of clay and sand; crudely to well stratified, 5 to 30 feet thick; sandy or gravelly silt occurs in larger tributary valleys or valleys with bedrock outcrops	Cahokia Formation (tributary facies) — c	Alluvium (river sediment); primarily derived from thick loess deposits on surrounding uplands; occurs in tributaries to the Mississippi River valley
Silt, 5 to 25 feet thick; may contain thin fine sand beds; overlies sand, silty sand, or clay	Cahokia Formation (fan facies) — c-f	Alluvial fan deposits, redeposited loess; immediately underlain by clayey or sandy alluvial deposits; occurs at base of Mississippi River valley bluffs
Silt, silty clay, and clay; 5 to 60 feet thick; gray to brown; laminated; crudely to well stratified; underlain by fine sand, coarse sand and gravel, or bedrock	Cahokia Formation (clayey facies) — c-c	Alluvium; deposited in floodplain or backswamps of abandoned channels; underlain by coarser Cahokia Formation alluvium and Henry Formation outwash; occurs in Mississippi River valley
Fine sand with some coarse sand and silt; 20 to 35 feet thick; crudely to well stratified; immediately underlain by cleaner fine to medium sand followed by coarse sand and gravel at depth	Cahokia Formation (sandy facies) — c-s	Alluvium; deposited in point bars or channels; underlain by coarser Cahokia Formation alluvium and Henry Formation outwash; occurs in the American Bottoms (Mississippi River valley)
WISCONSIN EPISODE (~75,000–12,000 years B.P.)		
Silt and silty clay with some sand; light brown to gray to pinkish gray; massive to laminated; occurs mainly below 480 feet elevation in large tributaries to the Mississippi	Equality Formation (in cross sections only) — e	Lake deposits; overlain by Cahokia Formation; underlain by Petersburg Silt, Glasford Formation till, or bedrock
Medium sand coarsening with depth to fine gravel; well-sorted, common igneous and metamorphic pebbles; up to 70 feet thick	Henry Formation (in cross sections only) — h	Glacial outwash transported by the Mississippi River; overlain by postglacial Cahokia alluvium
Silt to silt loam, yellow-brown to gray and 10 to 60 feet thick overlying silt to silt loam, pink-brown to brownish gray and 8 to 40 feet thick; commonly massive, dolomitic, and in places, contains terrestrial gastropods; thickest deposits occur near bluffs; typically leached of carbonate minerals to depths between 5 and 25 feet; uppermost 2 to 5 feet altered by the modern soil	Peoria and Roxana Silts (hatchured areas overlie bedrock valleys that contain Petersburg Silt) — pr	Loess; includes some slope deposits (colluvium) and redeposited loess in areas of steep topography; Peoria Silt is the younger and typically the thicker unit; on some steep, eroded slopes, Roxana Silt is the surface unit; underlain by Illinois Episode silt, till and ice marginal sediments
LATE ILLINOIS AND SANGAMON EPISODES (~150,000–75,000 years B.P.)		
Silt loam to silty clay loam to silty clay; reddish brown to yellow brown to gray-brown to greenish gray; blocky soil structure to weakly laminated; 0 to 15 feet thick	Berry Clay Member and Teneriffe Silt (in cross sections only) — bct	Loess, lake silts, and accretionary sediments; mostly contained within weathering profile of Sangamon Geosol; typically overlies Glasford diamicton
ILLINOIS EPISODE (~200,000–130,000 years B.P.)		
Pebbly loam diamicton, with minor sand and silt beds, gray to yellow-brown; 5 to 75 feet thick; shale pebbles are common; erratics pebbles are scarce; upper 5 to 10 feet is commonly softer, sandier, and more oxidized; the lower and major thickness of unit is commonly gray, uniform, dense, and calcareous; the unit is overlain by 0 to 5 feet silt	Glasford Formation (< 5 feet of loess cover) — g	Near-surface till; the loess cover, having been mostly eroded, is less than 5 feet thick; upper 5 to 10 feet is commonly meltout till and drift; lower portion and most of major thickness of unit are uniform basal till; typically contains Sangamon Geosol in upper 4 to 7 feet; overlies Petersburg Silt, Lierle Clay Member, or bedrock
Silt to silt loam, gray to yellow-brown, weakly laminated to massive, soft, dolomitic, containing abundant spruce wood fragments, aquatic and terrestrial gastropods, and scattered pebbles; 5 to 50 feet thick	Petersburg Silt (in cross sections only) — pt	Lake silt with some eolian silt; contains ice-rafted pebbles; overlies Lierle Clay Member or bedrock
PRE-ILLINOIS AND YARMOUTH EPISODES (~500,000–200,000 years B.P.)		
Silty clay loam, silty clay and clay; gray to greenish gray to gray-brown; leached of carbonates; perhaps up to 25 feet thick	Lierle Clay Member, Banner Formation (in cross sections only) — lc	Accretionary or lake deposits in small closed depressions or lowlands; contained within the weathering profile of the Yarmouth Geosol

