Department of Natural Resources
ILLINOIS STATE GEOLOGICAL SURVEY
Illinois Geologic Quadrangle Map: IGQ Villa Grove-SG
William W. Shilts, Chief
1999

SURFICIAL GEOLOGY MAP
Villa Grove Quadrangle, Douglas County, Illinois

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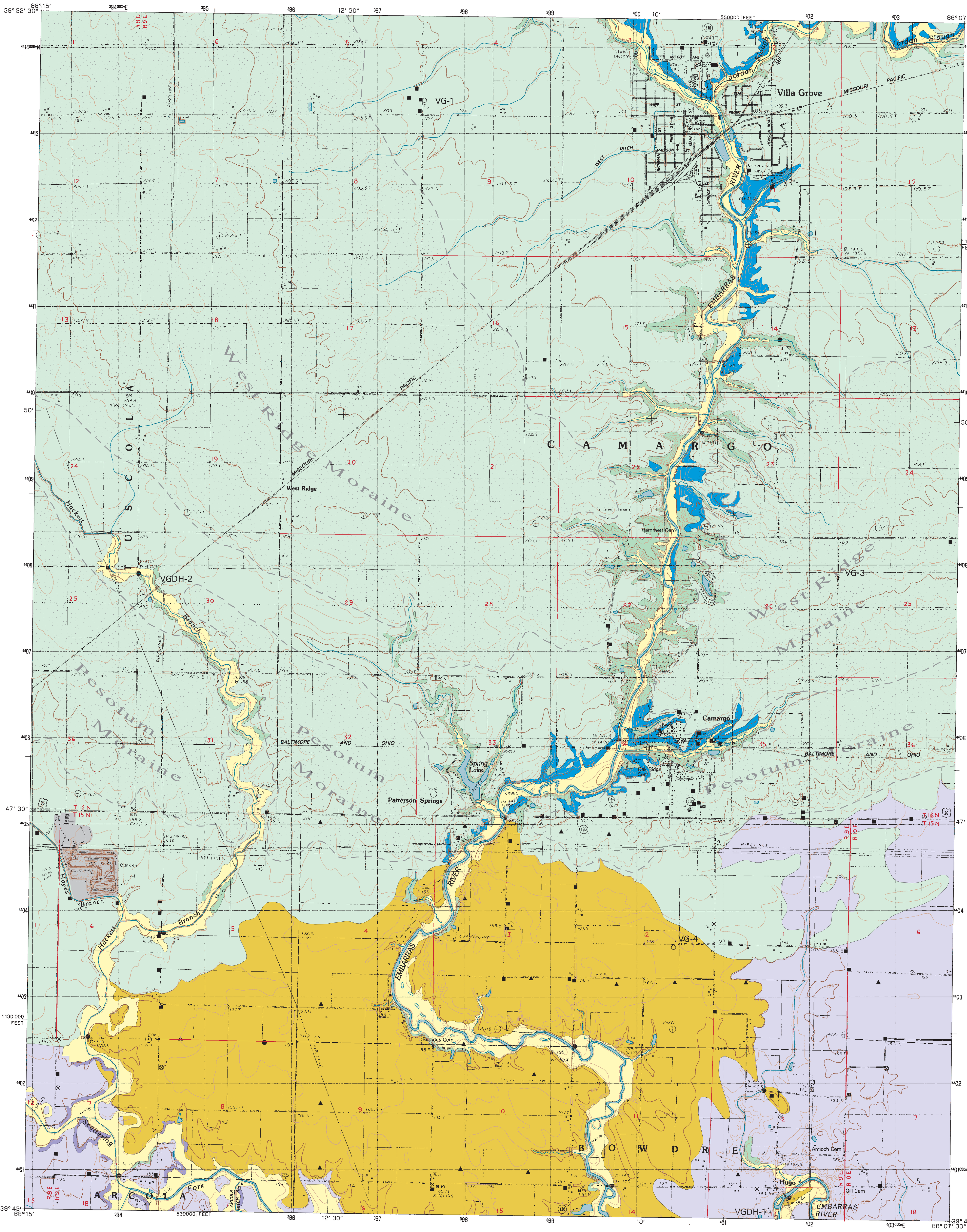
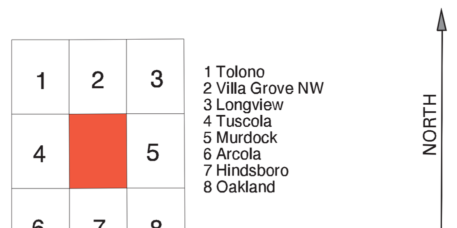


Scale 1:24,000

0 — 2 miles
0 — 2 kilometers
0 — 2000 feet

DISCLAIMER: This map was prepared for the purpose of quadrangle mapping, resource evaluation, and regional planning. It is based on interpretations of available data obtained from a variety of sources. Certain locations may not have been field-verified or the data were not rigorously reviewed. The accuracy of the unverified data and the interpretations based upon them are not guaranteed by the Illinois State Geological Survey.

