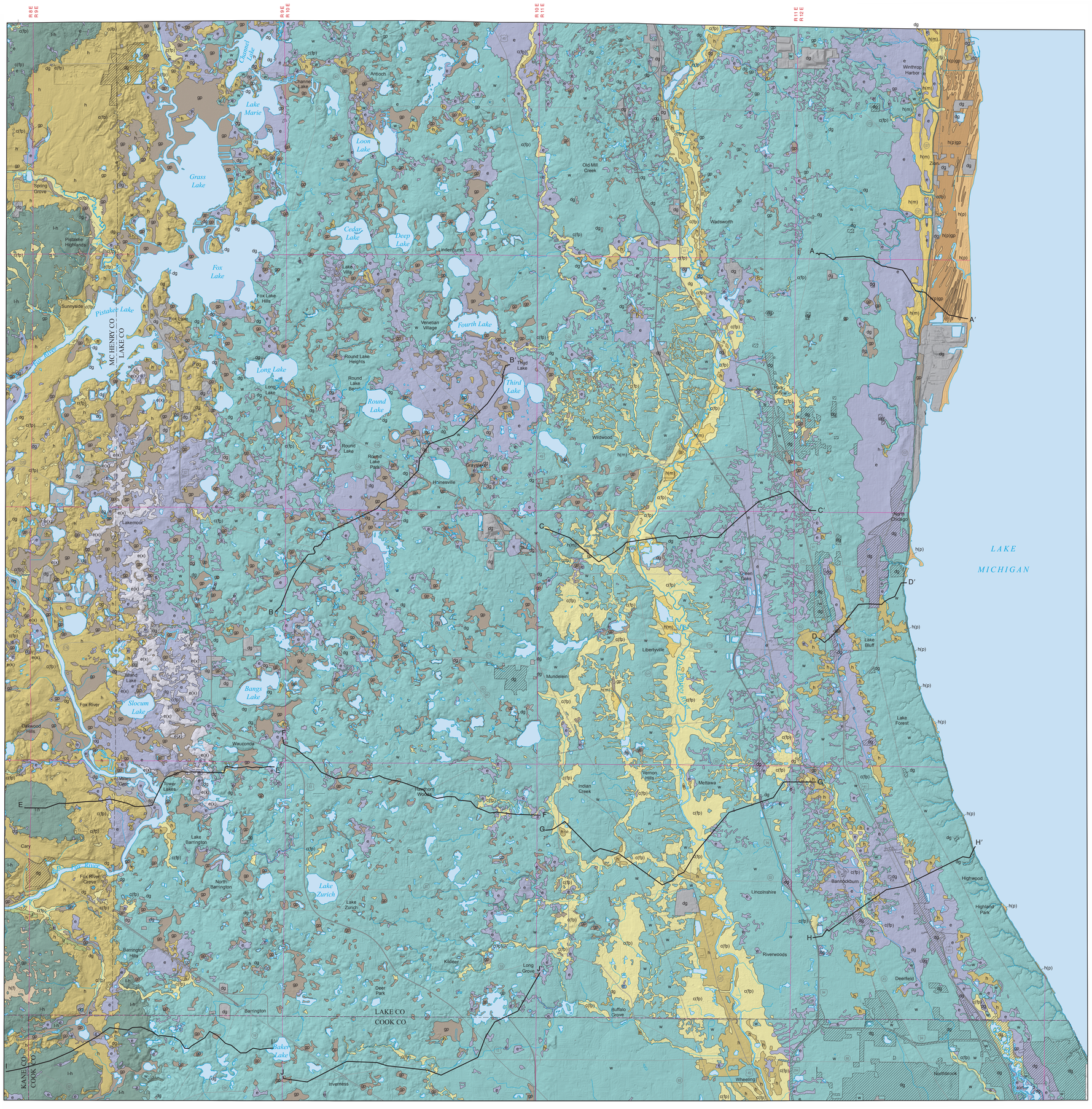
Prairie Research Institute
ILLINOIS STATE GEOLOGICAL SURVEY

SURFICIAL GEOLOGY OF LAKE COUNTY, ILLINOIS, AND SURROUNDING AREAS

STATEMAP Lake County-SG

Michael L. Barnhardt, Andrew J. Stumpf, Jason F. Thomason, Steven E. Brown, and Ardith K. Hansel
2015