TERTIARY/QUATERNARY DEPOSITS

Description	Unit	Interpretation
Clay, cherty clay, silty clay, and silty clay loam; red to yellow-brown with some gray mottles; rare erratics at some localities	Oak formation (in cross sections only) — o	Weathered bedrock (residuum) and colluvium with some admixed and highly weathered loess, dust, and perhaps thin till deposits

PALEOZOIC BEDROCK

Description	Unit	Interpretation
Shale, siltstone, sandstone, coal, and limestone, with shale being the predominant lithology; Pennsylvanian rocks dip very gently to the east (0 to 3 degrees)	Near-surface bedrock — R	Bedrock exposures or bedrock within about 5 feet of land surface; mostly Pennsylvanian; Mississippian rocks occur in southwestern areas

Note: Loess thickness contour lines (thick dashed lines on map) mark the combined total thickness of Peoria and Roxana Silts on uneroded upland areas. Total loess thickness can be much less along valley slopes where erosion of loess has been significant (see cross sections). Loess cover does not occur in the Mississippi River valley.

Base map compiled by Illinois State Geological Survey from digital data provided by the United States Geological Survey. Topography compiled 1954. Revised 1993 from imagery taken 1988.

North American Datum of 1983 (NAD 83)
Projection: transverse Mercator
10,000-foot ticks: Illinois State Plane coordinate system, west zone (transverse Mercator)
1,000-meter ticks: Universal Transverse Mercator grid system, zone 15

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SCALE 1:24 000

1   1/2   0   1 MILE

1000   0   1000   2000   3000   4000   5000   6000   7000 FEET

1   .5   0   1 KILOMETER

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

Released by the authority of the State of Illinois: 2004

Geology based on field work by David A. Grimley (1998–1999) and E. Donald McKay, III (1975–1977), Illinois State Geological Survey.

Digital cartography and layout by M. Barrett, P. Carrillo, and J. Domier, Illinois State Geological Survey.

Data Type

- Natural outcrops and manmade exposures (described by ISGS)
- Stratigraphic test hole (drilled by ISGS)
- Engineering boring
- Coal boring
- Water well boring
- Contact
- Inferred contact
- Loess thickness contour
- A—A′ Line of cross section
- Water

Note: Data symbol labels indicate the county number, a portion of the 12-digit API number on file at the ISGS Geological Records Unit. (Outcrop labels indicate field number.)

ILLINOIS
DEPARTMENT OF NATURAL RESOURCES

ISGS Illinois State Geological Survey

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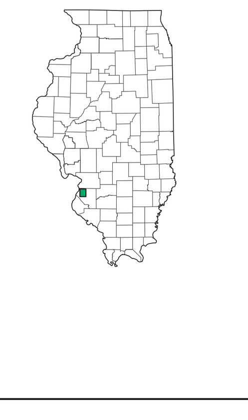

1	2	3
4		5
6	7	8

ADJOINING QUADRANGLES
1 Granite City
2 Monks Mound
3 Collinsville
4 Cahokia
5 O'Fallon
6 Columbia
7 Millstadt
8 Freeburg