Base map compiled at the Illinois State Geological Survey (ISGS) from Digital Raster Graphic data (1982) provided by the U.S. Geological Survey.
1927 North American datum
Universal Transverse Mercator projection - Zone 16



1 Tolono
2 Villa Grove NW
3 Longview
4 Tuscola
5 Murdock
6 Arcola
7 Hindsboro
8 Oakland

ADJOINING 7.5-MINUTE QUADRANGLES

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Regional Geology

The surficial geology of the Villa Grove Quadrangle is predominantly the result of continental glaciation. Glaciers advanced and retreated across the map area during at least three different glacial episodes (from oldest to youngest, the pre-Illinois, Illinois, and Wisconsin Episodes). With the exception of postglacial stream channels and floodplains (deposits of which are shown in yellow on the *Surficial Geology Map*), the landforms of the Villa Grove Quadrangle and the geologic materials at land surface resulted from the Wisconsin Episode. When the Wisconsin glacier melted back from the area about 18,000 years ago, it left a low-relief landscape of (1) large, broad, end moraines with smooth low-angle slopes (fig. 1a), (2) slightly undulating till plain (fig. 1a), and (3) a flat, low-lying lake plain (fig. 1a). The landscape is drained by the Embarras River, which originated as a glacial meltwater stream, and smaller streams, many of which developed in postglacial time.

Geology and Landforms of the Villa Grove Quadrangle

The materials that compose the landforms of the quadrangle are dominated by silt. The landscape is blanketed by 1 to 4 feet of windblown material called loess (fig. 2), deposited during dust storms that were common in Illinois when glacial meltwater channels dried up and fine sediment was exposed to wind erosion. The modern soil is developed in this silty loess, which is classified as the Peoria Silt.

End moraines and till plain The end moraines and till plain are composed of diamicton, an unsorted mixture of clay, silt, sand, and rocks (fig. 3). This diamicton is interpreted to be predominantly subglacial till deposited directly by the glacier; it shows little evidence of reworking by water or slope processes. The till is composed of about 40% silt and is dark gray; it weathers to brown. Classified as the Batestown Member of the Lemont Formation, this till is shown on the *Surficial Geology Map* as gray-green, to indicate where it is overlain by 1 to 4 feet of loess, and green, to indicate where it is overlain by less than 1 foot of loess. The latter conditions mainly occur along eroded river bluffs.

Lake plain Part of the southern third of the map area is a flat plain dissected in the center by the Embarras River. This plain is the former floor of glacial Lake Douglas. Glacial Lake Douglas formed when meltwater ponded between the retreating ice margin and the Arcola Moraine (about 6 miles south of the quadrangle). The lake continued to exist as the glacier melted back from the West Ridge Moraine toward the Villa Grove area and northward. The glacial Embarras River cut through the West Ridge Moraine and a delta (fig. 1a) formed where the river entered glacial Lake Douglas.

As shown in figure 1b, the lake plain is composed of laminated (thinly bedded) silt, clay, and fine sand (fig. 4), except in the center, where stratified medium sand, fine sand, and silt of the delta (fig. 5) overlie the laminated sediment. The laminated fine sediment is classified as the Equality Formation; it is shown on the *Surficial Geology Map* as light purple, to indicate where it is overlain by 1 to 4 feet of loess, and purple, to indicate where it is overlain by less than 1 foot of loess. The latter situation only occurs on eroded slopes in the southwestern corner of the quadrangle. Stratified coarser sediment, shown as bronze on the *Surficial Geology Map*, is classified as the Henry Formation. These deposits of glacial Lake Douglas overlie diamicton of the Batestown Member.

Floodplains and terraces The floodplains and terraces along the Embarras River, Jordan Slough, Hackett Branch, and Scattering Fork are composed of up to 20 feet of stratified and laminated sediment consisting predominantly of silt and sand and containing lesser amounts of gravel and clay that were deposited by postglacial steams. This sediment is classified as the Cahokia Formation. It overlies other map units, except for the Peoria Silt.

Mapping Methods

The first step in preparing this map was to use soil survey maps for Douglas County (Hallbick and Fehrenbacher 1971). A preliminary map of geologic materials was created from groups of soil parent materials. Additional information from maps and reports (Willman and Frye 1970, Fraser and Steinmetz 1971, Lineback 1979, and Hansel and Johnson 1996) and cores and water-well sample sets were then used in combination with new data from exposures and hand-augering to create the final *Surficial Geology Map*. A digital orthophoto image map (Luman 1999) was used to help distinguish boundaries, particularly in the southern half of the quadrangle.

