Figure 1.—Location of the map area, east-central Illinois

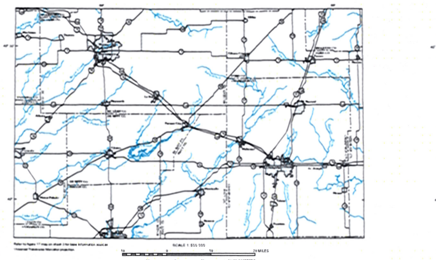


Figure 2.—Selected natural and cultural features in the map area

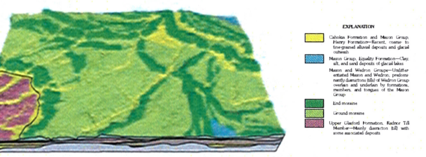


Figure 3.—Perspective view, looking north, showing surficial geology and buried Quaternary units in the map area. Surficial geology is from Lineback (1979) and Stiff (1996); the latter is a digital version of the map by Hansel and Johnson (1996). Subsurface geology is from this study, and is shown in more detail on sheet 2; subsurface units are the same as those shown in figure 7. Bedrock is shown in gray. In the southwestern part of the map area, the Upper Glasford Formation is covered in places by younger deposits, which for modeling purposes are assumed to be 15 ft thick (see discussion under "An internally consistent geologic model and set of maps," fourth paragraph). Black line shows the southwesternmost limit of Wedron Group deposits. Topography is from edited, digital versions of USGS 1:100,000-scale topographic maps. Image is vertically exaggerated approximately 30x.

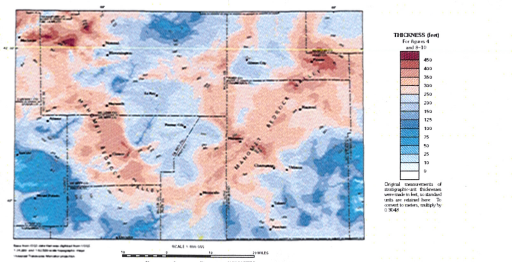


Figure 4.—Thickness of glacial sediments, including minor overlying sediments of nonglacial origin. Sediments overlie a bedrock surface of moderate relief; thicker sediments occur in the Mahomet Bedrock Valley and beneath Wedron Group end moraines (fig. 3), and somewhat thinner sediments occur on the bedrock uplands. The Mahomet Bedrock Valley is a preglacial and early glacial drainage system in the region (see Kempton and others, 1991).

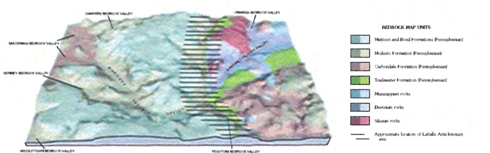


Figure 5.—Perspective view, looking north, of the geology and topography of the bedrock surface in the map area. Bedrock geology is from Pius Weibel (Illinois State Geological Survey (ISGS), written commun., 1997). Bedrock topography is from this study. The axis of the LaSalle Anticlinorium, of late Paleozoic age, also is shown. To enhance topographic detail, the image is vertically exaggerated approximately 30x.

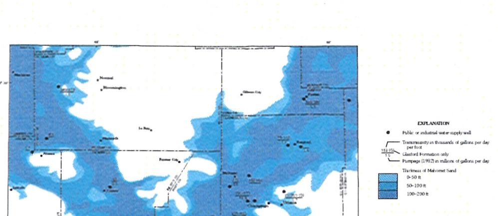


Figure 6.—Representative hydrologic properties of municipal and industrial wells developed in the Mahomet Sand and Glasford Formation aquifers (modified from Kempton and others, 1991, fig. 23).

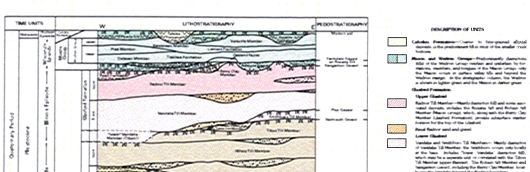


Figure 7.—Diagrammatic stratigraphic column of glaciogenic sediments in east-central Illinois. The Cahokia Formation was deposited mostly during the Hudson Episode. Geologic and stratigraphic names and intervals used in this figure are those accepted by the ISGS.

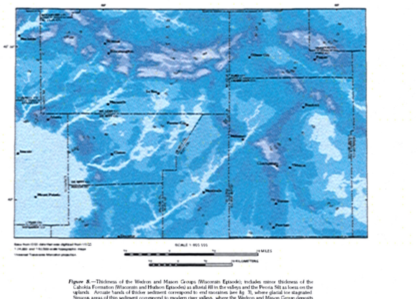


Figure 8.—Thickness of the Wedron and Mason Groups (Wisconsin Episode); includes minor thickness of the Cahokia Formation (Wisconsin and Hudson Episodes) as alluvial fill in the valleys and the Peoria Silt as loess on the uplands. Arcuate bands of thicker sediment correspond to end moraines (see fig. 3), where glacial ice stagnated. Sinuous areas of thin sediment correspond to modern river valleys, where the Wedron and Mason Group deposits have been eroded (for example, the valleys of the Sangamon River and Salt Creek). The southwestern part of the map area lies beyond the limit of Wedron Group deposits. There, only thin, discontinuous Cahokia Formation and Mason Group deposits occur, mostly as alluvium, outwash, and loess; to permit them and the underlying units to be mapped efficiently by computer, a uniform thickness of 15 ft was assumed (see discussion under "An internally consistent geologic model and set of maps," fourth paragraph).

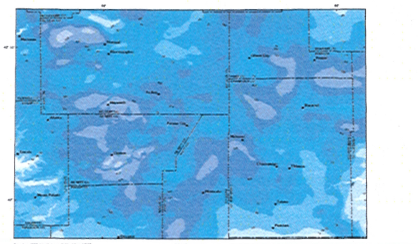


Figure 9.—Thickness of the Glasford Formation (Illinois Episode). The pattern of sediment deposition was affected by the Mahomet Bedrock Valley, which had been partly filled by older sediment. Areas of thicker sediment mostly correspond to this ancient valley. Sinuous areas of thinner sediment correspond to modern river valleys, where the Glasford Formation has been partly or completely eroded (for example, the valleys of the Sangamon River and Salt Creek).

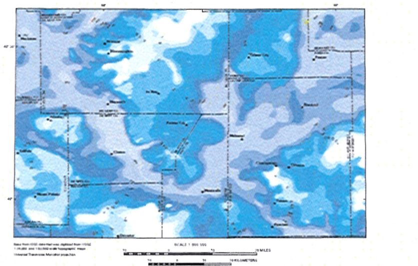
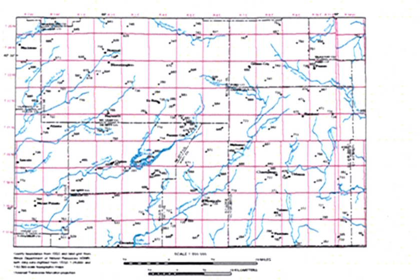


Figure 10.—Thickness of the Banner Formation (pre-Illinois Episode). The pattern of sediment deposition was greatly influenced by the Mahomet Bedrock Valley. The fluvial phase of these sediments constitutes the thickest part of the section and delineates the valley and its tributaries. These mostly sand and gravel sediments are overlain by diamictons, which occur in the valley and on the surrounding bedrock uplands. In many areas, especially on the bedrock uplands, the Banner Formation was eroded by later glaciations or fluvial action.



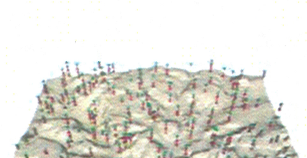


Figure 12.—Perspective view of the map area showing distribution of 167 key stratigraphic control points relative to the bedrock topographic surface. Viewpoint is from the south. Each control point is represented by a linked, vertical sequence of colored cubes. The top of each cube represents the top of a stratigraphic unit, as follows: green, land surface; magenta, upper Glasford Formation; pink, lower Glasford Formation; orange, Glasford Formation sands; brown, upper Banner Formation; yellow, middle Banner Formation; and black, bedrock. Cube thickness does not imply unit thickness. To show topographic detail, the image is vertically exaggerated approximately 30x.

DISCUSSION

INTRODUCTION

ACKNOWLEDGMENTS

REGIONAL GROUND-WATER RESOURCES

QUATERNARY STRATIGRAPHY

MAPPING THE DEPOSITS

Creating a vector map

Converting to raster format

VISUALIZING THE DEPOSITS IN THREE DIMENSIONS

REFERENCES CITED

THREE-DIMENSIONAL GEOLOGIC MAPS OF QUATERNARY SEDIMENTS IN EAST-CENTRAL ILLINOIS

By

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1999

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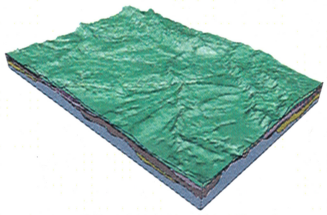
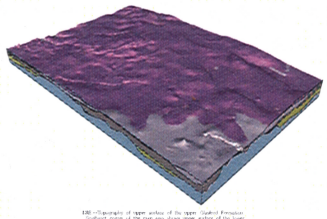
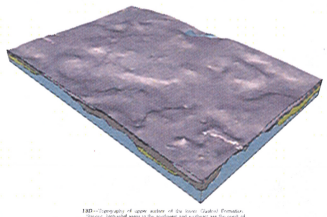
GEOLOGIC INVESTIGATIONS SERIES
MAP I-2689 (SHEET 2 OF 2)



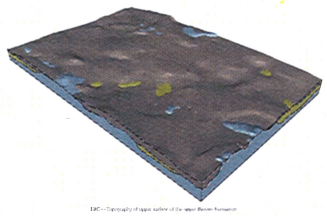
13F.—Topography of the land surface, which is equivalent to the upper surface of the Wedron and Equality Groups except where they are covered by younger deposits. Equivalent to the upper surface of the Quaternary deposits beyond the limit of the Illinoian glaciation. Modern valley deposits, the Cahokia Formation, and Peoria Silt directly overlie the upper Glasford Formation.



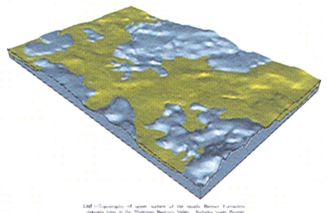
13E.—Topography of upper surface of the upper Glasford Formation (Glasford Centralia of the map area, shown upper surface of the lower Glasford Formation (Glasford Vandalia) where the upper Glasford is absent and the record of erosion is recorded in many thin strata). Equivalent to that in the southern half of the map area, the valleys of Salt Creek, Sangamon River, and Kickapoo Creek are incised into the upper Glasford. The east surface of the map area is underlain by a late stratigraphic unit (Glasford Centralia Lower Glasford Formation deposits were found at a noticeably lesser elevation than in adjacent areas. Although the data were good, they did not agree with the regional map trend, it was included the discussion on sheet 1 under "Pre-Wisconsinan deposits and surfaces" for internally consistent geologic model and set of maps. [text paragraph]



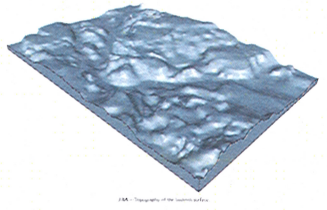
13D.—Topography of upper surface of the lower Glasford Formation (Glasford Vandalia) where it is the uppermost unit exposed at the land surface. Equivalent to that in the southern half of the map area, the valleys of Salt Creek, Sangamon River, and Kickapoo Creek are incised into the lower Glasford. A broad topographic high near the southeast corner of the map area is attributed to a late stratigraphic control (point where Glasford Centralia lower Glasford Formation deposits were found at a noticeably lesser elevation than in adjacent areas). Although the data were good, they did not agree with the regional map trend, it was included the discussion on sheet 1 under "Pre-Wisconsinan deposits and surfaces" for internally consistent geologic model and set of maps. [text paragraph]



13C.—Topography of upper surface of the upper Banner Formation.

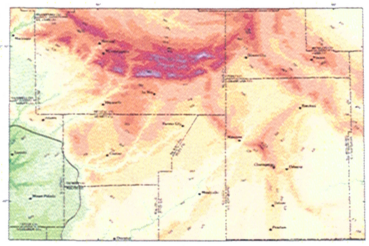


13B.—Topography of upper surface of the mostly Banner Formation deposits lying in the Mahomet Bedrock Valley. Includes lower Banner Formation deposits where in the valley (see discussion on sheet 1 under "Quaternary stratigraphy, fifth paragraph).

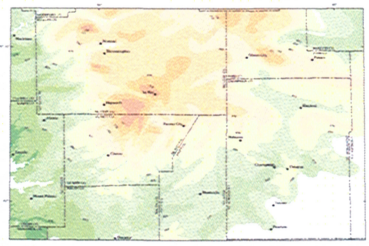


13A.—Topography of the bedrock surface.

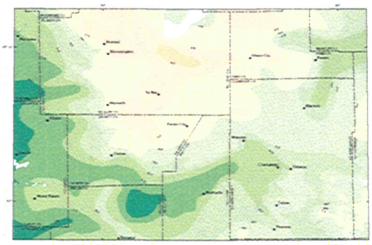
Figure 13A-F.—Block diagrams of the map area showing surface topography (13A) and the shape of the upper surface of each of the five Quaternary units (13B–F). Vertical exaggeration is 20 times the thickness of the Quaternary units. Topography is from the bedrock surface. To show topographic features, the images are vertically exaggerated approximately 30X.



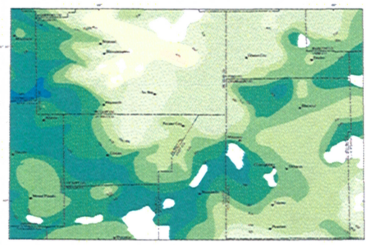
14F.—Elevation of the land surface, which is equivalent to the top of the Wedron and Mason Groups except where they are covered by thin, discontinuous Cahokia Formation. In the southwestern part of the map area, beyond the limit of the Illinoian glaciation, the Wedron Group deposits, shown by black lines, thin. Cahokia Formation and Peoria Silt directly overlie the upper Glasford Formation.



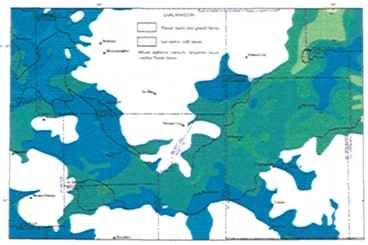
14E.—Elevation of the top of the upper Glasford Formation.



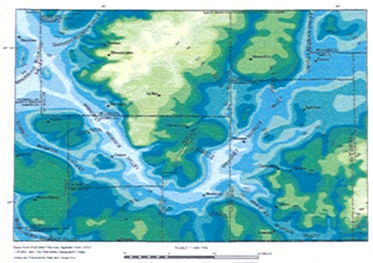
14D.—Elevation of the top of the lower Glasford Formation.



14C.—Elevation of the top of the upper Banner Formation.

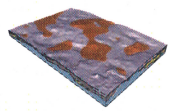


14B.—Elevation of the top of the middle Banner Formation. Approximate distribution of fluvial sand and gravel and lacustrine silt facies of the Mahomet Sand Member is shown by patterns. Sand and gravel consistently coarse in the Mahomet Bedrock Valley's main channel. Silt and clay occur in tributaries because ice or sediment dams in the main channel blocked the tributaries, causing water to pond and flow sediment to be deposited.

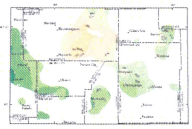


14A.—Elevation of the bedrock surface. Bedrock units are undifferentiated. Scoured bedrock valleys are identified.

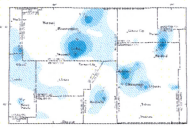
Figure 14A-F.—Elevation, at last above sea level, of the bottom or uppermost surface of bedrock and of five Quaternary stratigraphic units. Refer to discussion on sheet 1 under "Cementing to raster format" for explanation of thin-schematic mapped boundaries of units on these raster maps.



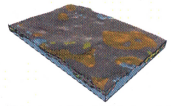
15F.—Surface topography of the upper Glasford (sand and gravel and silt) deposits.



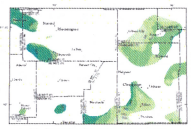
15E.—Elevation of top of basal sand, upper Glasford Formation.



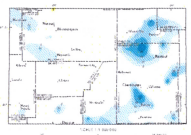
15D.—Thickness of basal sandy upper Glasford Formation.



15C.—Surface topography of the lower Glasford (sand and gravel and silt) deposits.

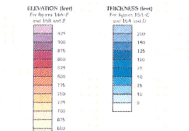


15B.—Elevation of top of basal sand, lower Glasford Formation.



15A.—Thickness of basal sand, lower Glasford Formation.

Figure 15A-F.—Maps and block diagrams showing sand layers at the base of the lower and upper Glasford Formation. These layers, although they are discontinuous, are used to studies. Other sands within the Glasford were not generally correlated between drill points. Elevations are in feet above sea level. Thickness is in feet. Vertical exaggeration is 10 times. Diagonal is 10 mi. Diagram is from the subsurface. To show topographic detail, the images are vertically exaggerated approximately 30X.