0°
TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 2004

ROAD CLASSIFICATION

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

Intended Uses of This Map Product

This surficial geology map portrays near-surface sediments (the sediments between the land surface and bedrock) in the rapidly developing French Village area in the St. Louis Metro East region. Knowledge of the character and distribution of near-surface deposits is necessary, for example, to identify aquifers, their susceptibility to groundwater contamination, areas susceptible to erosion or slumping, areas suitable for mining, sediments that have low bearing strength, and areas that have higher sensitivity to seismic shaking. Furthermore, detailed surficial geology mapping and related studies provide a basis for better understanding and appreciation of landscapes, archeological sites, past environments, and past climates in the region.

Near-Surface Geological Deposits and History

The French Village Quadrangle, located in southwestern Illinois about 10 miles southeast of St. Louis, Missouri, contains mainly loess-covered, glaciated uplands but also includes a portion of the broad Mississippi River valley in the northwestern third of the quadrangle. Near-surface deposits on uplands are dominated by thick loess (20 to 100 feet thick on uneroded uplands) deposited during the last glaciation (Wisconsin Episode). Loess deposits are underlain mainly by till and lake deposits of the next to last glaciation (Illinois Episode). Isolated fine-grained older sediments (pre-Illinois episode) are preserved in some buried bedrock valleys. In the Mississippi River valley, up to 125 feet of water-laid gravel, sand, silt, and clay were deposited during glacial and postglacial times.

Bedrock and Residuum

The bedrock underlying most of this quadrangle is Pennsylvanian shale, siltstone, sandstone, coal, and limestone. Exposures of Mississippian limestone and shale occur in the extreme southwestern part of the quadrangle. Bedrock also crops out along the Mississippi River valley bluffs and along streams that have dissected surficial deposits, particularly in northeastern and southwestern parts of the area. Some small exposures of coal occur in near-bluff areas of the quadrangle.

Preserved in a few areas in the subsurface, immediately above the bedrock, is a silty clay loam to silty clay that contains numerous angular bedrock fragments (more abundant with depth). This clay-rich material is interpreted as strongly weathered bedrock (residuum) and is classified informally as the Oak formation (Nelson et al. 1991) (cross section B–B′).

Pre-Illinois and Yarmouth Episode Deposits

Fine-grained sediments, deposited by streams, by wind, and in lakes during the pre-Illinois glacial and Yarmouth interglacial episodes, directly overlie bedrock or residuum in many areas. These sediments are silty clay loam to silty clay, typically gray to greenish gray, leached of carbonates, and, unlike the Oak formation, may contain sparse erratic pebbles. Classified as the Lierle Clay Member of the Banner Formation (Willman and Frye 1970), these materials occur predominantly in bedrock valleys (cross section C–C′). The Lierle Clay was strongly altered by soil development during the Yarmouth interglacial episode (thus forming the Yarmouth Geosol) during and after its deposition. Although originally defined as overlying Banner Formation till (Willman and Frye 1970), the Lierle Clay Member is herein used for similar accretionary or lowland deposits that are bounded on top by the Yarmouth Geosol and overlain by Illinois Episode deposits.

The general absence of pre-Illinois episode till in the quadrangle and the occurrence of the Yarmouth Geosol developed into fine-grained stream, loess, and lake deposits overlying bedrock suggest that the pre-Illinois till border may be near the eastern edge of this quadrangle. Previous studies (Willman and Frye 1970, Grimley et al. 2001) suggested pre-Illinois ice advanced regionally from the east or northeast and that the pre-Illinois till border is near the eastern edge of this quadrangle. In the eastern portion of this quadrangle in test hole 29727 (Sec. 5, T1N, R8W), the Lierle Clay is pebbly in the lower 2 feet and might include some thin, weathered pre-Illinois till deposits, but is not practically separable as a map unit.