Geologic Materials and Land Use

Many land-use activities are controlled by the distribution and variability of these geologic materials. For example, when constructing shallow residential and commercial foundations, bridge abutments, and sewer and oil/gas pipelines, sand and gravel is easier to excavate than diamicton. However, when the sand and gravel occurs in low-lying and poorly-drained areas, water moves more freely in these materials than in diamicton. Artesian conditions (seeping springs) can result, making construction conditions difficult.

In turn, these geological materials are affected by land-use activities, such as application of agricultural chemicals and fertilizers to fields; spills, leakage, or application of chemicals along highways and railroad lines; and containment of wastes in landfills. Clay, sand, and gravel may be extracted for construction and other uses. In some places, the unconsolidated geologic materials at and near land surface must be stripped away to extract bedrock resources, for example, at the Tuscola quarry in the southwest part of the quadrangle.

References

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Lineback, J., 1979, Quaternary Deposits of Illinois: Illinois State Geological Survey map, scale 1:500,000.
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Material	Lithostratigraphic Units and Interpretations
stratified silt containing sand and clay lenses; up to 20 feet thick	Cahokia Formation (channel and floodplain deposits of modern streams and rivers)
loosely consolidated loam or silt loam diamicton over compact silt loam diamicton	Peyton Formation over Batestown Member, Lemont Formation (slope deposits [colluvium] overlying till)
leached silt (1 to 4 feet thick) overlying up to 11 feet of stratified sand and silt	Peoria Silt over Dolton facies, Henry Formation (windblown silt [loess] overlying delatic sand)
leached silt (1 to 4 feet thick) overlying up to 20 feet of laminated silt containing lenses of silty clay	Peoria Silt over Equality Formation (windblown silt overlying quiet-water lake sediment)
leached silt (< 1 foot thick) overlying up to 20 feet of laminated silt containing lenses or silty clay	Peoria Silt over Equality Formation (windblown silt overlying quiet-water lake sediment). Generally found on sloping banks of streams and rivers, particularly Scattering Fork.
leached silt (1 to 4 feet thick) overlying silt loam diamicton	Peoria Silt over Batestown Member, Lemont Formation (windblown silt overlying till)
leached silt (< 1 foot thick) overlying silt loam diamicton	Peoria Silt over Batestown Member, Lemont Formation (windblown silt overlying till). Generally found on sloping banks of streams and rivers, especially the Embarras and its tributaries.

○ ISGS test borings

⊗ ISGS shallow test borings (< 15 feet deep)

■ Shallow borings to verify upper 5 feet

▲ Shallow borings (from Fraser and Steinmetz)

● Engineering borings

Moraine

Quarry

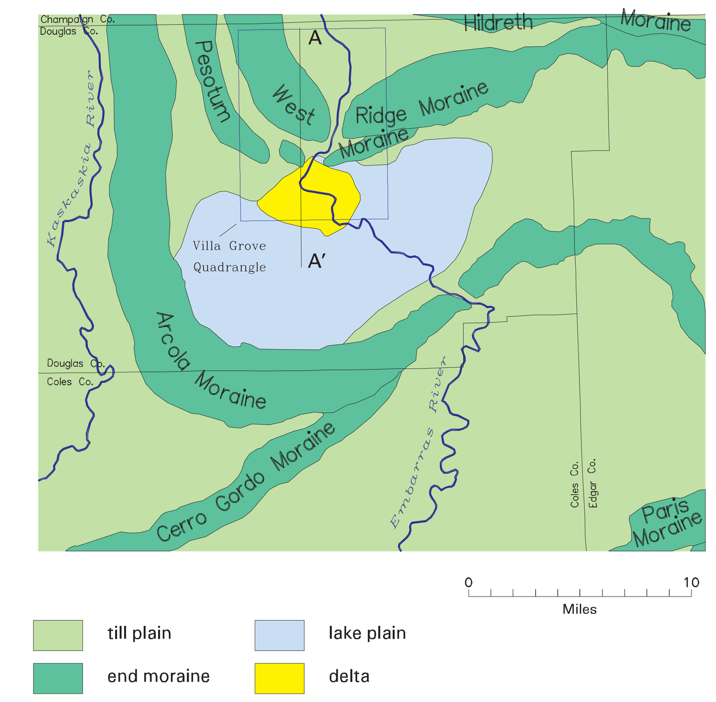

Figure 1a The general northward retreat of the Wisconsin glacier from central Illinois was interrupted by many intervals during which the ice margin remained at the same general place for tens to hundreds of years. During such intervals, the amount of ice flowing to the glacial margin each year equaled the amount of ice lost to melting. Much of the debris carried in the melting ice was deposited at the glacier's leading edge. The debris piled up over the years to form large ridges known as end moraines.