Original measurements of stratigraphic and locations of drill holes are from the Illinois State Geological Survey's data as reported here. To convert to meters, multiply by 0.3048.

Location of the map area, outlined in black.

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THREE-DIMENSIONAL GEOLOGIC MAPS OF QUATERNARY SEDIMENTS IN EAST-CENTRAL ILLINOIS

By
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1999

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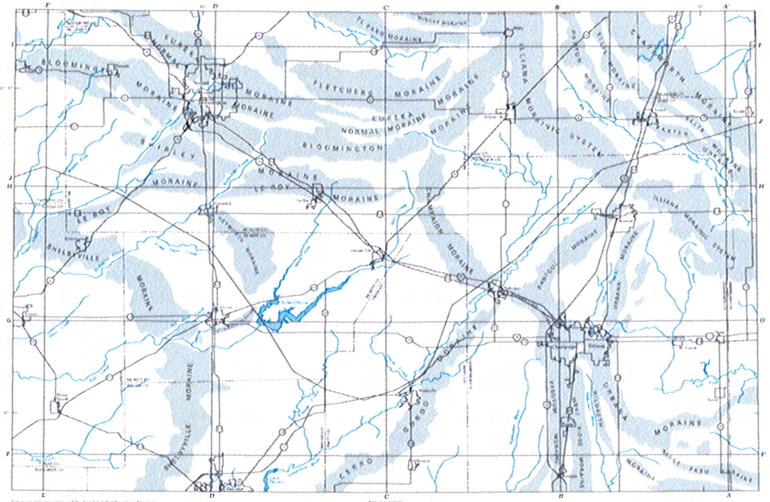
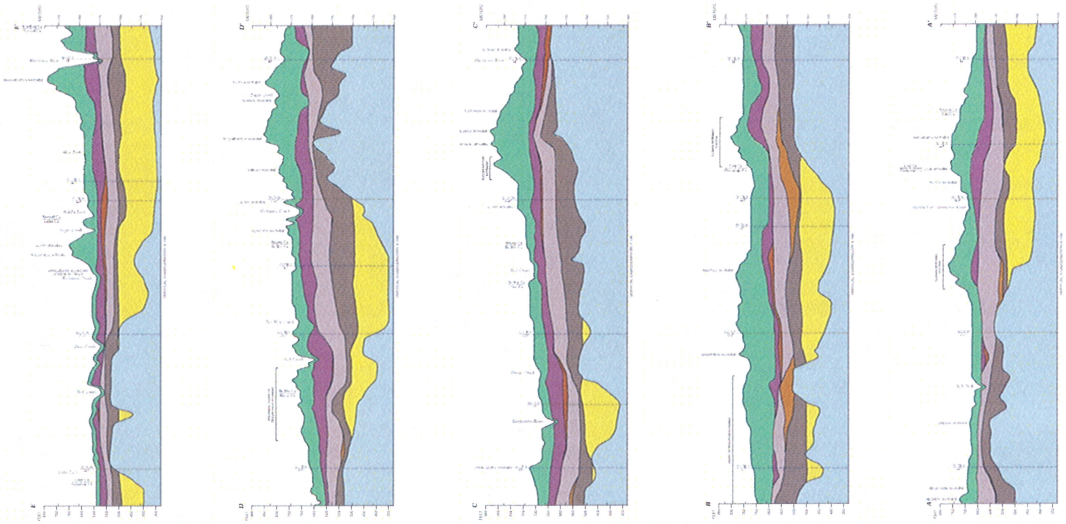
MAP I-2569 (SHEET 3 OF 3)



Location of cross sections (arrows). End moraines, a significant stratigraphic horizon, are shown for reference. Moraines are from a smaller scale map by Willman and Frye (1970).



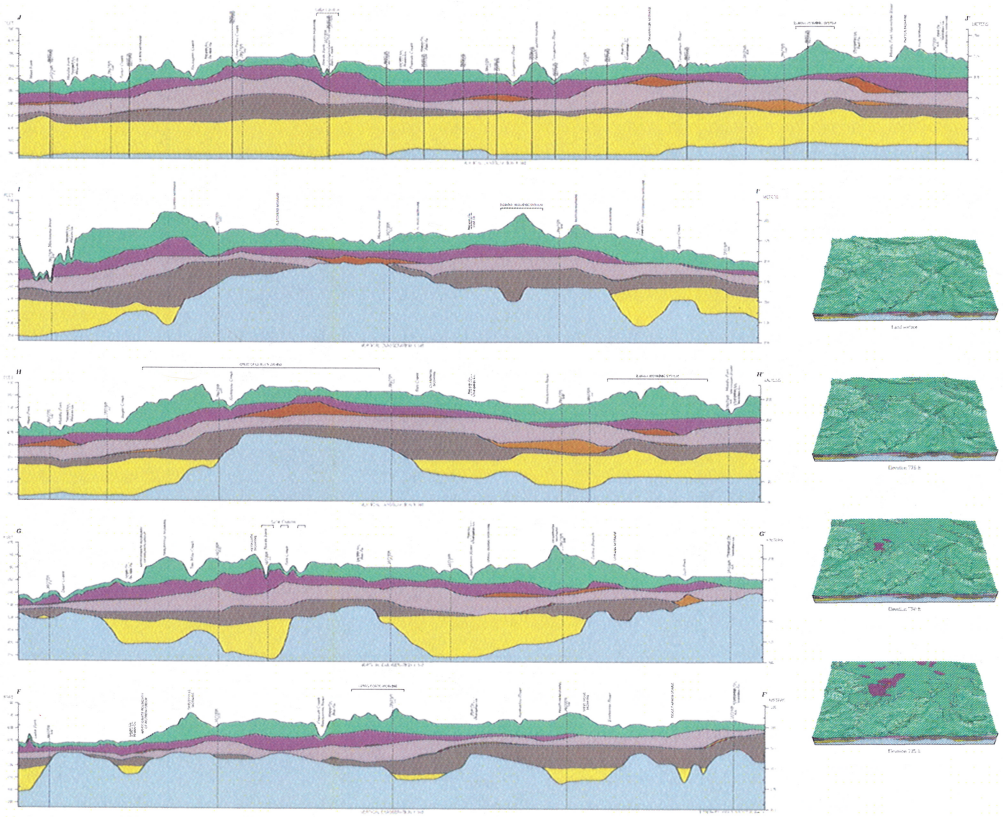
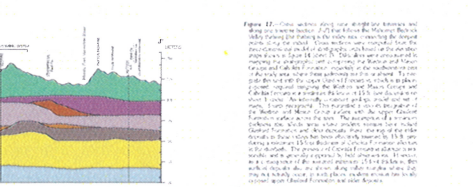


Figure 17.—Cross sections along some straight line distances and along some bends. A–A' (see Index to the Mahomet Bedrock Valley Survey) is the widest area researched by the Illinois State Geological Survey. Cross sections were compiled from the geologic logs of more than 1,000 water wells and test holes. Locations are shown in figure 14 (see Index to the Mahomet Bedrock Valley Survey). Data were entered and displayed by means of the stratigraphic unit symbols. The Banner and Mason Formation and Glasford Formation (deposits) at the southern end (see A–A' through area where these sediments are first encountered. To the north the sand unit (the upper Glasford Formation) is mostly in place (glacial lake) and designates the Banner and Mason Formation and Glasford Formation as undifferentiated. Vertical exaggeration is 10 times (10x) the horizontal scale. An arbitrarily contoured geologic model was used to create the cross sections. The interpolation between data points was based on the geologic model of the Mahomet Bedrock Valley and the Quaternary deposits in the area. The interpolation was based on the Glasford Formation, which forms a thick, uniform, basal unit. The Glasford Formation and other deposits (Banner Formation and Yarmouth-Sangamon Paleosol) that rest on the Glasford Formation were mapped as a unit. The interpolation of the Glasford Formation was based on the data points. The interpolation of the Glasford Formation was based on the data points. The interpolation of the Glasford Formation was based on the data points.



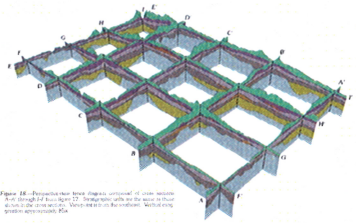


Figure 18.—Perspective view (from diagonal viewpoint of cross sections A–A' through H–H' from figure 17. Stratigraphic units are the same as those shown in the cross sections. View is toward the northwest. Vertical exaggeration approximately 10x.

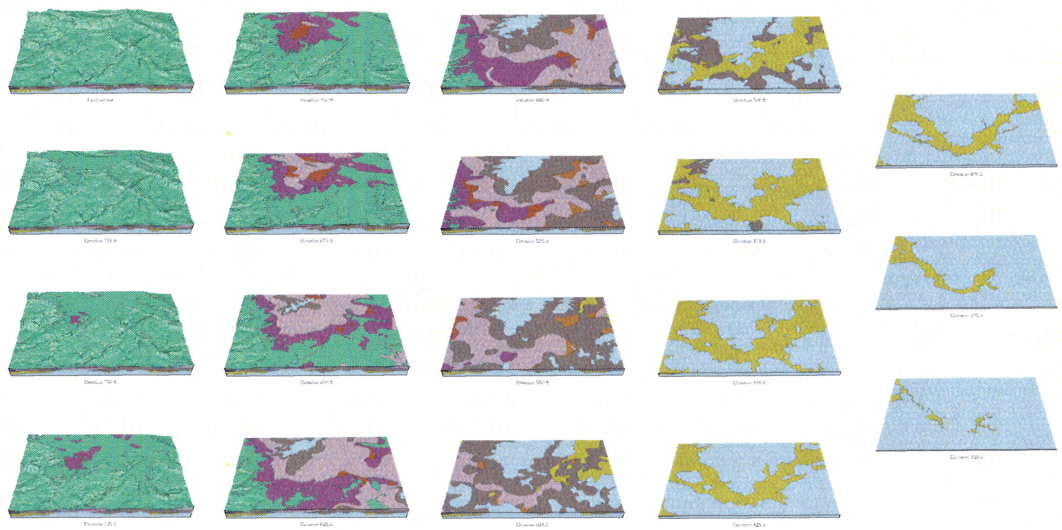


Figure 19.—Horizontal "slices" through the geologic contents in the cross area, showing the stratigraphic units encountered at different elevations above sea level. Viewpoint is from the south; vertical exaggeration is approximately 20x. Slices are shown from elevation 775 ft (236 ft at 25 times exaggeration). The upper left diagram shows the land surface, which ranges generally from 800 ft above sea level (244 m at 25 times exaggeration) to 600 ft (183 m at 25 times exaggeration). Note in particular the gradual filling of the Mahomet Bedrock Valley from the left to the right (west to east).

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1999

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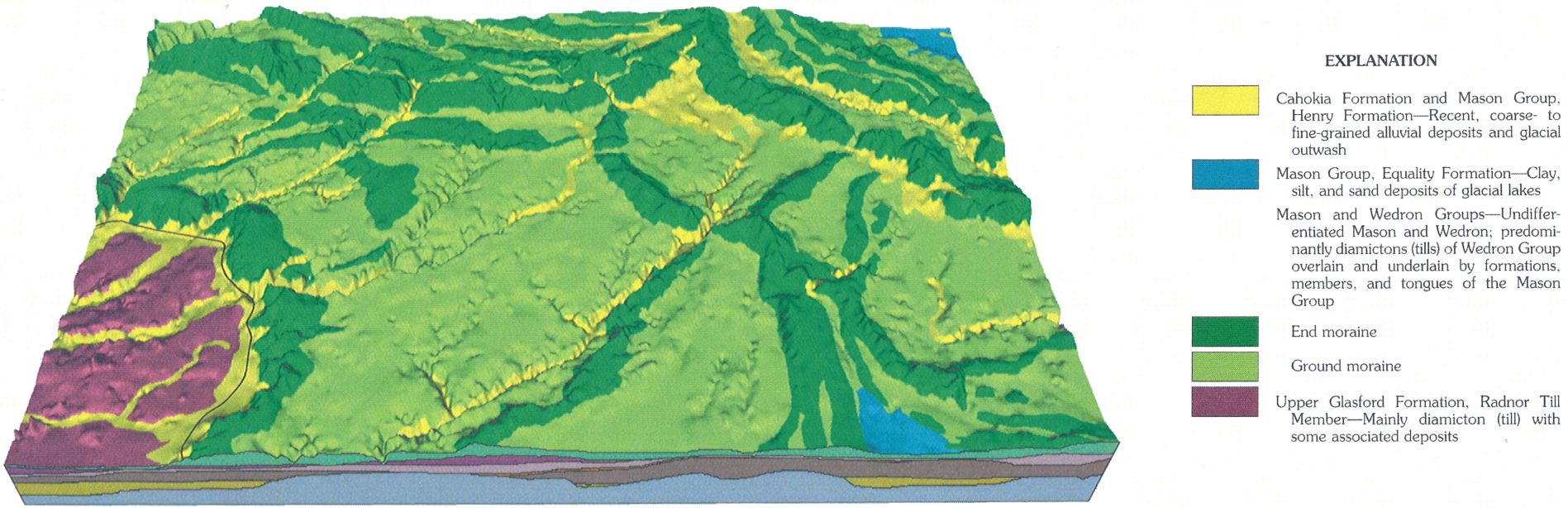


Figure 3.—Perspective view, looking north, showing surficial geology and buried Quaternary units in the map area. Surficial geology is from Lineback (1979) and Stiff (1996); the latter is a digital version of the map by Hansel and Johnson (1996). Subsurface geology is from this study, and is shown in more detail on sheet 2; subsurface units are the same as those shown in figure 7. Bedrock is shown in gray. In the southwestern part of the map area, the Upper Glasford Formation is covered in places by younger deposits, which for modeling purposes are assumed to be 15 ft thick (see discussion under "An internally consistent geologic model and set of maps," fourth paragraph). Black line shows the southwesternmost limit of Wedron Group deposits. Topography is from edited, digital versions of USGS 1:100,000-scale topographic maps. Image is vertically exaggerated approximately 30x.