Illinois Episode Deposits

Illinois Episode deposits include till, lake sediment, water-laid sand, and loess. Because the Illinois Episode was the last (and perhaps only) time glaciers advanced into the French Village Quadrangle, the deposits have not been eroded by later glaciations and are preserved largely intact on uplands away from major stream valleys.

Silty deposits, weakly laminated to massive and as much as 54 feet thick, underlie Illinois Episode till (Glasford Formation) in many outcrops (29756, 15f, 26f, 31f, 38f) and boreholes (29725, 29726, 28234) in bedrock valleys proximal to Prairie du Pont Creek, Powdermill Creek, Schoenberger Creek, and Little Canteen Creek (see Grimley and Denny 2003). This unit, predominantly silt loam with minor silty clay and fine sand beds, is correlated with the Petersburg Silt (Willman and Frye 1970). At several sites, the Petersburg Silt contains zones with a distinctive fossil assemblage, including numerous fossil spruce wood fragments (fig. 1), aquatic and terrestrial gastropods (snails), small fingernail clams (*Pisidium*), and a few ostracodes (freshwater micro-crustaceans). Thus, this unit is interpreted to be mainly a shallow lake deposit (crudely stratified; aquatic fauna; lower elevations), but includes minor occurrences of loess deposits (massive silt loam; terrestrial fauna; higher elevations). Proglacial loess deposits interfinger with lake deposits near the margins of former lakes or in near-bluff areas where loess deposition would have been rapid, such as at the Powdermill Creek sections (sites 29756 and PMCB; NW, Sec. 10, T1N, R9W). Bedrock valleys (containing Petersburg Silt today) were likely dammed and flooded to form slack water lakes as the local Mississippi River base elevation rose to as high as 475 feet in response to glacial sediment influx. Rare pebbles that occur within the silt were likely transported by ice rafting or slope processes. Wood branches and fragments, terrestrial snails, and loessal silts from the surrounding uplands could easily have washed into these ancient lake basins. Advancing ice buried and overrode these windblown and lake sediments. Glacial erosion may, in part, explain why the elevation of the top of the Petersburg Silt is somewhat variable (see cross sections A–A′, B–B′, and C–C′).

Bedrock valleys and ancient lowlands in the quadrangle were filled with the thickest deposits of Glasford Formation diamicton, up to 74 feet thick. Typically a silty loam to loam, this diamicton is interpreted to be primarily till (mostly subglacial; some supraglacial). In stratigraphic test holes 29725, 29726, and 29727 (cross sections B–B′ and C–C′), the till contains 17 to 25% (<4 μm), 40 to 57% silt, and 22 to 32% sand, based on 14 analyses. Illite constitutes about 40 to 50% of the clay minerals in the <2-μm fraction of the till samples, as determined by H.D. Glass (ISGS). The fine-grained texture and moderate percentage of illite in Glasford Formation till are consistent with glacial erosion and significant incorporation of local materials, including bedrock residuum and paleosol surfaces (clayey; less illite), shale (clayey; more illite), lake deposits (silty; more illite), preexisting till (clayey; moderate illite), and loess (silty; less illite) over which the ice would have flowed. Evidence for glacial incorporation of loess, paleosol, and residuum includes siltier textures and a lower illite percentage in the lowest few feet of the Glasford till in cores and outcrops. In unoxidized portions of thick Glasford till, spruce or larch wood fragments are fairly common. Such wood was likely entrained into glacial ice from upland boreal forests, which were overridden by the glacier, and from the underlying Petersburg Silt.