Meltwater flowing away from the retreating glacier sometimes ponded between the ice margin and older moraines and formed large lakes. Glacial Lake Douglas, for example, formed between the Arcola Moraine and the retreating ice margin. Silt and clay in the glacial meltwater settled to the lake bottom (light purple on the *Surficial Geology Map*). As the glacier margin continued to melt back toward Villa Grove, the ancestral Embarras River cut a gap through the West Ridge and Pesotum Moraines and flowed into glacial Lake Douglas. As its velocity slowed, the river deposited its coarse-grained sediment (mostly sand), forming a delta at the north end of the lake (bronze on the *Surficial Geology Map*). The line of cross section (fig. 1b) is shown on the map.

A North — South A'

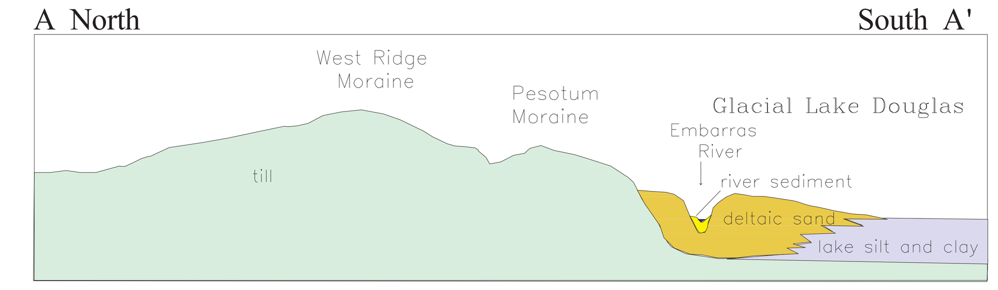

Figure 1b This schematic cross section, which runs from north to south across the Villa Grove Quadrangle (fig. 1a), illustrates relationships among materials shown on the Surficial Geology Map, the genetic interpretation of those materials, and their relationship to the landscape. Vertical exaggeration = 110 times.

Figure 2 Most of the Villa Grove Quadrangle is covered by 1 to 4 feet of massive silt, classified as the Peoria Silt. This silt (called loess) was deposited when dust storms picked up fine-grained sediment from glacial meltwater channels exposed during dry seasons and blew it across the landscape. The modern soil has developed in this silt. The thickness of the dark, organic topsoil reveals that it developed under prairie vegetation.

Figure 3 The uppermost diamicton of the Villa Grove Quadrangle is the Batestown Member of the Lemont Formation. The diamicton (called till) is a compact mixture of sand, silt, clay, and rocks deposited about 18,000 years ago by the glacier. At the Tuscola quarry, samples of the Batestown till contain, by weight, approximately 27% sand, 40% silt, 33% clay, plus gravel.

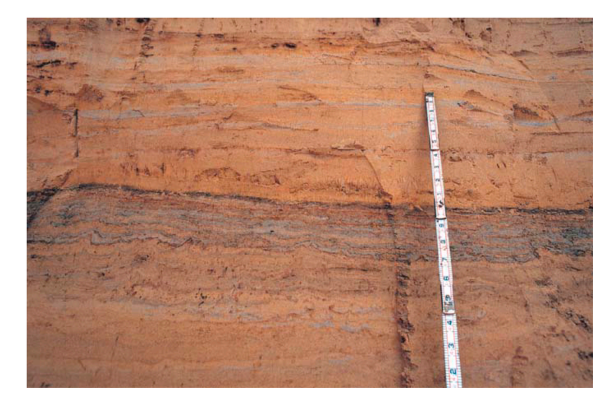

Figure 4 Layers of clay, silt, and fine sand were deposited on the floor of glacial Lake Douglas (fig. 1a). Fine-grained, layered sediments like those shown in this photo are part of the Equality Formation.

Figure 5 Stratified sand and silt (like that shown in this photo) was deposited in a delta that formed where the glacial Embarras River flowed into Lake Douglas (fig. 1a). This fan-shaped deposit, composed of Henry Formation deposits, is underlain by the more impermeable, fine-grained, lake-bottom sediments of the Equality Formation. The sand deposit forms a shallow near-surface aquifer in the south-central part of the Villa Grove Quadrangle.

Figure 6 Poorly sorted layers of silt, sand, clay, and gravel (like those shown in this photo) were deposited on floodplains and in channels of the Embarras River and smaller streams. Such deposits, classified as the Cahokia Formation, are among the youngest sediments of the Villa Grove Quadrangle. Most floodplain sediment is deposited near the end of flooding, when stream velocity slows and streams drop their suspended sediment load.

Figure 7 The Embarras River valley on the north side of Villa Grove is about 300 feet wide and has gently sloping valley walls that rise about 10 feet above the floodplain. A boring for the Front Street bridge across the Embarras River, about 800 feet down-river from this location, reveals 10 feet of modern silty floodplain deposits (Cahokia Formation) overlying sand.