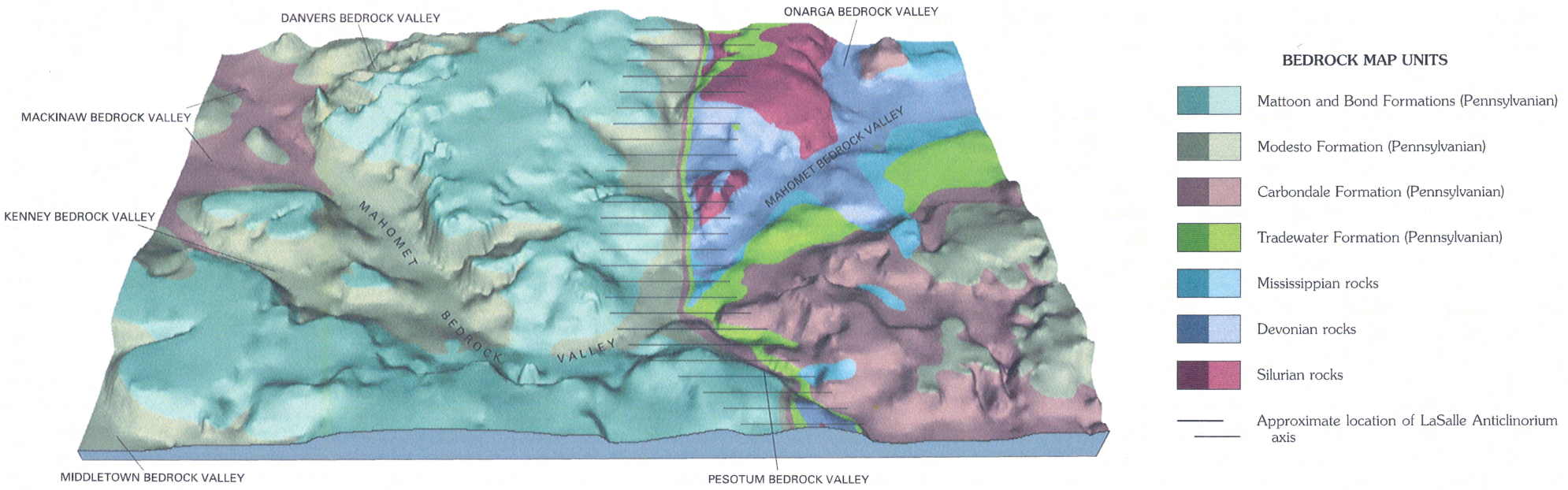
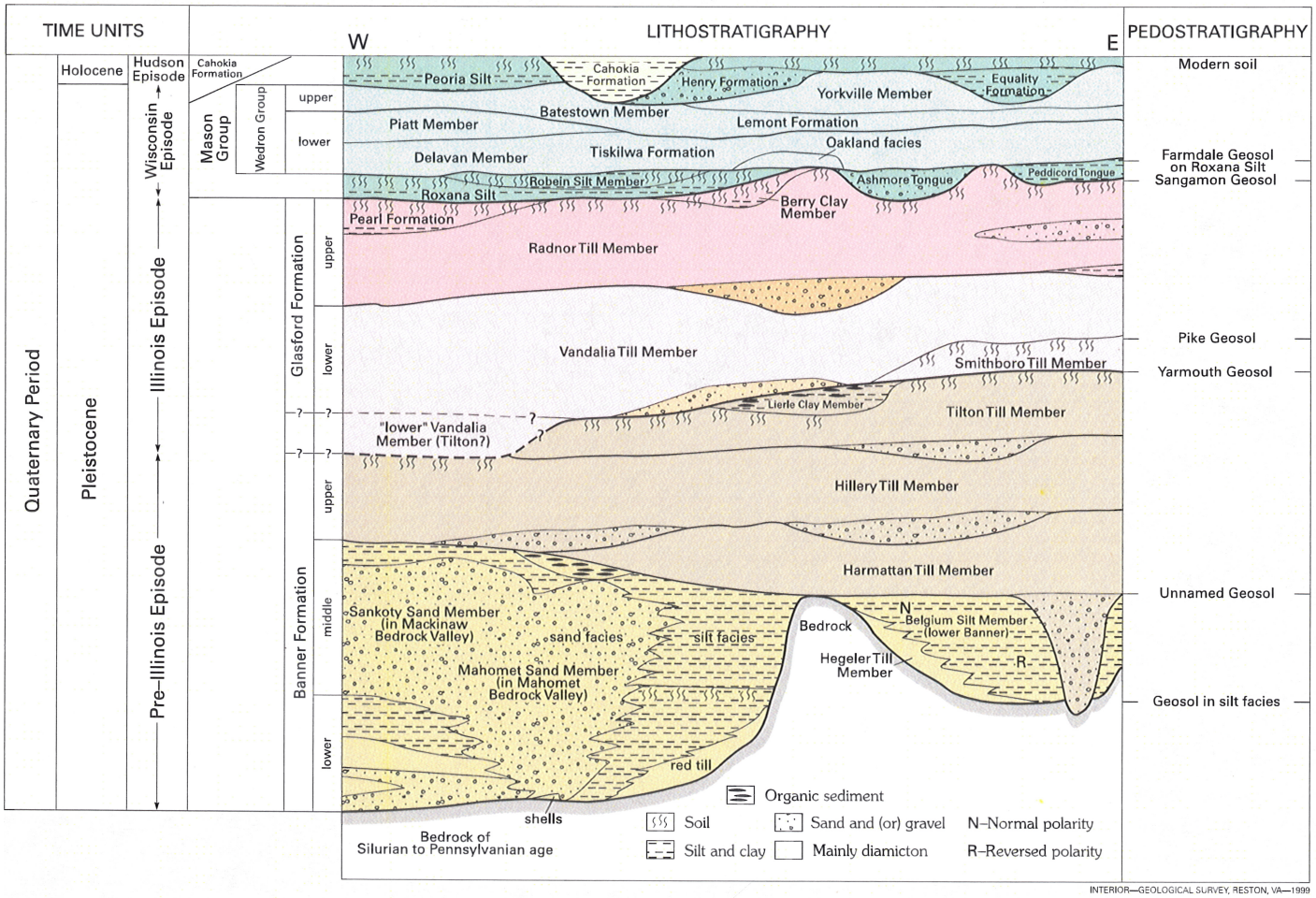


Figure 5.—Perspective view, looking north, of the geology and topography of the bedrock surface in the map area. Bedrock geology is from Pius Weibel (Illinois State Geological Survey (ISGS), written commun., 1997). Bedrock topography is from this study. The axis of the LaSalle Anticlinorium, of late Paleozoic age, also is shown. To enhance topographic detail, the image is vertically exaggerated approximately 30x.

89°

88°



DESCRIPTION OF UNITS

Cahokia Formation—Coarse- to fine-grained alluvial deposits; is the predominant fill in most of the smaller creek bottoms

Mason and Wedron Groups—Predominantly diamictons (tills) of the Wedron Group overlain and underlain by formations, members, and tongues of the Mason Group; only the Mason occurs in surface valley fills and beyond the Wedron margin. In the stratigraphic column, the Wedron is shown in lighter green and the Mason in darker green

Glasford Formation

Upper Glasford

Radnor Till Member—Mainly diamicton (till) and some associated deposits; includes the Roxana Silt and Robein Silt Member (Mason Group), which, along with the Berry Clay Member (Glasford Formation), provide subsurface marker horizon for the top of the Glasford

Basal Radnor sand and gravel

Lower Glasford

Vandalia and Smithboro Till Members— Mainly diamicton of Vandalia Till Member; the Smithboro occurs only locally at the base. Includes "lower Vandalia" diamicton (till), which may be a separate unit or correlated with the Tilton Till Member (upper Banner). The Robein Silt Member and Sangamon Geosol, including the Berry Clay Member, locally cap the Vandalia beyond the Radnor boundary

Basal Vandalia sand and gravel

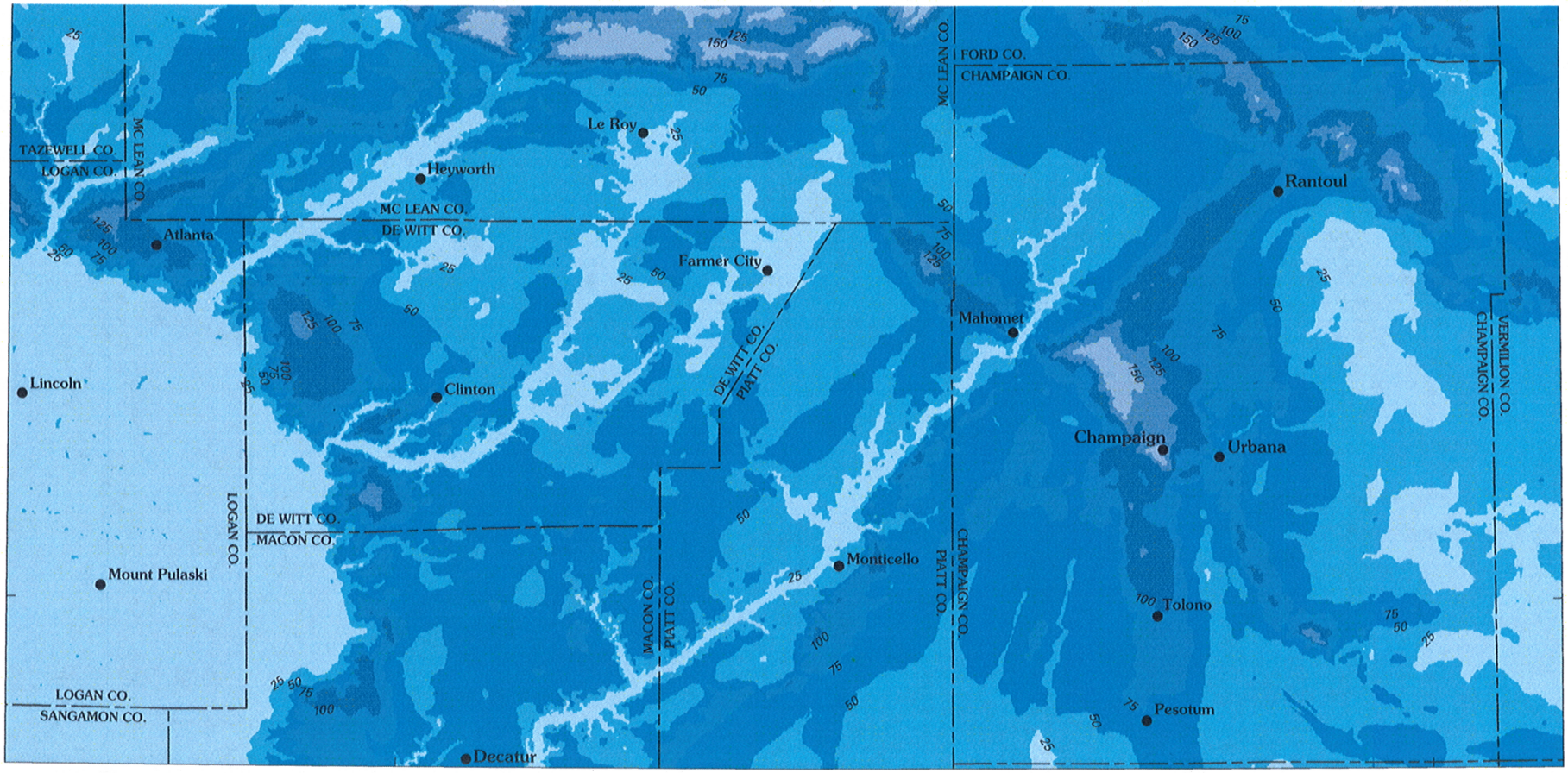
Banner Formation

Upper Banner— Mainly diamictons and local sand and gravel of the Tilton, Hillery, and HarmattanTill Members; locally includes cap of the Lierle Clay Member and Yarmouth Geosol. Thin, patchy lower Banner deposits may occur on bedrock uplands, and are included

Middle and lower Banner—Mainly middle Banner sand and gravel of the Mahomet and Sankoty Sand Members, with associated silt (lacustrine) facies. The lower Banner occurs locally as diamictons, silt, and sand and gravel, mainly in bedrock valleys in the northwestern part of the map area

Bedrock—Rocks of Pennsylvanian, Mississippian, Devonian, and Silurian age

Figure 7.—Diagrammatic stratigraphic column of glaciogenic sediments in east-central Illinois. The Cahokia Formation was deposited mostly during the Hudson Episode. Geologic and stratigraphic names and intervals used in this figure are those accepted by the ISGS.



Base from ISGS data that was digitized from USGS 1:24,000- and 1:62,500-scale topographic maps

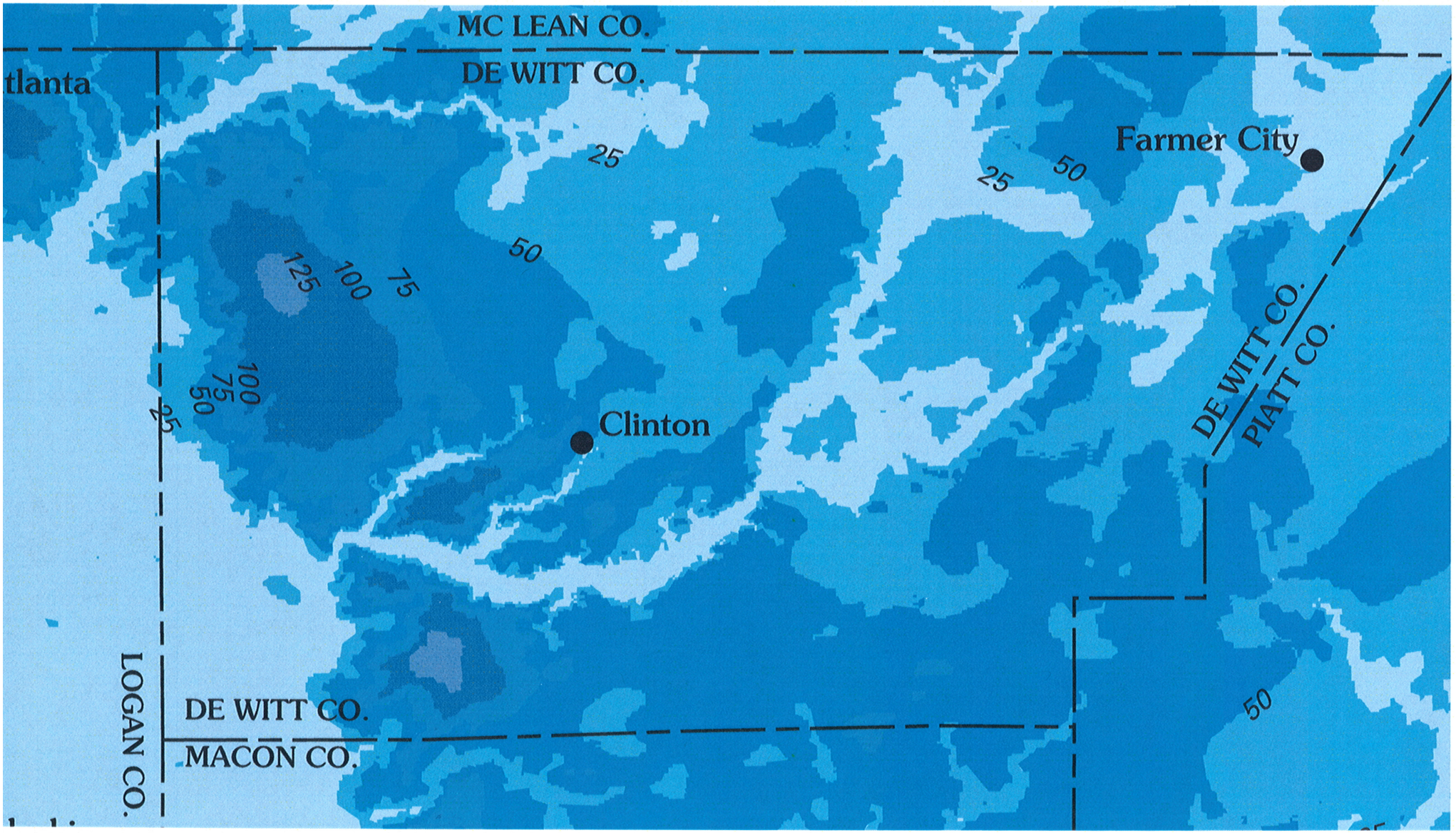
Universal Transverse Mercator projection

SCALE 1:500 000

10 0 10 20 MILES

10 0 10 20 KILOMETERS

Figure 8.—Thickness of the Wedron and Mason Groups (Wisconsin Episode); includes minor thickness of the Cahokia Formation (Wisconsin and Hudson Episodes) as alluvial fill in the valleys and the Peoria Silt as loess on the uplands. Arcuate bands of thicker sediment correspond to end moraines (see fig. 2), where glacial ice stagnated


MC LEAN CO.
DE WITT CO.
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Farmer City
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PIATT CO.
LOGAN CO.
DE WITT CO.
MACON CO.
50