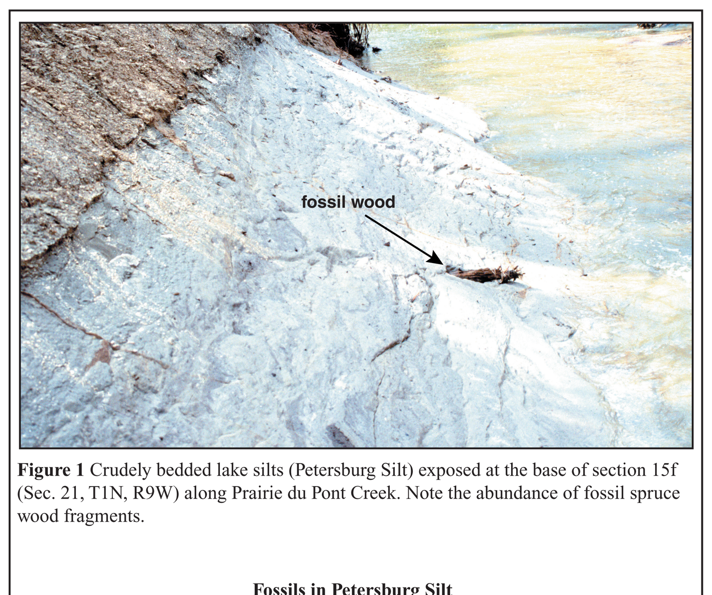

Figure 1 Crudely bedded lake silts (Petersburg Silt) exposed at the base of section 15f (Sec. 21, T1N, R9W) along Prairie du Pont Creek. Note the abundance of fossil spruce wood fragments.

Fossils in Petersburg Silt

Field identifiable aquatic gastropod genera, such as *Pomatiopsis* and *Lymnaea* (3 to 6 mm in height), appear to be locally distinctive and help to differentiate the Petersburg Silt from older and younger silt units (Grimley et al. 2001). *Pomatiopsis* lives today in areas of moist land or in shallow water with freshwater plants (Baker 1931). The ostracode species *Cypridopsis vidua* (identified at site 15f by B.B. Curry, ISGS) also suggests a shallow water environment fed by groundwater, but with occasional flooding. A wide variety of terrestrial gastropods, such as *Strobilops* and *Hendersonia*, have also been observed in the loess facies of the Petersburg Silt (Miller et al. 1994; formerly called Chinatown silt). Amino acid ratios of various genera of gastropod shells from site 15f (Grimley et al. 2001; Prairie du Pont Section) and from the Powdermill Creek Sections (Miller et al. 1994) help substantiate an Illinois Episode age for this deposit. Fossil spruce wood in the Petersburg Silt is also common and indicates a cooler climate than today for this region.

Beneath upland areas, till of the Glasford Formation is commonly overlain by 2 to 10 feet of silt loam to silty clay loam material, a late Illinois Episode deposit known as the Teneriffe Silt. The upper few feet of this unit tends to be more clayey, is reddish brown (in well-drained areas) or yellow-brown to greenish gray (in poorly drained areas) and typically contains clay accumulations, iron staining, color mottling, and evidence for mixing by soil organisms. This altered zone represents a fossil soil, known as the Sangamon Geosol, which formed in the Teneriffe Silt during the last interglacial episode (fig. 2). The Teneriffe Silt is interpreted to have been deposited either in a lake environment or as loess along uplands adjacent to the Mississippi River valley as glacial ice was retreating to the northeast. This unit tends to be thicker near the Mississippi River valley bluffs, closer to the source of the wind-blown sediments.

Sangamon Episode Deposits

In some low-lying areas or on poorly drained depressions on the Illinoian till plain, a fine-grained (typically silty clay loam), gray to greenish gray deposit is found overlying Glasford till and containing alteration features such as soil structure, color mottling, carbonate leaching, and mixing by soil organisms. These deposits, interpreted as accretionary, slope or lake sediments that accumulated during the Sangamon Episode, are classified as the Berry Clay Member of the Glasford Formation. Alteration features are interpreted as the weathering profile of the Sangamon Geosol, which developed at times synchronously with Berry Clay deposition. Because of strong soil development, the Berry Clay, when thinner than about 6 feet, is not practically distinguishable from the Teneriffe Silt, so these units are combined in the cross sections. The Sangamon Geosol is an important marker horizon that is ubiquitous beneath uneroded upland areas, where it is buried and preserved by windblown silt (loess) deposits (fig. 2). Soil development occurred during warm interglacial conditions similar to those of today and continued until Wisconsin Episode loess deposition began.