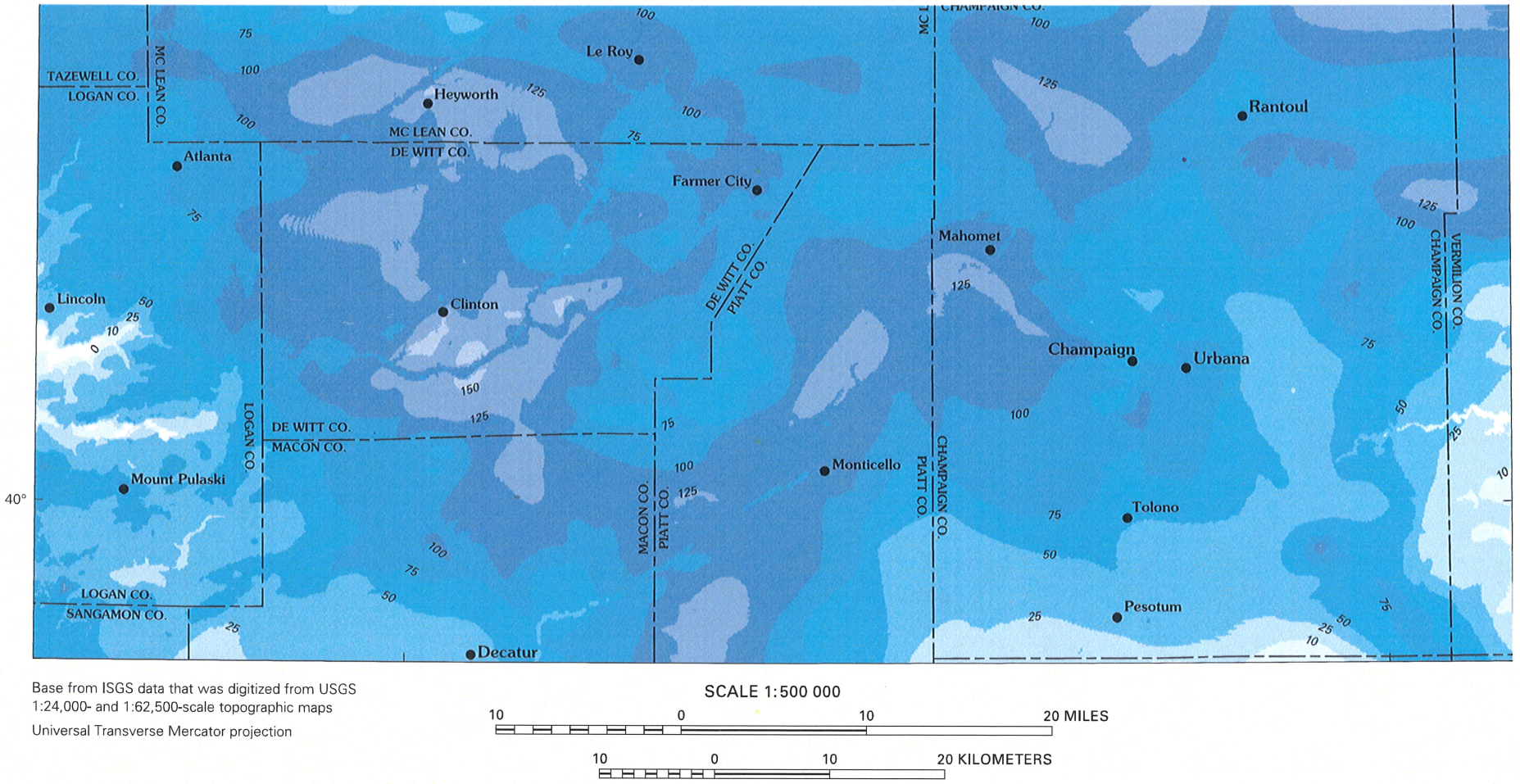
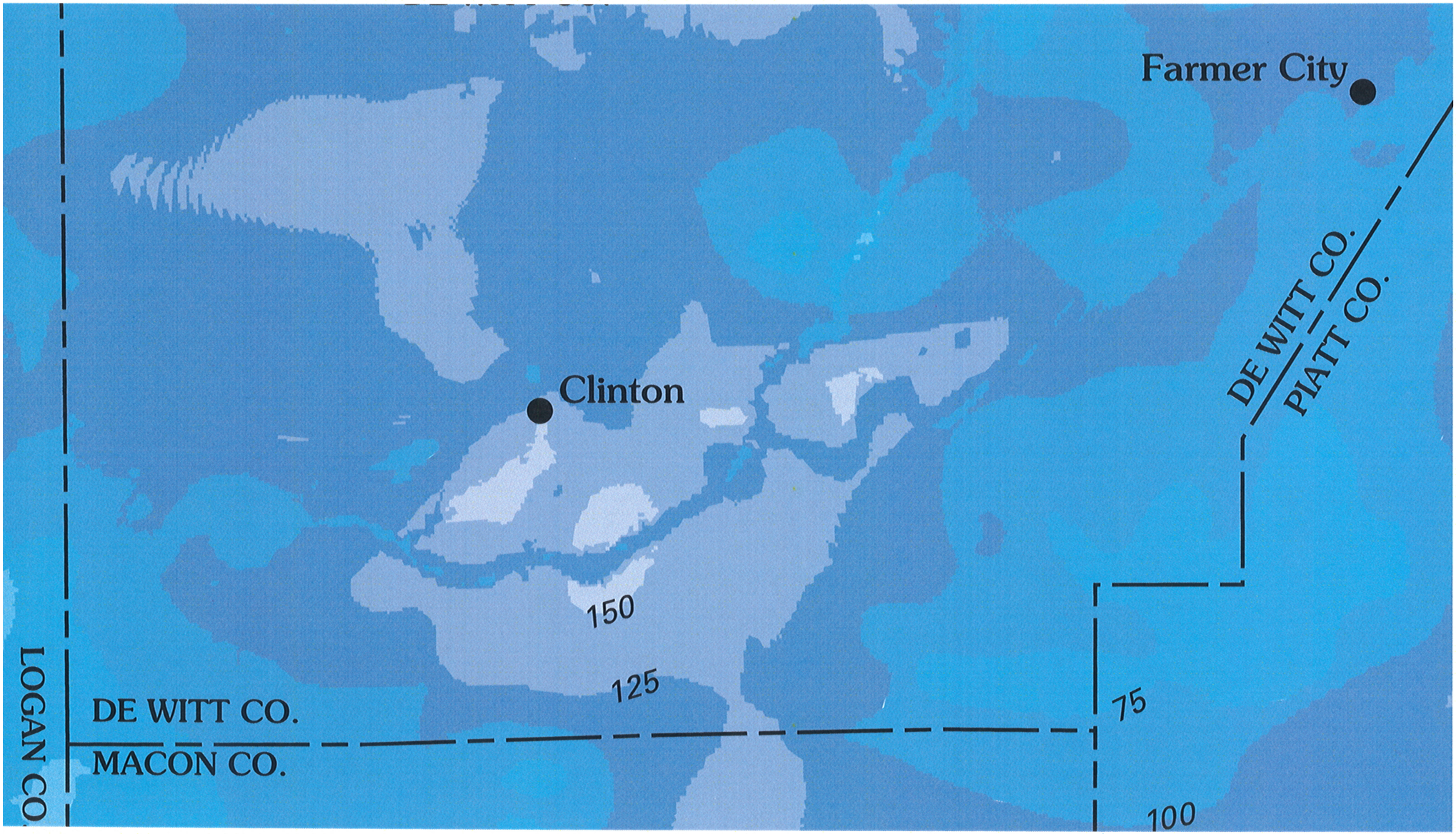


Figure 9.—Thickness of the Glasford Formation (Illinois Episode). The pattern of sediment deposition was affected by the Mahomet Bedrock Valley, which had been partly filled by older sediment. Areas of thicker sediment mostly correspond to this ancient valley. Sinuous areas of thinner sediment correspond to modern river valleys, where the Glasford Formation has been partly or completely eroded (for example, the valleys of the Sangamon River and Salt Creek).


Farmer City
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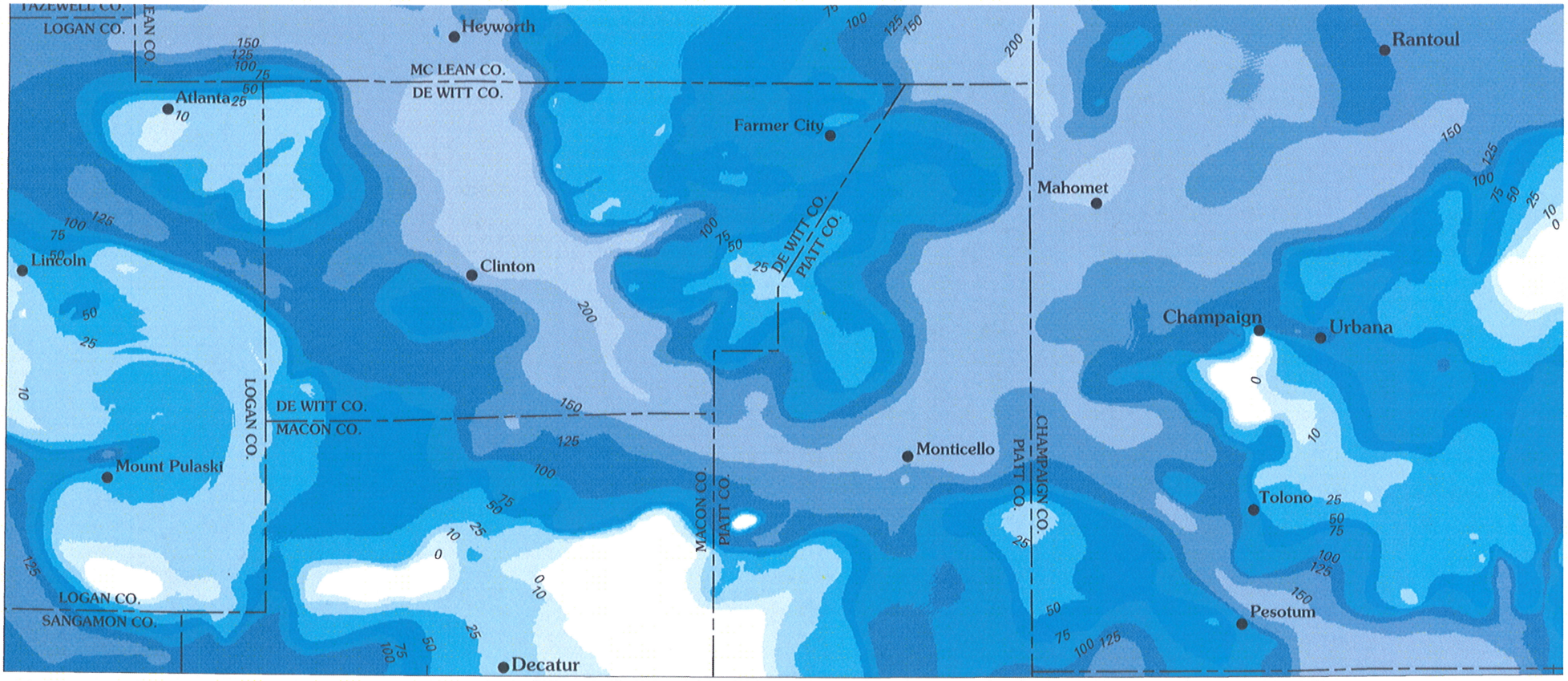


Base from ISGS data that was digitized from USGS 1:24,000- and 1:62,500-scale topographic maps

Universal Transverse Mercator projection

SCALE 1:500 000

10 0 10 20 MILES

10 0 10 20 KILOMETERS

Figure 10.—Thickness of the Banner Formation (pre-Illinois Episode). The pattern of sediment deposition was greatly influenced by the Mahomet Bedrock Valley. The fluvial phase of these sediments constitutes the thickest part of the section and delineates the valley and its tributaries. These mostly sand and gravel sediments are over

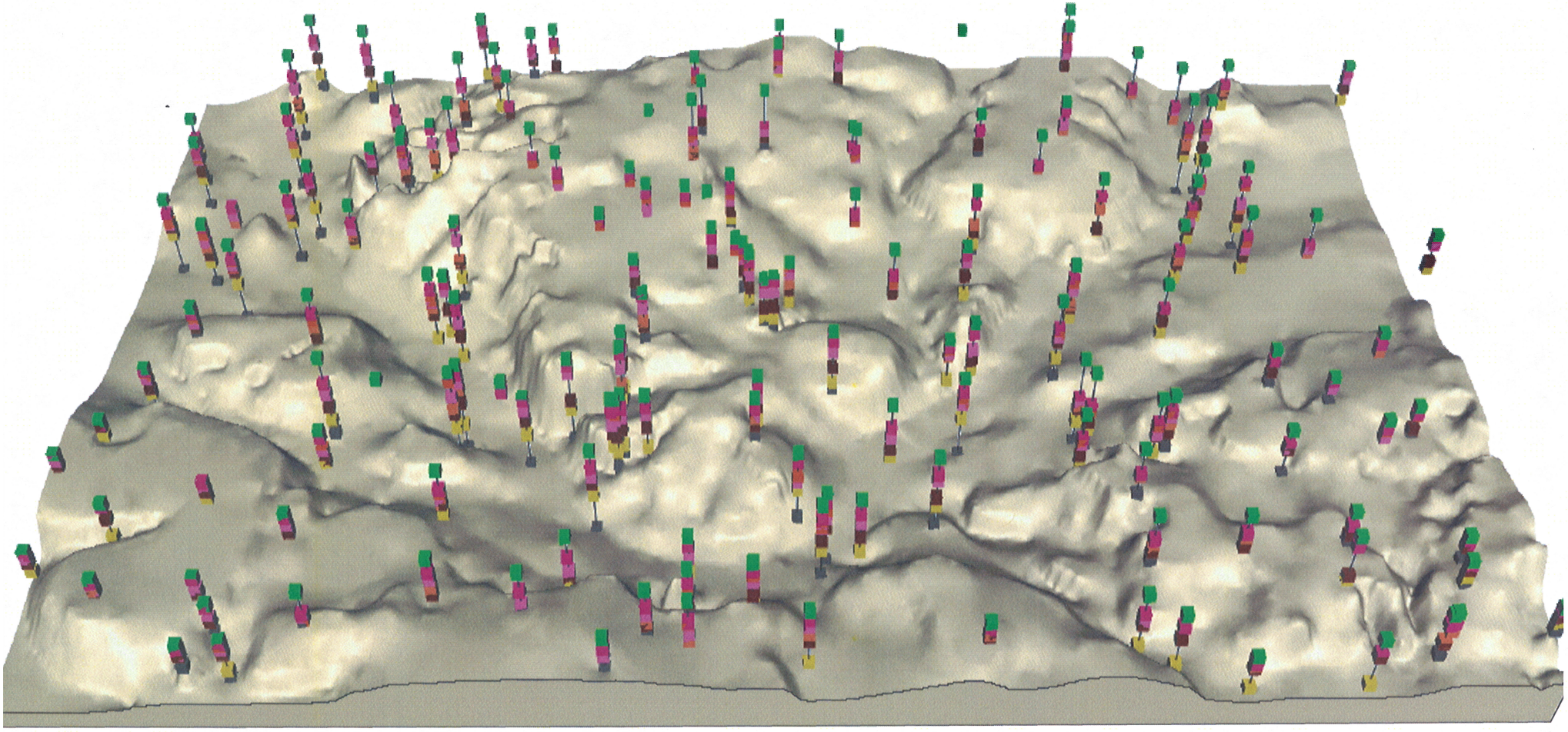
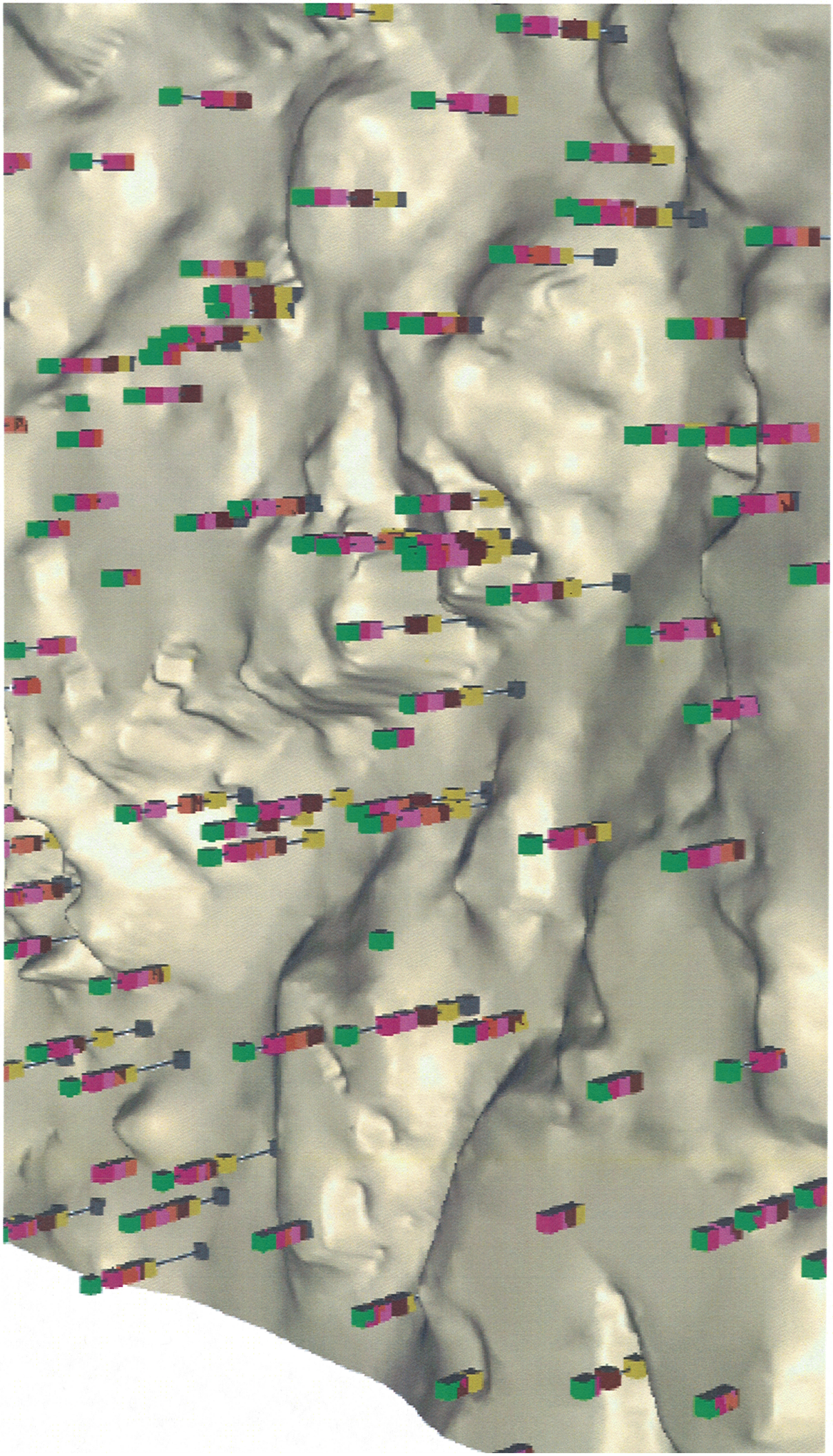
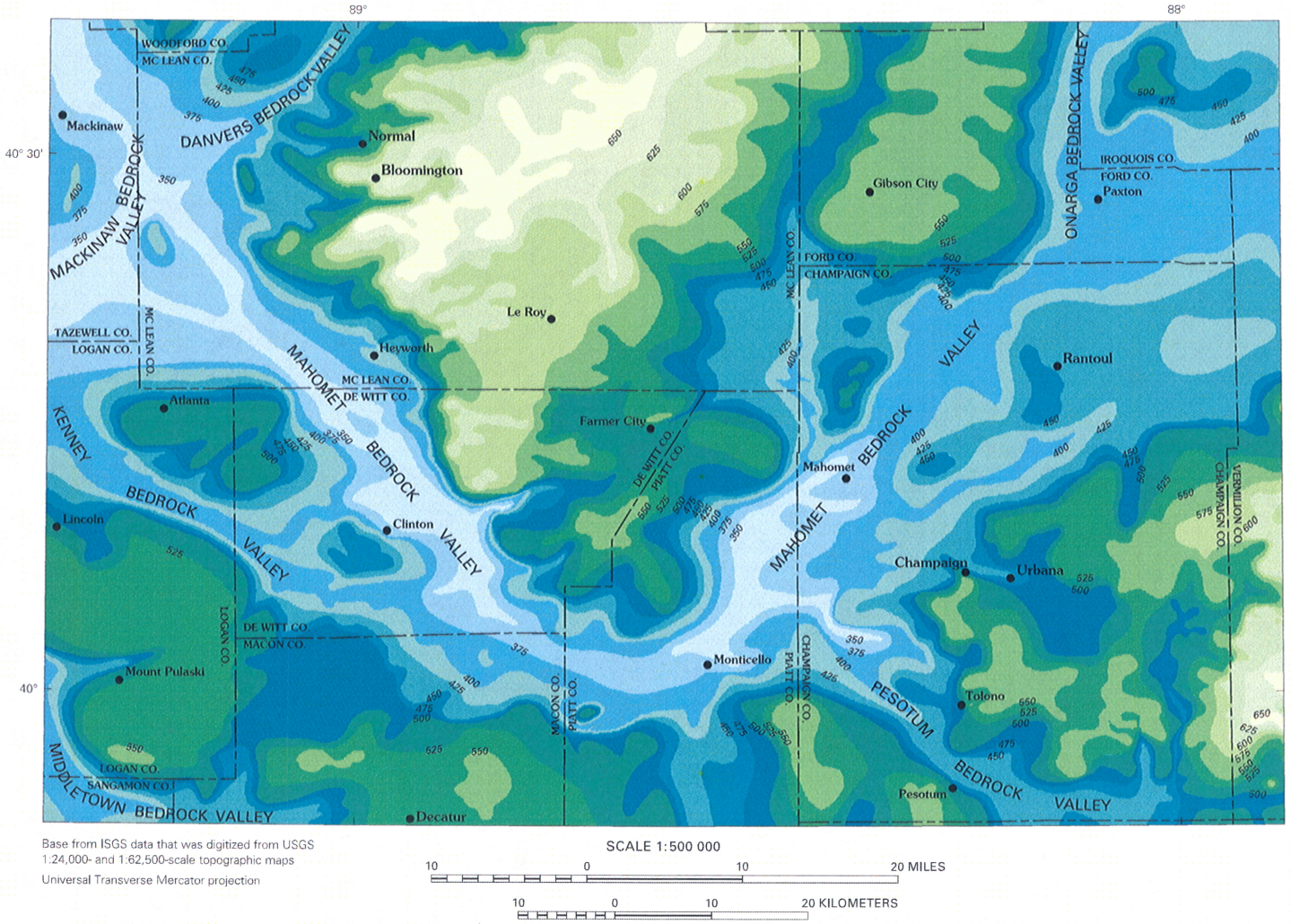