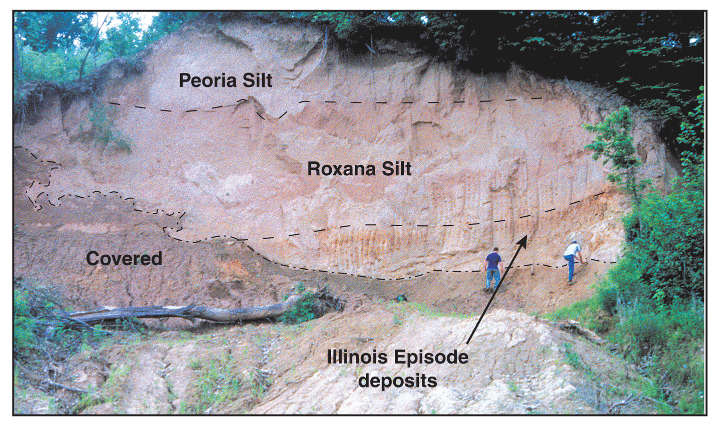

Figure 2 The Powdermill Creek Section (NW, Sec. 10, T1N, R9W; no. 29756) exposes thick loess (Peoria and Roxana Silts) over a Sangamon Geosol (red clayey band) developed in silts and diamicton (Teneriffe Silt and Glasford Formation). The Sangamon Geosol is just above the geologists' heads.

Wisconsin Episode Deposits

Silt deposits of the Wisconsin Episode are up to 100 feet thick on flat uplands close to the Mississippi Valley bluffs, but thin dramatically toward the southeast to less than 25 feet on uplands. These upland silt deposits, the surficial unit over most of the quadrangle, are typically a massive, dolomitic silt loam and contain terrestrial snail fossils in near-bluff areas of more rapid deposition. Interpreted as windblown silt (loess), these deposits are classified as either Peoria Silt (yellow-brown to gray) or Roxana Silt (pinkish brown to gray), based on their color, grain size, carbonate content, and stratigraphic position (McKay 1977, 1979). Both the Peoria and Roxana Silts are predominantly silt with a few percent of sand and 5 to 25% clay, but the Roxana Silt consistently has slightly more sand, coarse silt, and clay than does the Peoria Silt (McKay 1977). Peoria Silt, the upper unit, is typically about 50% thicker than the Roxana Silt in uneroded areas. The Roxana Silt was deposited between about 55,000 and 28,000 radiocarbon years before present (B.P.), and the Peoria Silt was deposited between about 25,000 and 12,000 radiocarbon years B.P. (McKay 1977, Grimley et al. 1998, Wang et al. 2000). Both loesses were derived primarily from windswept outwash in the American Bottoms area of the Mississippi River valley and, to a lesser extent, the Missouri River valley.

The upper 2 to 5 feet of the Peoria Silt contains weathering features of the modern soil profile and is thus a bit more clay-rich (silt loam to silty clay loam) than the remainder of the unit. These soil profiles normally contain the A, E, and B soil horizons that are typical of native forest soils (Alfisols). In addition to near-surface weathering, the loess deposits are generally leached of carbonates to depths of about 5 to 25 feet. In many places, these carbonates have reprecipitated at lower depths, forming irregularly shaped nodules or concretions.

The oldest and coarsest deposits in the Mississippi Valley are the basal sand and gravel (classified as Henry Formation), which is as much as 70 feet thick with a general fining-upward sequence. The Henry Formation, which contains some large erratic pebbles, is interpreted to be valley-train outwash derived from glacial advances in the upper Midwest that did not reach the study area. The Henry Formation generally thins toward the valley walls where the bedrock surface rises. Glacial meltwater sediment, associated with earlier Illinois and pre-Illinois episode glaciations, presumably once filled the valley, but apparently was eroded by fluvial action prior to Henry Formation deposition.

Fine-grained, massive to crudely laminated deposits occur below recent stream deposits in lower reaches of the larger tributary valleys to the Mississippi Valley, such as Schoenberger Creek and Prairie du Pont Creek valleys. Such deposits (correlated to the Equality Formation) generally occur at elevations below 480 feet. Mapped occurrences are based on engineering boring logs where a relatively soft, light-brown to gray to pinkish gray silt or clay is noted. The Equality Formation may also occur beneath alluvial fan deposits immediately adjacent to the bluffs, where fan-covered terraces might exist. Analogous to the older Petersburg Silt, the Equality Formation was probably deposited in backflooded lakes formed when high Mississippi River water levels caused ponding in the lower reaches of tributary valleys.

Postglacial Deposits

Postglacial deposits in the Mississippi River valley can be divided into three principal map units: sandy, clayey, and fan deposits. All are classified as facies of the Cahokia Formation. The sandy facies comprises stratified fine sand at the surface that coarsens with depth to a well-sorted medium to fine sand unit with little gravel (cross section A–A′). This unit occurs at the surface at slightly higher elevations on the Mississippi Valley floodplain and is thus interpreted as former point bar and river channel deposits. At depth, the fine to medium sand (Cahokia Formation) is distinguished from the coarser Henry Formation primarily by texture (Bergstrom and Walker 1956, Willman and Frye 1970). The clayey Cahokia facies consists of gray to brown, laminated, silty clay to silty clay loam that tends to occur near the surface in topographically low areas and swales on the Mississippi River floodplain. This facies is thus interpreted as abandoned meander channel fill or overbank deposits. Such clayey alluvium is up to 60 feet thick in the middle of the abandoned channel in Frank Holten State Park known as the Grand Marais meander. This channel fill (shown in cross section B–B′) was abandoned between 6,000 and 2,500 radiocarbon years B.P. (White et al. 1984, Booth and Koldehoff 1999). A radiocarbon age of 3,600 ± 65 years B.P. (ISGS-A-0139) was determined for charred wood found in silty clay from site 6f (Sec. 14, T2N, R9W) at the 10-foot depth.

Silt-rich wedges of crudely bedded sediment that thin to the northwest are found where large creeks emerge from the bluffs onto the Mississippi River floodplain. These deposits are interpreted as alluvial fan deposits (Cahokia, fan facies) and consist mainly of redeposited silty loess derived from upland areas. The largest fan occurs at the mouth of Schoenberger Creek, where silty sediment can be up to 25 feet thick and may overlie backswamp deposits (cross section A–A′). As much as 6 feet of silt was deposited in an alluvial fan near Edgemont during historical times as a result of enhanced erosion in the watershed due to upland deforestation, farming, and subdivision development (Booth and Koldehoff 1999).

In most tributary stream valleys east of the Mississippi Valley, deposits consist of stratified silty and sandy sediment (Cahokia, tributary facies) up to 34 feet thick. The thickest stream deposits tend to occur near the mouth of some of the larger creeks such as Schoenberger and Prairie du Pont Creeks. The Cahokia Formation, in creek valleys of these dissected upland areas, has a large component of redeposited Peoria and Roxana Silts.

Economic Resources

Sand and Gravel

Sand deposits, containing some gravel, are as much as 90 feet thick (cross section A–A′) and are a potential source for construction materials. Sand and gravel is being actively dredged in the Mississippi River valley along the north edge of the quadrangle (Sec. 14, T2N, R9W) where sand is encountered at a depth of about 5 to 40 feet, below clayey alluvium and below the water table. The upper sand is fine-grained and primarily used for fill. The sand coarsens with depth into the Henry Formation and below 70 feet is more usable by the construction industry. However, the gravel content is low, somewhat limiting the use of these sediments as aggregate (Goldman 1994). Descriptive logs of wells in the floodplain indicate that usable river sands are commonly buried by 30 to 60 feet of silt, clay, or poorly sorted sands.