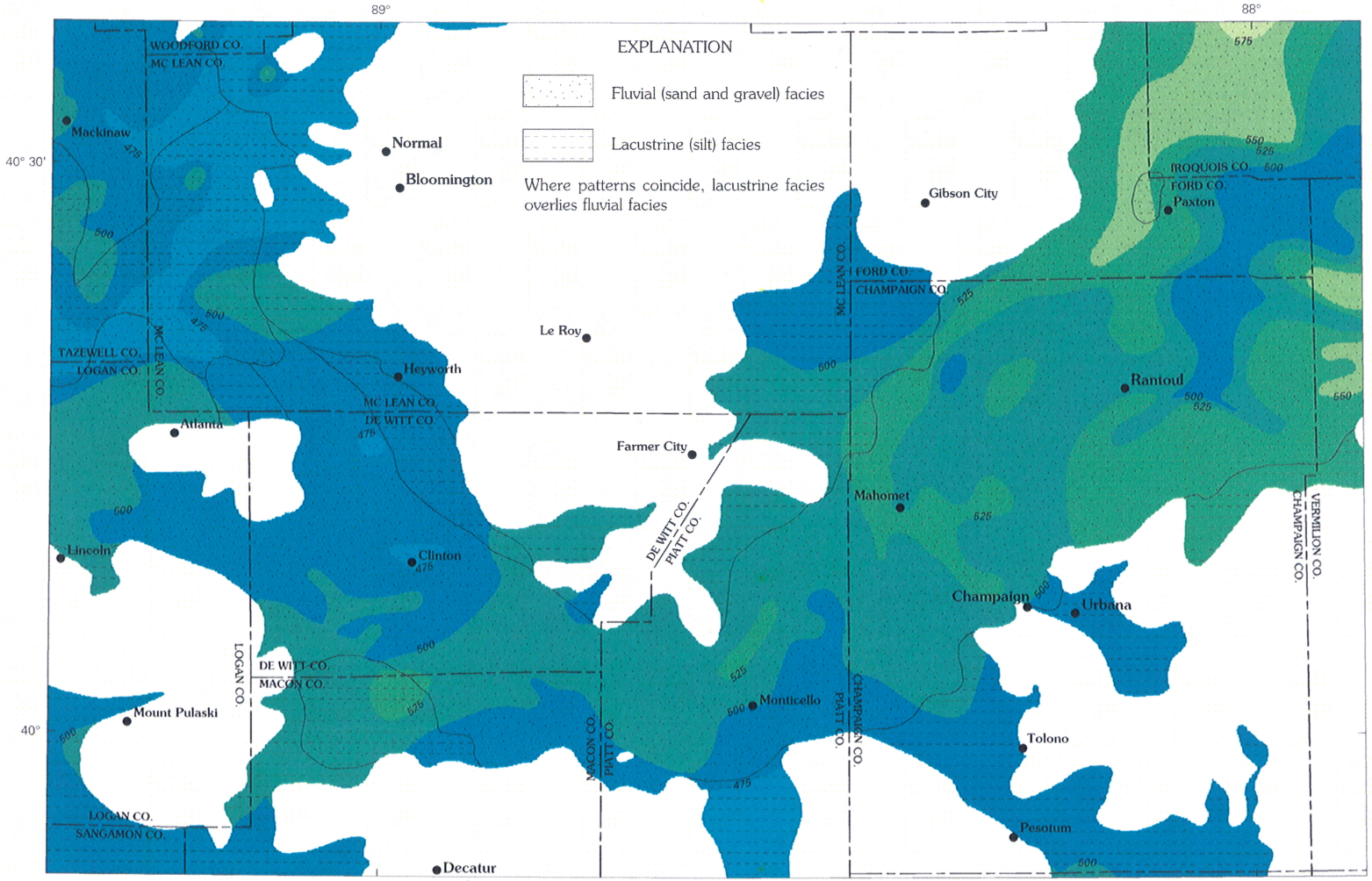
Figure 12.—Perspective view of the map area showing distribution of 167 key stratigraphic control points relative to the bedrock topographic surface. Viewpoint is from the south. Each control point is represented by a linked, vertical sequence of colored cubes. The top of each cube represents the top of a stratigraphic unit, as follows:



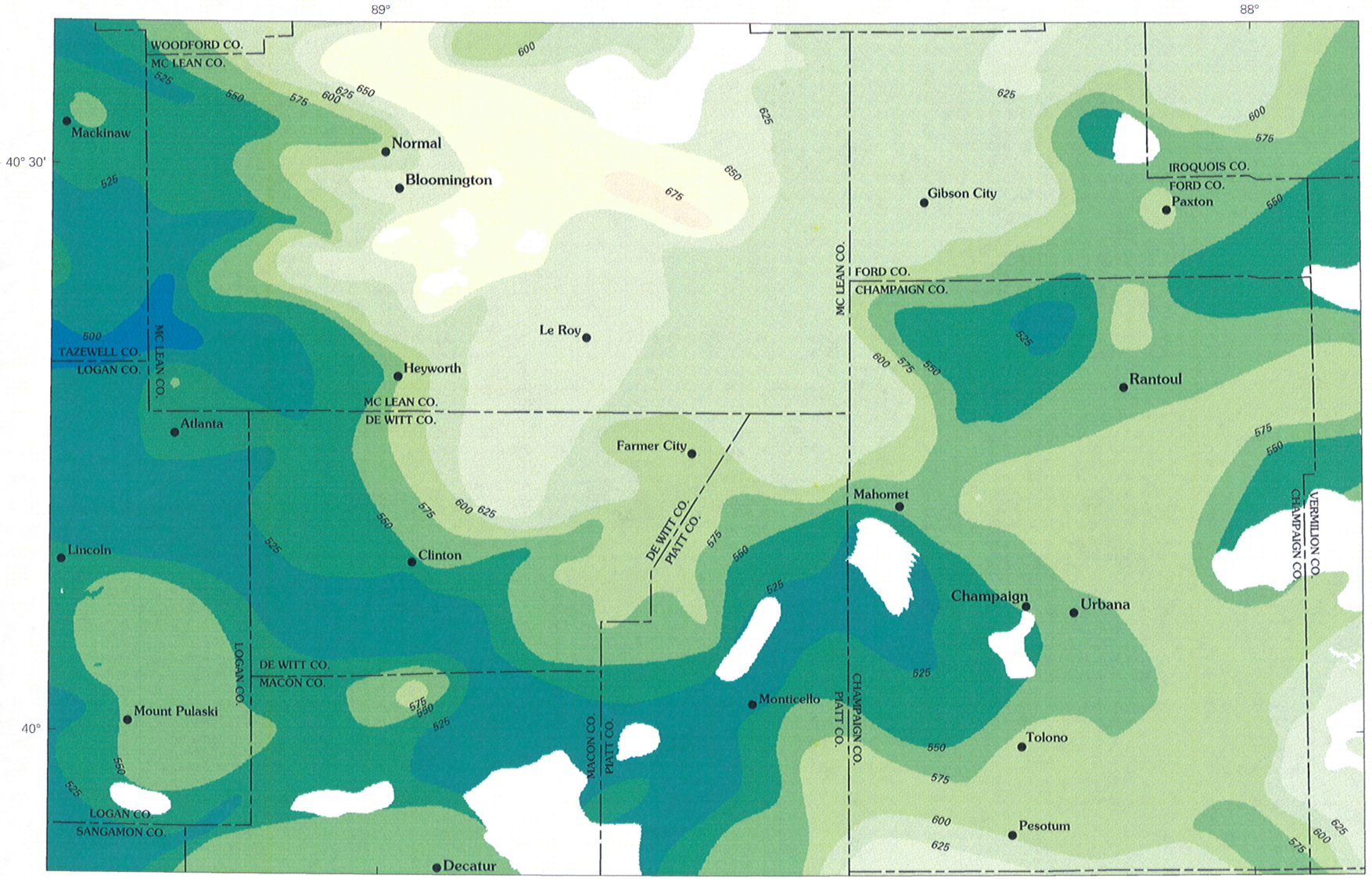


14A.—Elevation of the bedrock surface. Bedrock units are undifferentiated. Selected bedrock valleys are identified.

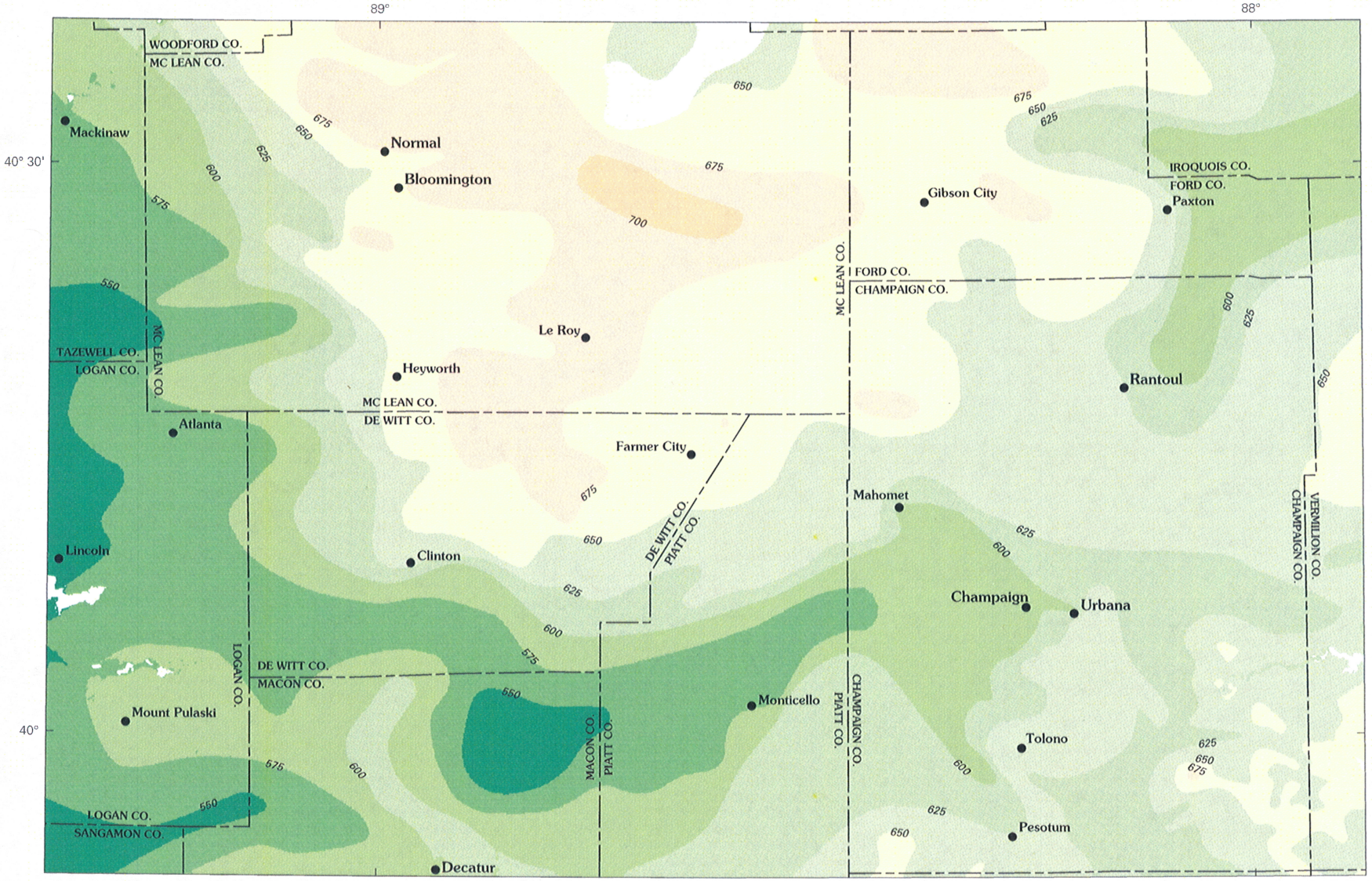
Figure 14A–F.—Elevation, in feet above sea level, of the top or uppermost surface of bedrock and of five Quaternary stratigraphic units. Refer to discussion on sheet 1 under "Converting to raster format" for explanation of characteristic jagged boundaries of units on these raster maps.



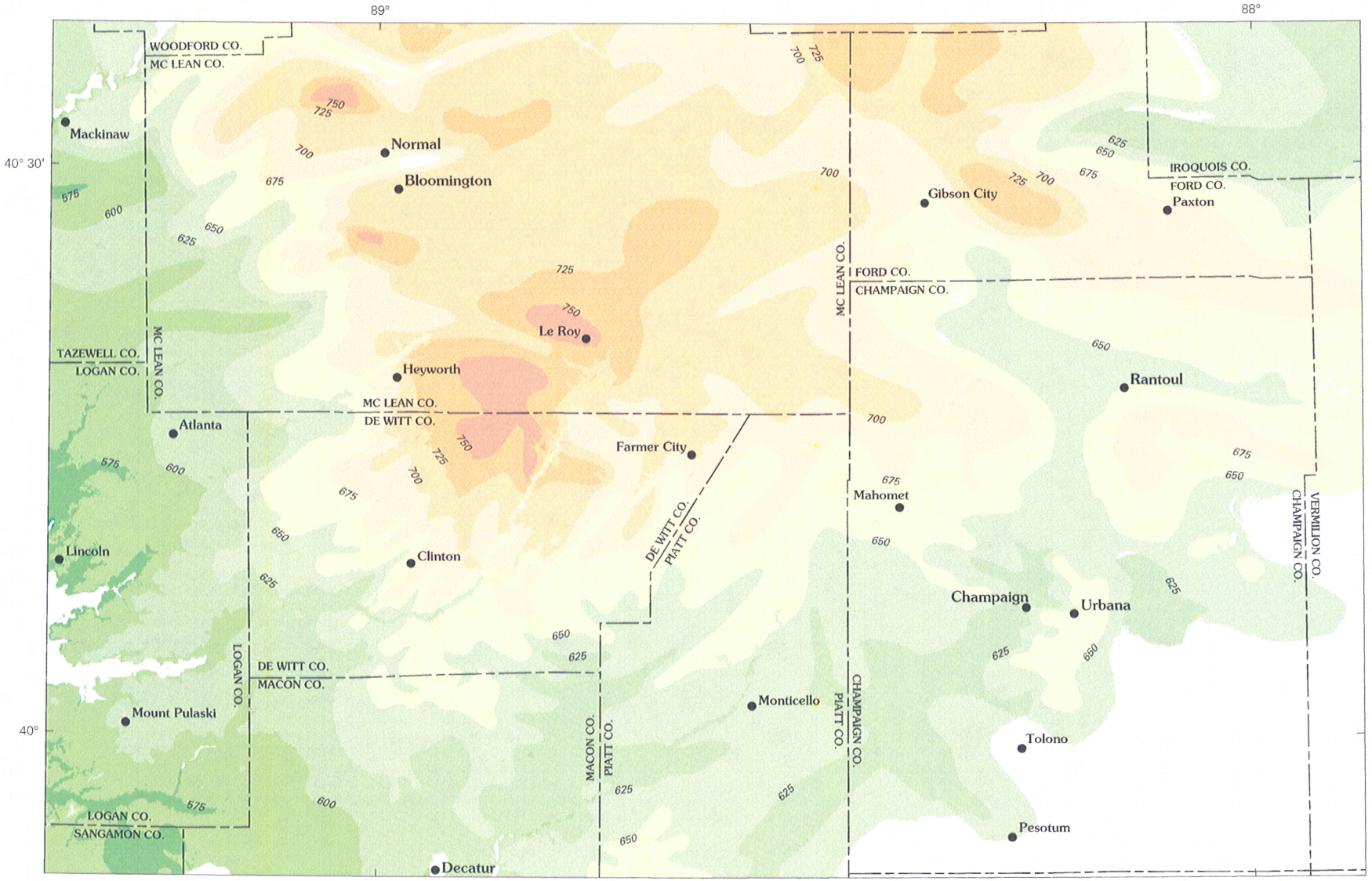
14B.—Elevation of the top of the middle Banner Formation. Approximate distribution of fluvial (sand and gravel) and lacustrine (silt) facies of the Mahomet Sand Member is shown by patterns. Sand and gravel commonly occur in the Mahomet Bedrock Valley's main channel. Silt and clay occur in tributaries because ice or sediment dams in the main channel blocked the tributaries, causing water to pond and fine sediment to be deposited.



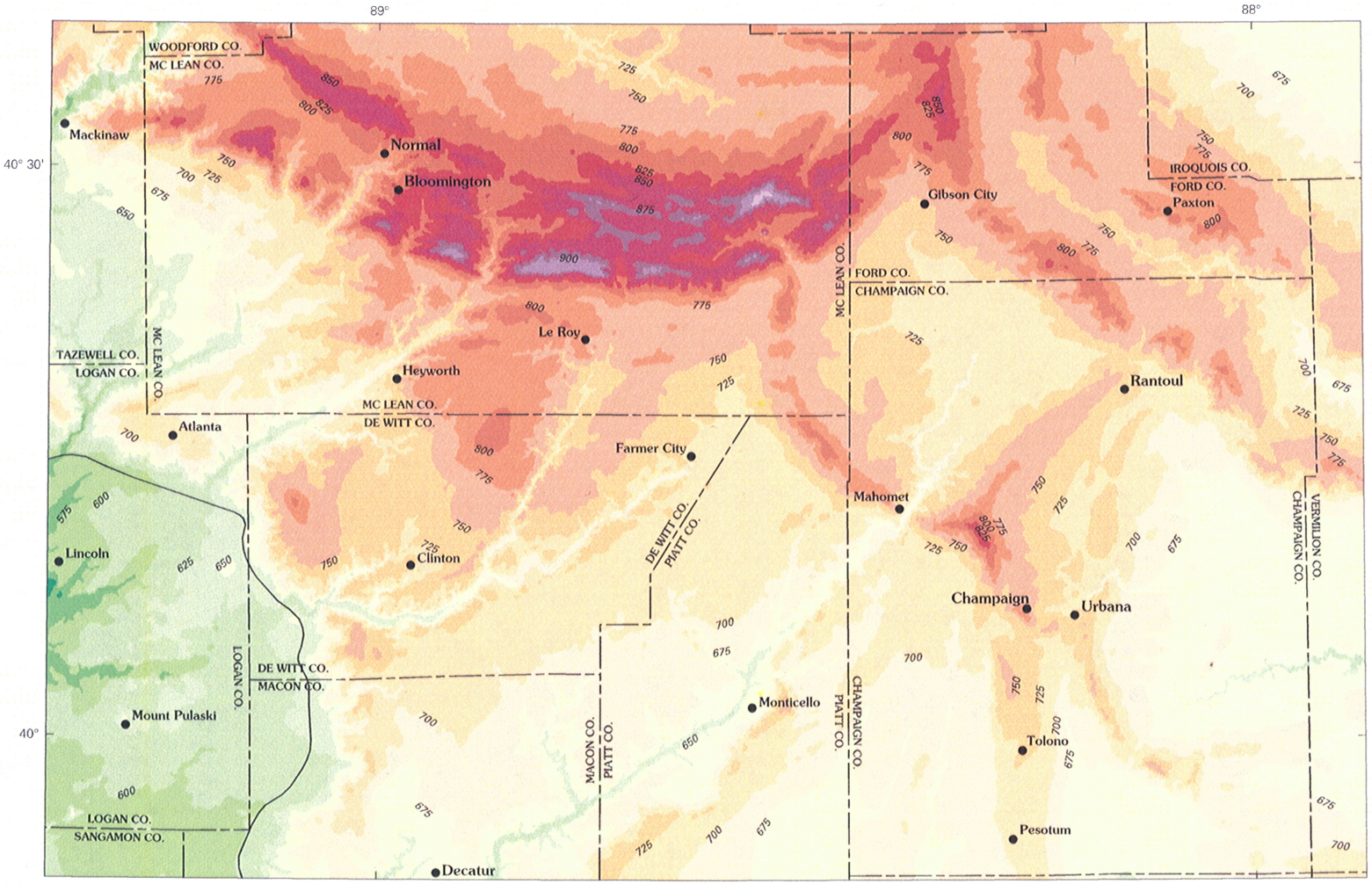
14C.—Elevation of the top of the upper Banner Formation.



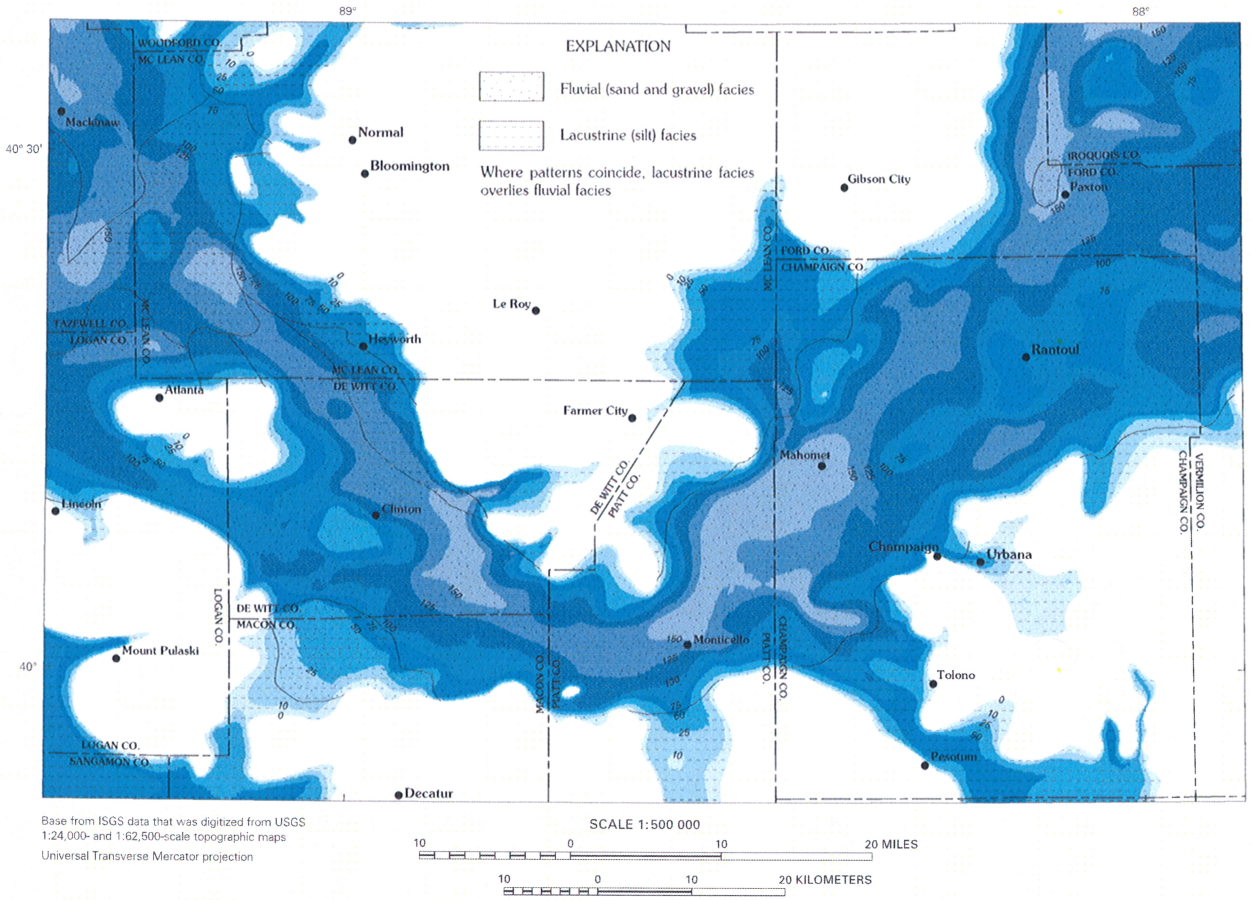
14D —Elevation of the top of the lower Glasford Formation



14E.—Elevation of the top of the upper Glasford Formation.



14F.—Elevation of the land surface, which is equivalent to the top of the Wedron and Mason Groups except where they are covered by thin, discontinuous Cahokia Formation. In the southwestern part of the map area (beyond the limit of ice that deposited the Wedron Group diamictons, shown by black line), thin Cahokia Formation and Peoria Silt directly overlie the upper Glasford Formation.



ELEVATION (feet)
For figures 14*A–F* and 16*B* and *E*

925
900
875
850
825
800
775
750
725
700
675
650
625
600
575
550
525
500
475
450
425
400
375
350
325
Unit not present

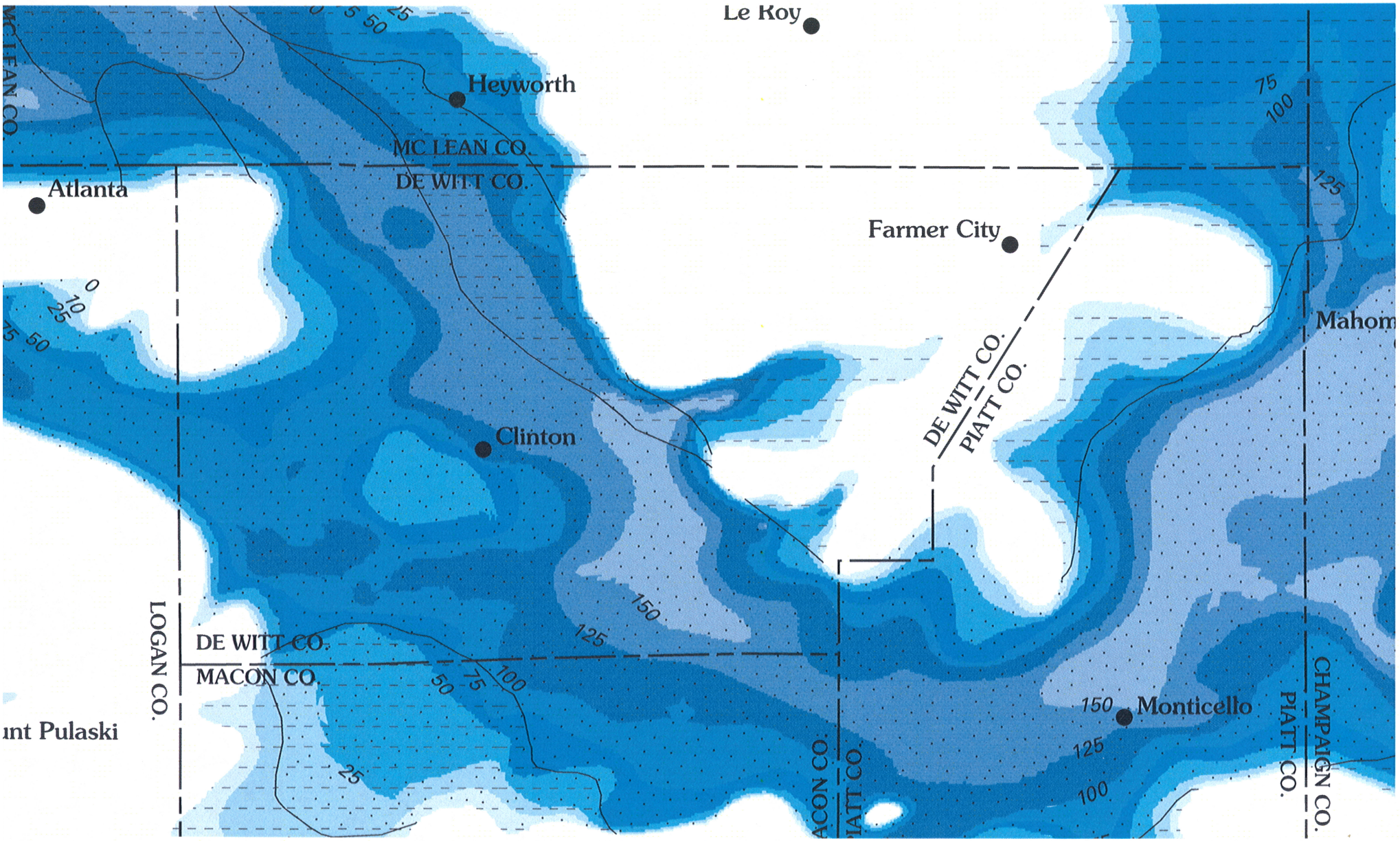
THICKNESS (feet)
For figures 15*A–E* and 16*A* and *D*

200
150
125
100
75
50
25
10
0

Original measurements of stratigraphic-unit elevations and thicknesses were made in feet, so standard units are retained here. To convert to meters, multiply by 0.3048.

15A.—Thickness of the middle Banner Formation. In the Mahomet and Mackinaw Bedrock Valleys the middle Banner includes lower Banner Formation sediments, as they are patchy in distribution and not mappable separately (see discussion on sheet 1 under "Quaternary stratigraphy," fifth paragraph). Approximate distribution of fluvial (sand and gravel) and lacustrine (silt) facies of the Mahomet Sand Member is shown by patterns. Sand and gravel are the principal constituents in the Mahomet Bedrock Valley's main channel. Silt and clay occur in tributaries because ice or sediment dams in the main channel blocked the tributaries, causing water to pond and fine sediment to be deposited.

Figure 15A–E.—Thickness, in feet, of five stratigraphic units. Thickness was computed as the difference in elevation between the top of a unit and the top of the underlying unit. Refer to discussion on sheet 1 under "Converting to raster format" for explanation of characteristic jagged boundaries of units on these raster maps.