Groundwater

Groundwater supplies in upland areas are taken mostly from bedrock or from the Glasford Formation. In some areas, well water on rural upland farms is drawn from loose, sandy deposits in the upper portion of the Glasford Formation, where water collects below the permeable loess and above the dense, clay-rich basal till. Yields from these wells are low and are suitable mainly for household water supplies. In most places, the Glasford till is only slowly pervious to groundwater flow. Where the Glasford Formation is thick, some discontinuous sand and gravel bodies contained within it have been utilized for water supply (see well 27184 on cross section C–C′)

Beneath the Mississippi River floodplain, sand and gravel in the Henry and Cahokia Formations constitute the most significant near-surface aquifer (cross sections; also Bergstrom and Walker 1956). Yields from this aquifer are large; however, their potential for contamination is high because of the relatively thin and discontinuous covering of silt and clay (0 to 40 feet).

Environmental Hazards

Mass Wasting

Erosion, undercutting, and slumping of thick loess deposits at bluff edges and along tributary valleys are potential hazards to property and stream environments (Krumm 1984, Killey et al. 1985). Slumps, rotational failures in sediment along a curved slip surface, commonly occur in this area where groundwater saturates the loess overlying the more clayey and less permeable Sangamon Geosol or Glasford Formation (Krumm 1984). Slumps predominantly occur within loess deposits but also occur within outcrops of the Petersburg Silt or within the Glasford Formation. Slumps in glacial materials have been noted along many creek cutbanks, for example, at sites 15f, 23f, 26f, and 29f. Slope failure and slumping, in large part due to site excavations and heavy precipitation, were studied in detail at a site along Bunkum Road in the southwestern portion of Sec. 18, T2N, R8W (Krumm 1984).

Soil Erosion

Steep slopes along ravines and bluffs are subject to severe soil erosion because of the friable nature of loessal soils. In particular, the Peoria and Roxana Silts are soft and weakly cohesive, have low shear resistance, and are easily eroded by running water. Runoff during rainstorms can thus quickly enlarge rills and gullies, thereby accelerating erosion, as water is channeled into the growing drainage system. Mass wasting processes (slumping) and some agricultural and construction practices can also greatly contribute to the amount of sediment in creek valleys.

Subsidence

As much as one-third of the area of this quadrangle has been undermined for extraction of coal during the past century (Jacobs 1971, Chenoweth 2000), mostly from the Herrin (No. 6) Coal Member of the Carbondale Formation. Land subsidence in mined-out areas is a serious potential problem for developers and construction projects in this area (Treworgy and Hindman 1991).

Mapping Techniques

Surficial Geology Map

This surficial geology map is based considerably on soil series parent materials compiled from the St. Clair County soil survey (Wallace 1978), especially the mapping of Cahokia Formation units and near-surface Glasford till. Soil survey boundaries were modified based on field observations, geomorphology from topographic map overlays, and newly acquired subsurface data. Loess thickness was contoured from stratigraphic borings (McKay 1977), engineering borings, outcrops, and new stratigraphic test holes as part of this mapping project. Near-surface bedrock areas were mapped from field observations, unpublished ISGS field notes of F.B. Denny, and soil survey information. Other data used for the surficial map included ISGS field notes, well logs, Illinois Department of Transportation boring records, borings from the Metrolink project, and a thesis (Bratton 1971).

Cross Sections

The three east-west cross sections (A–A′, B–B′, and C–C′) portray Quaternary deposits from the ground surface to bedrock. Subsurface unit contacts are based on material descriptions (in approximate order of decreasing quality) from outcrops, ISGS test drill holes, engineering boring records, water-well records, and coal test hole borings. Most of the data points intersect the lines of cross section. A few projected records, indicated as such by dashed vertical lines, were transferred to points on the cross section with similar geomorphology and surface elevation.

Subsurface contacts are shown as solid lines in areas of greater certainty but are dashed where inferred, such as where a boring did not penetrate the contact or where the material descriptions were not detailed enough (common for some water wells and coal test borings). Because of their windblown nature and thus more predictable thickness, loess unit contacts were not dashed. Material descriptions for data points, with the exception of outcrops, are on file at the ISGS Geologic Records Unit. Unit descriptions and interpretations for all cross section data, including outcrops, are in an unpublished manuscript in the ISGS library (Grimley 2003).

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