Le Roy
Heyworth
MC LEAN CO.
DE WITT CO.
Atlanta
Farmer City
Mahom
DE WITT CO.
PIATT CO.
Clinton
LOGAN CO.
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MACON CO.
Monticello
PIATT CO.
CHAMPAIGN CO.
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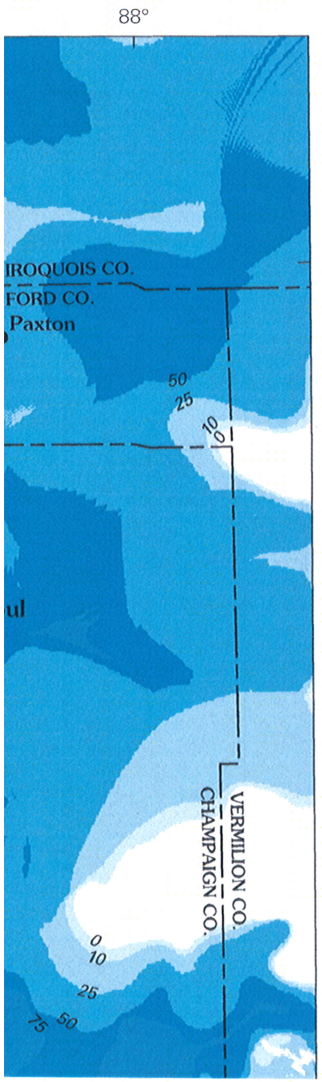
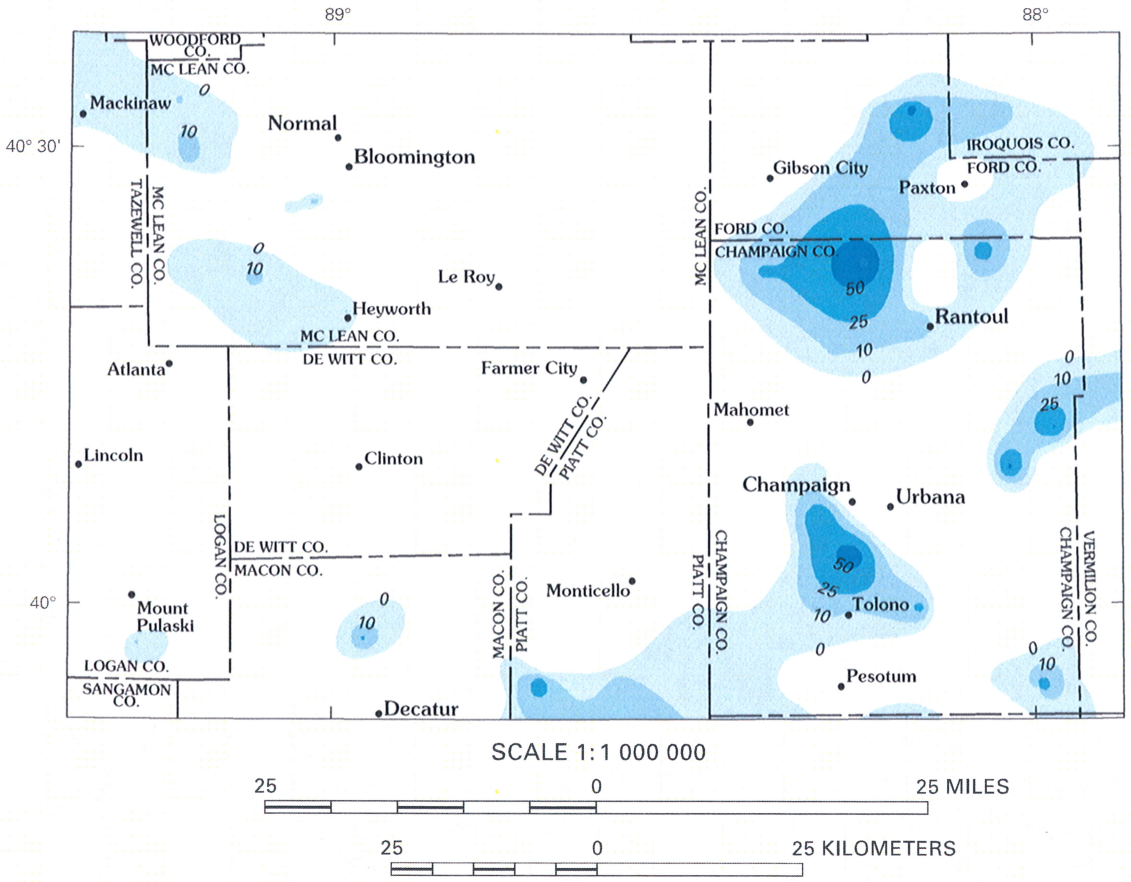
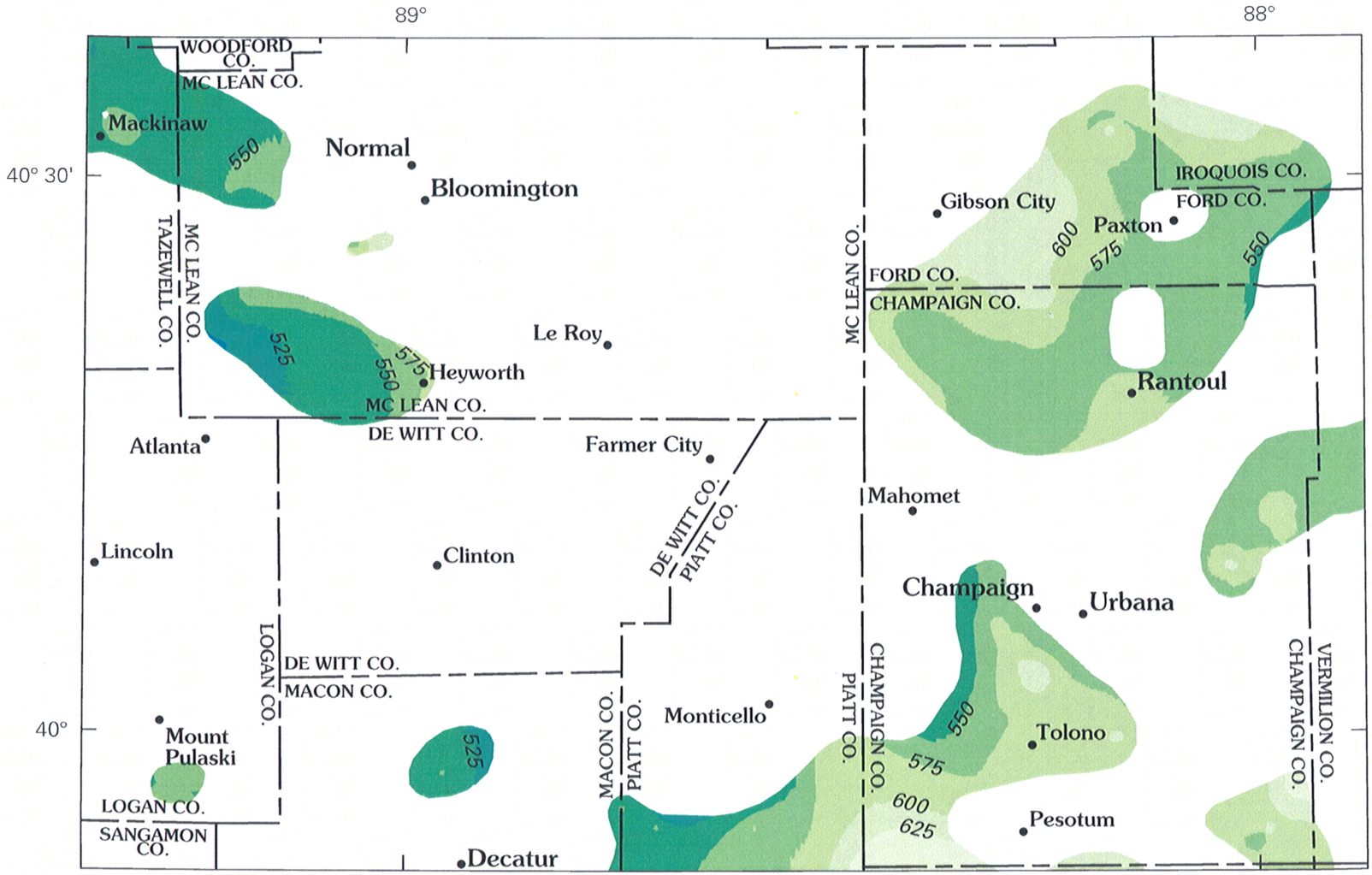


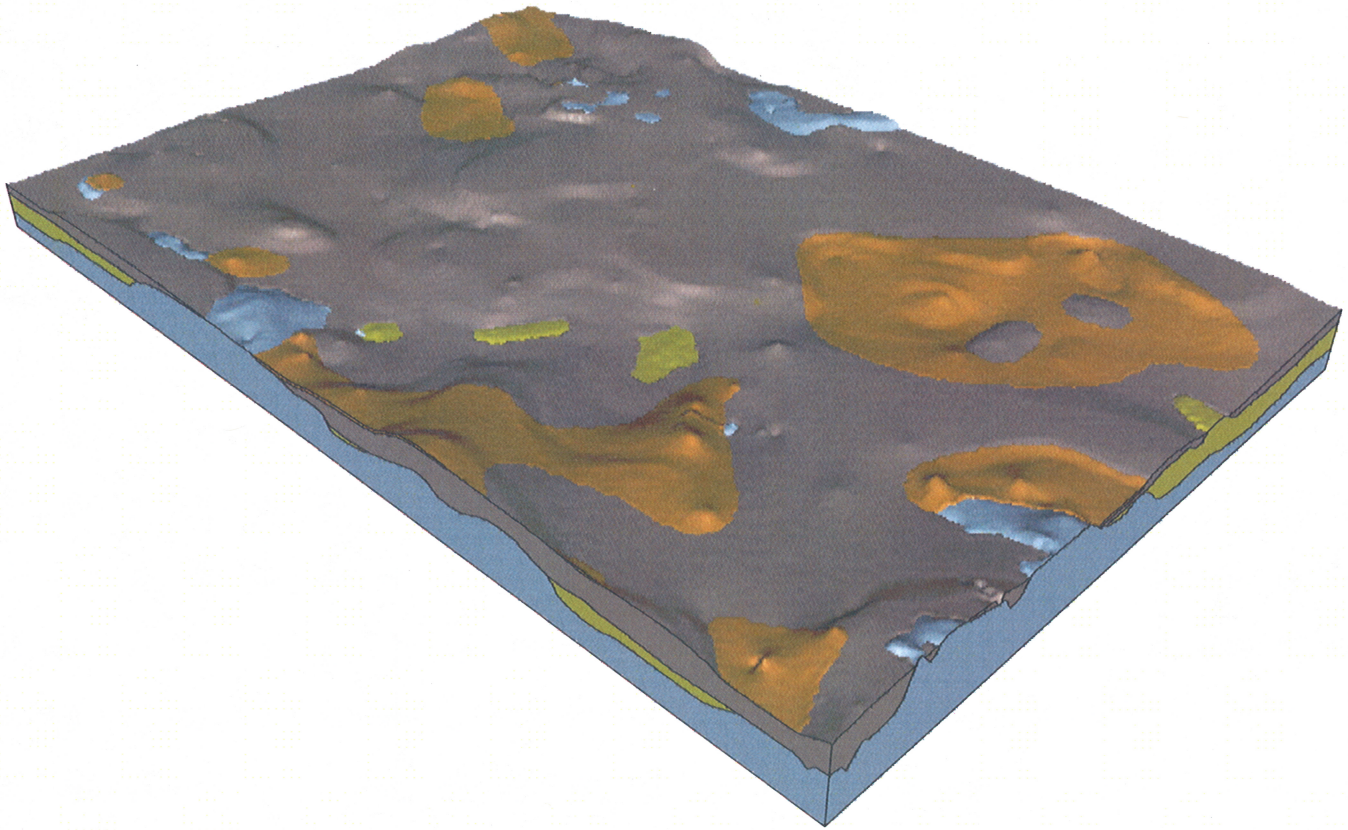


16A.—Thickness of basal sand, lower Glasford Formation.

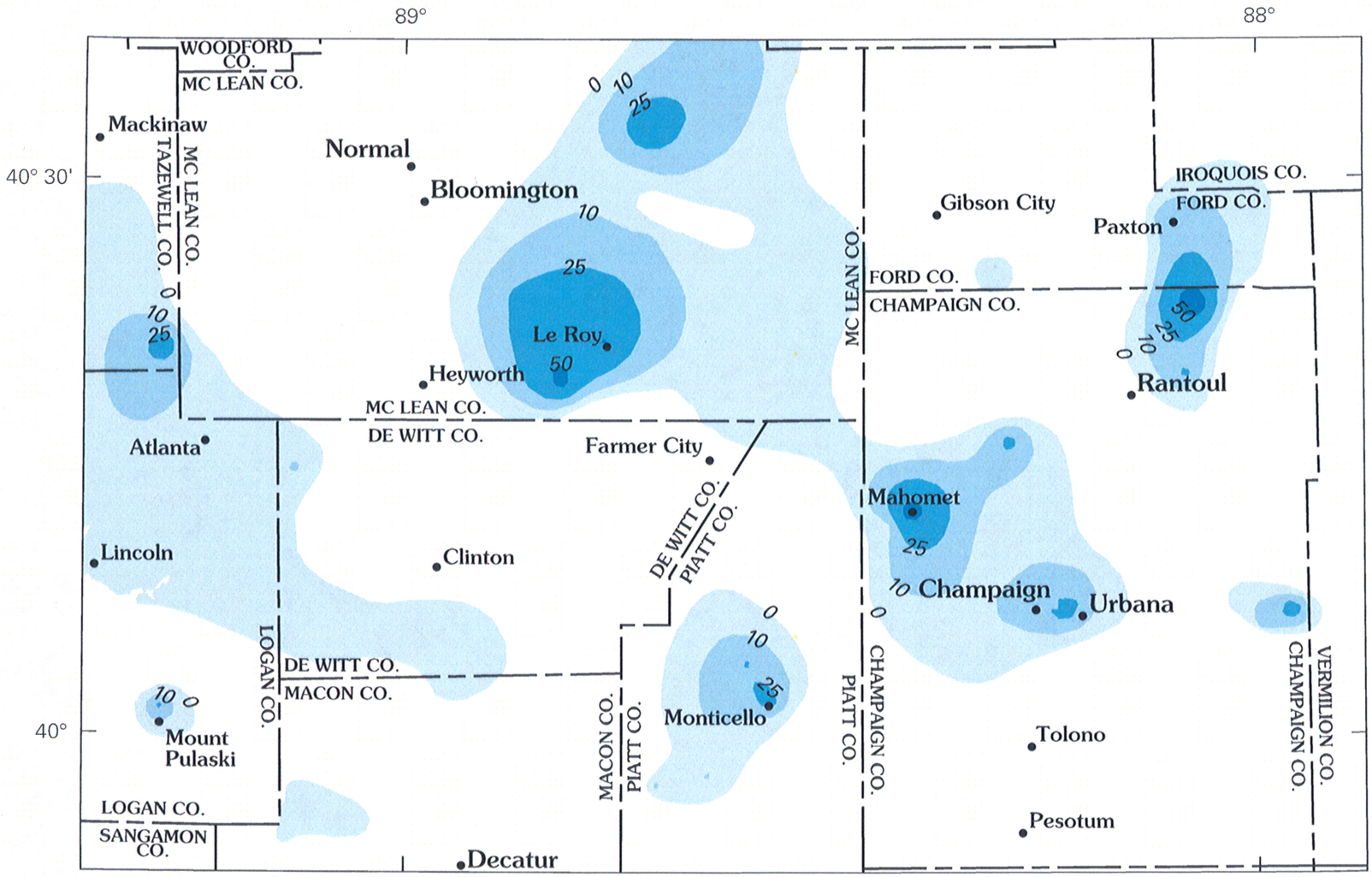
Figure 16A–F.—Maps and block diagrams showing sand layers at the base of the lower and upper Glasford Formation. These layers, although thin and discontinuous, also are used as aquifers. Other sands within the Glasford exist but are not as readily correlated between data points; therefore, they are not shown. Thickness and elevations are in feet above sea level. Viewpoint in block diagrams is from the southeast. To show topographic detail, the images are vertically exaggerated approximately 30x.



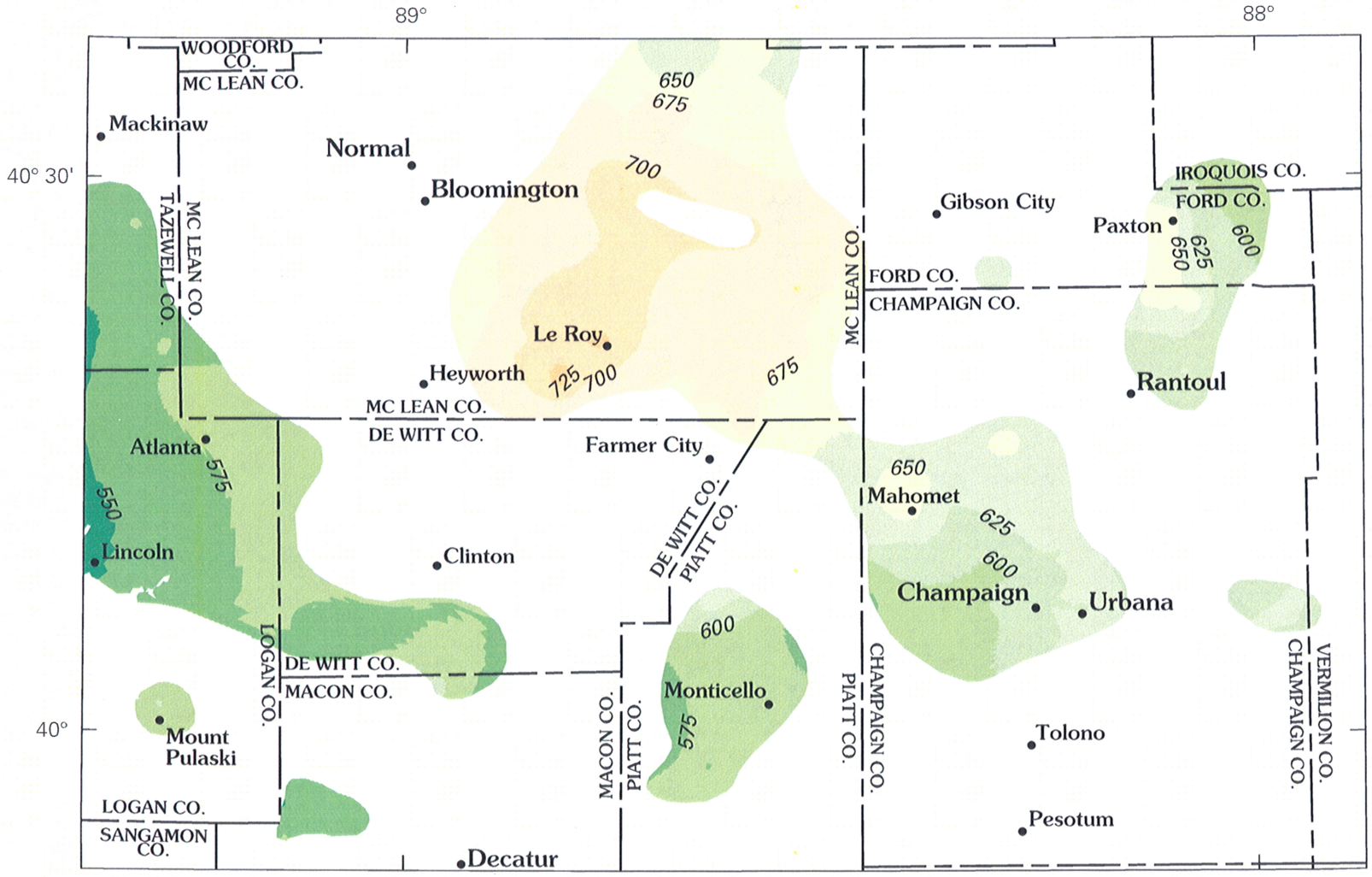
16B.—Elevation of top of basal sand, lower Glasford Formation.



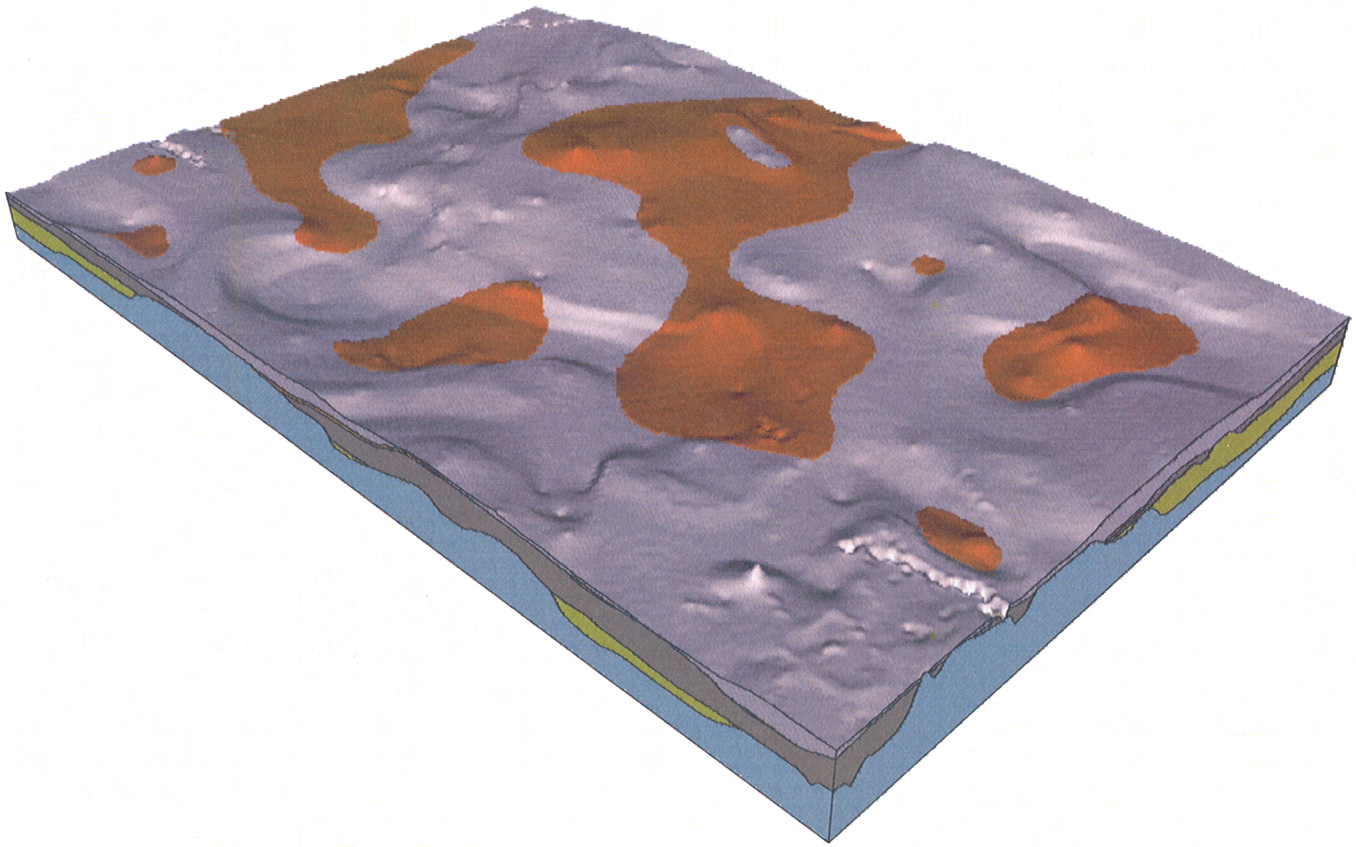
16C.—Surface topography of the lower Glasford basal sand (orange unit) and older deposits.



16D.—Thickness of basal sand, upper Glasford Formation.



16E.—Elevation of top of basal sand, upper Glasford Formation.



16F.—Surface topography of the upper Glasford basal sand (orange unit) and older deposits.

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U.S. GEOLOGICAL SURVEY

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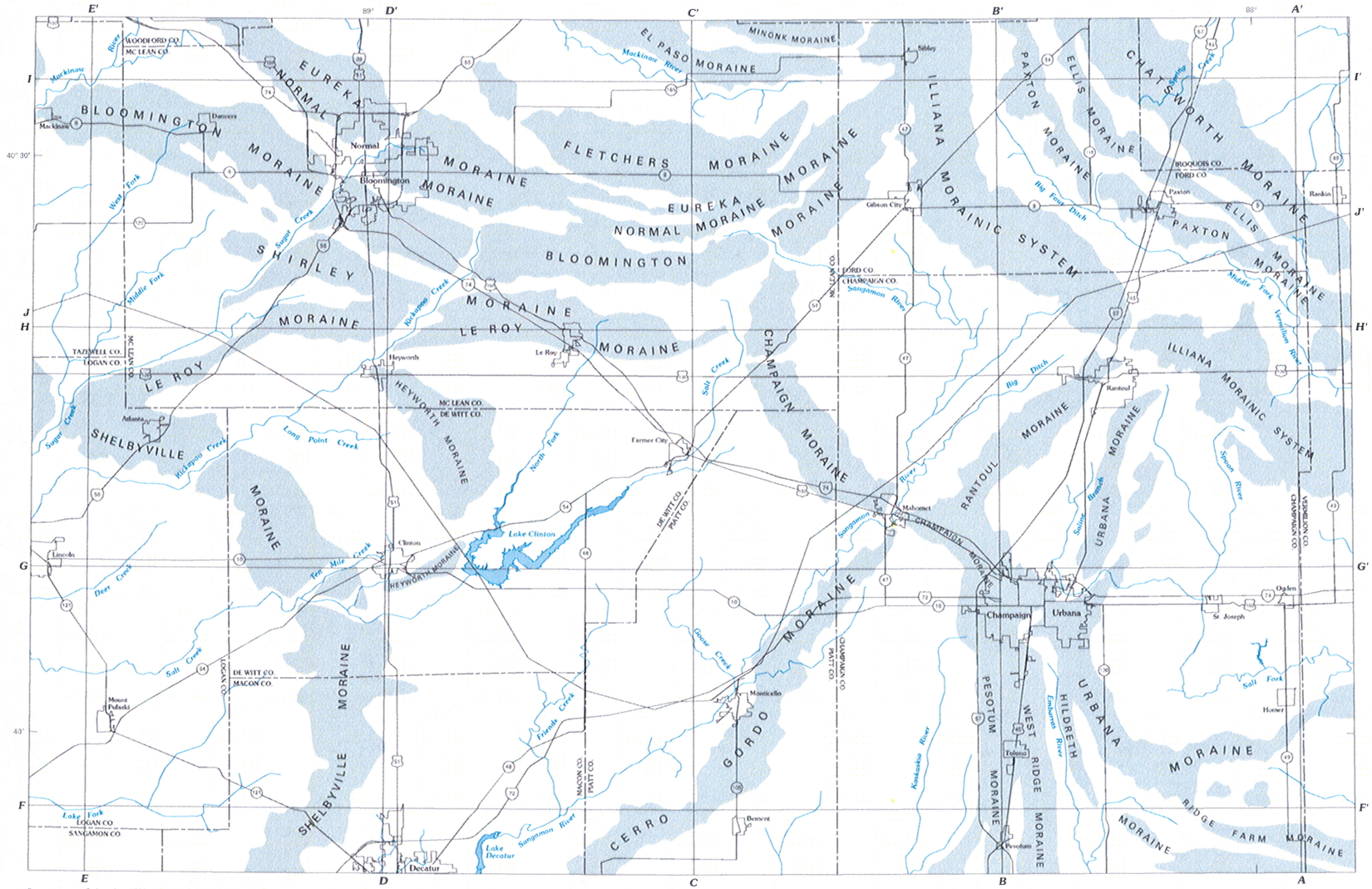
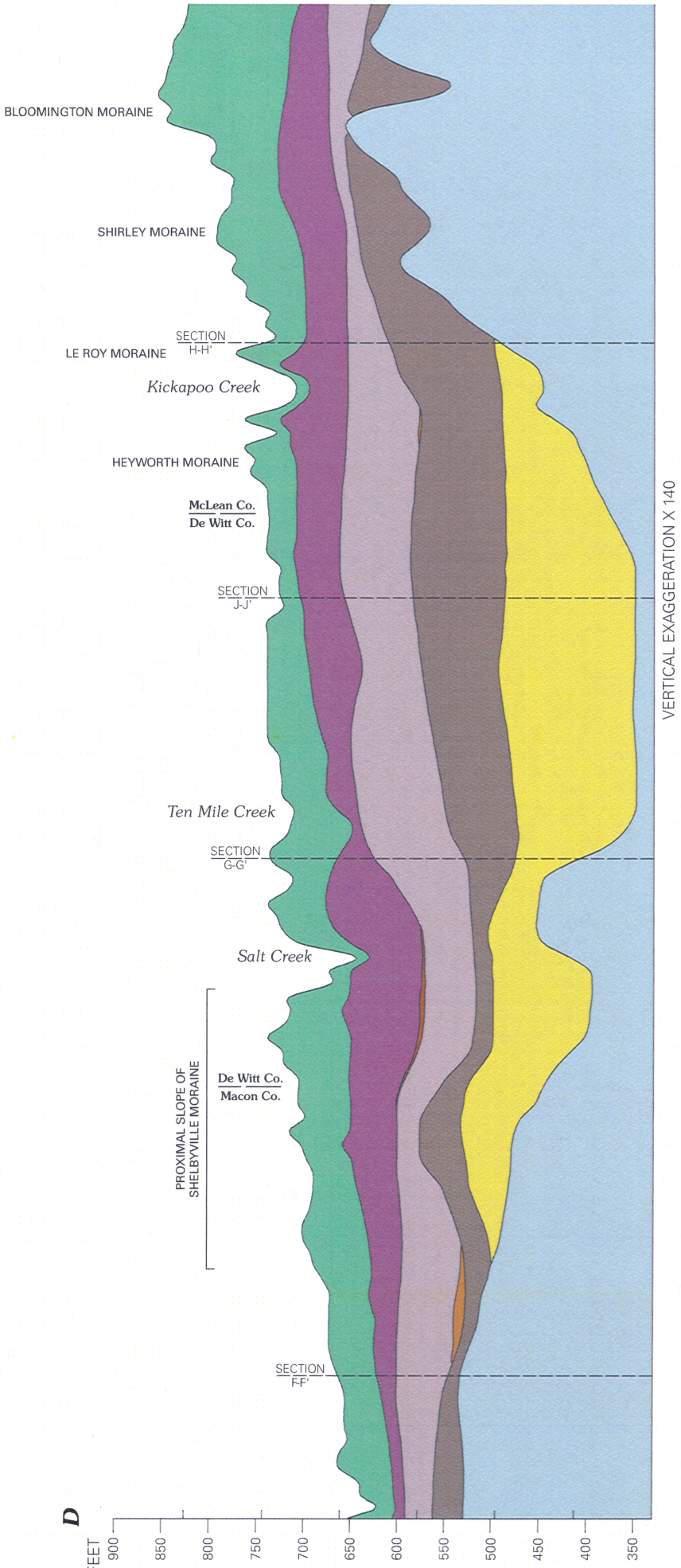


Base map sources: Drainage from USGS 1:100,000-scale Digital Line Graph files. County boundaries from ISGS and roads from Illinois Department of Natural Resources (IDNR); both data sets digitized from USGS 1:24,000- and 1:62,500-scale topographic maps. Municipal boundaries from IDNR, adapted from U.S. Census Bureau TIGER/line files
Universal Transverse Mercator projection

Location of cross-section traverses. End moraines, a significant topographic feature on the cross sections.


BLOOMINGTON MORAINE
SHIRLEY MORAINE
SECTION H-H'
LE ROY MORAINE
Kickapoo Creek
HEYWORTH MORAINE
McLean Co.
De Witt Co.
SECTION J-J'
Ten Mile Creek
SECTION G-G'
Salt Creek
PROXIMAL SLOPE OF SHELBYVILLE MORAINE
De Witt Co.
Macon Co.
SECTION F-F'
VERTICAL EXAGGERATION X 140
D
FEET
900
850
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600
550
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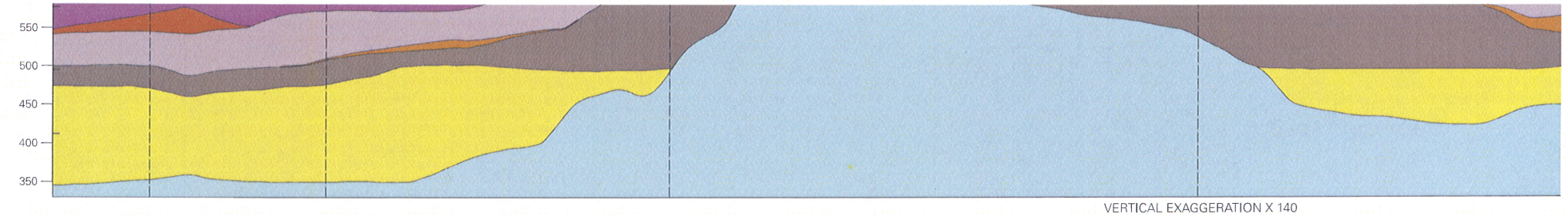
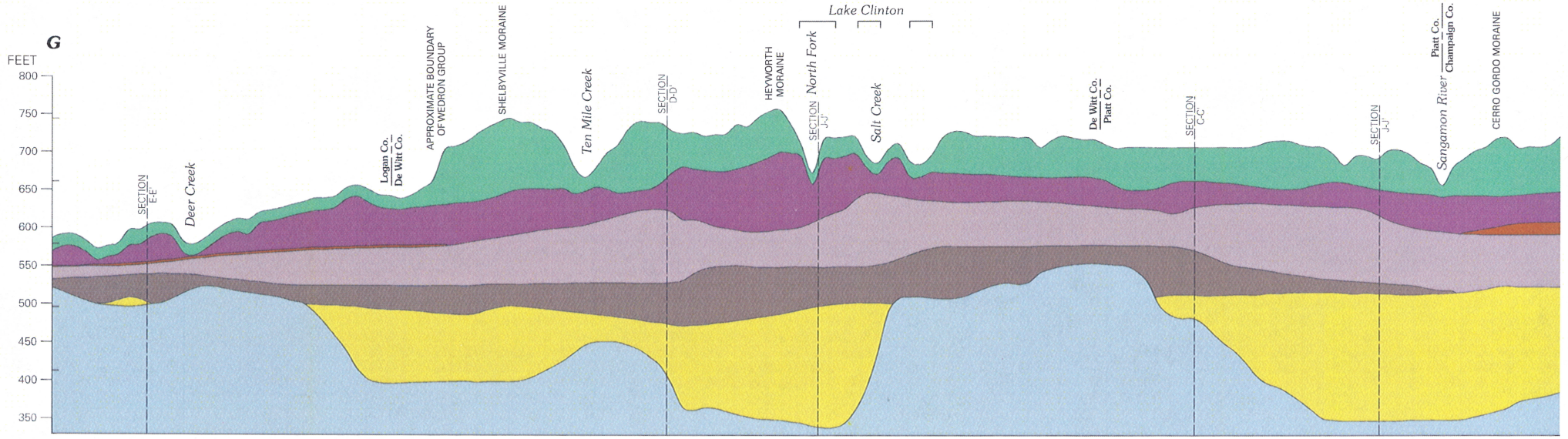


VERTICAL EXAGGERATION X 140



VERTICAL EXAGGERATION X 140