QUATERNARY DEPOSITS

Description	Unit	Interpretation
HUDSON EPISODE (~14,600 years before present [B.P.] to today)		
Fill, excavated land, or other disturbed material; highly variable in grain size (may range from clay to gravel) and color; may contain construction and mining debris; Typical thickness: variable	Disturbed ground dg (present over underlying unit)	**Human-disturbed deposits** found in gravel pits and quarries, retention ponds, earthen dams, excavations and landfills, and fill for transportation networks and residential and commercial construction; where possible, the original underlying sediments have been identified and mapped as one of the units described below
Silt and clay; occasional sand lenses; trace gravel; stratified; brown to yellowish brown; loose to compact; may be mottled and gleyed; some bedding; organic-rich in places; Typical thickness: 1 to 20 feet	Cahokia Formation (floodplain deposits) c(fp)	**Postglacial (modern) stream sediments** deposited on active floodplains; derived mainly from eroded loess and diamicton; overlies outwash sand and gravel along lake bluff; may overlie or interfinger with lacustrine silt and clay; includes silty slopewash deposits along footslope and minor drainageways on moraines
Peat, muck, and organic-rich sediment; may contain interbeds of silt, clay and some fine sand; black to dark brown; soft to firm; snail shells common. Typical thickness: 1 to 10 feet	Grayslake Peat gp	**Organic-rich deposits** accumulated in low-lying depressions, drainageways, and on floodplains; may include small areas of open water; locally intertongued with modern alluvium, or lake sediment; commonly found around lakes and marshes and channels connecting bodies of water; includes some areas where thin lenses of organic-rich sediments occur at shallow depths within gleyed, silty lake sediments; locally, may include slopewash deposits
Sand; fine and medium; well sorted; loose; may be mixed with organics, including layers of peat; some thin lenses of clay; Typical thickness: 1 to 12 feet	Henry Formation (Parkland facies) h(p)	**Windblown sand in dunes and sheet-like deposits** between active shoreline of Lake Michigan and wave-eroded bluff; local relief generally less than 12 feet; interdune swales often contain peat, muck, and organic-rich sand; eolian facies of Henry Formation
Sand and peat, muck, marl, and organic-rich sediment; intermixed dune sand and peat in back dune area; fine and medium sand with trace silt and clay; peat and silt and clay content increases in lower-lying areas; stratified; Typical thickness 1 to 12 feet	Henry Formation (Parkland facies) and Grayslake Peat, intermixed h(p)gp	**Former active dunes** now heavily vegetated; intervening swales are often saturated; may contain silt and clay and fine sand deposited in splays by wave overwash into shallow ponds and lagoons; complex intermixture of Henry Formation, Parkland facies, and Grayslake Formation peat; found only in beach-ridge plain
WISCONSIN EPISODE (~29,900 years–14,600 B.P.)		
Sand and gravel; stratified; occasionally massive; yellowish to grayish brown; calcareous; loose; sand is very fine to very coarse, very well to poorly sorted; gravel is very fine to coarse, very well to very poorly sorted; trace to little amounts of silt and clay, frequently as thin beds. Typical thickness: 5 to 120 feet	Henry Formation (Mackinaw facies) h(m)	**Proglacial fluvial (outwash) sediments** exposed along the Des Plaines River floodplain and as terraces above present stream level; also found along lake bluff in northeast Lake County where deposited as a valley train by meltwater along the glacier terminus
Sand and gravel; fine to coarse; often well stratified; yellowish brown to brown; may contain some silt and clay lenses; Typical thickness: 5 to 30 feet	Henry Formation (undifferentiated) h	**Proglacial outwash deposits** exposed at land surface associated with channelized glacial meltwater within the Fox River valley and its tributaries and the Des Plaines River
Silt and clay; may be massive, bedded or laminated; dark gray to light gray; calcareous; soft to hard; compact; may be sticky and plastic; very fine and fine sand common along bedding planes; occasional inclusions and lenses of light gray to white silt; some wood fragments; very few clasts; generally abrupt upper and lower contacts. Typical thickness: 5 to 25 feet	Equality Formation e	**Postglacial and proglacial lake (lacustrine) deposits** that infill low-lying areas, or depressions in drainage channels and where water was impounded along the fronts of moraines; at the surface, these sediments may interfinger with or be overlain by alluvium; in the subsurface may be interfingered with diamicton; may be overlain by silty slope wash deposits at the base of slopes
Clay, silt, sand, and diamicton; continuity, thickness, and composition variable; generally stratified; poorly to well sorted; dark gray to yellowish brown; calcareous; gradational to abrupt contacts; Typical thickness: 5 to 50 feet, varies with relief of landform	Equality Formation (complex) e(x)	**Ice-marginal sediment** deposited adjacent to the active glacier edge and dead or stagnant remnant blocks of ice. Textural variation is a defining characteristic. Forms positive landforms as hummocks or small, low-relief hills, some with flat tops similar to ice-wall lake plains. Abutting glacier ice created local depositional basins or holes that impounded glacier meltwater. Generally pre-dates the deposition of surrounding Equality Formation sediment in lower positions of the landscape.
Diamicton; silty clay loam to silty clay; dark gray to yellowish brown; massive; calcareous; compact; firm to very hard; pebbly with occasional cobbles and boulders; commonly contains silt and sand inclusions and sand and/or gravel lenses; may contain pebble-free, silty and clayey zones with strongly expressed laminations that may be interbedded with the diamicton; lenses of saturated silt and very fine sand are loose and liquify in core; Typical thickness: 50 to 200 feet	Wadsworth Formation w	**Subglacial and ice-marginal sediments (till)** deposited beneath glacial ice; sediment that melted out on top of the glacier or along the ice margin was reworked by slope processes and water; laminated sequences may be more than 40 feet thick, but their areal extent is irregular and difficult to delineate; extensive areas and thicknesses of bedded sand, silt, and clay may be intermixed with diamictons of mudflow and meltout origin along the ice margin
Sand; fine to medium, massive to stratified, lenses of silt common; yellowish brown to gray; Typical thickness: 5 to 30 feet	Henry Formation (fine facies) h(f)	**Lake sediment and slope deposits** that infill depressions on moraines; found in southwest part of map area
Diamicton; commonly very cobbly sandy loam to silty loam but quite variable; beds of sand, silt, and clay; yellowish brown to brown; calcareous; hard. Typical thickness: 10 to 50 feet	Haeger Member, Lemont Formation l-h	**Subglacial and ice-marginal sediment (till and reworked sediment)** deposited beneath and along ice margins during advance and retreat of glacial ice; often difficult to distinguish from adjacent outwash of the Henry Formation; locally eroded
Diamicton; pebbly loam to clay loam; light reddish brown to brown; hard; dense; calcareous; some cobbles and boulders; contains discontinuous beds of stratified sand, silt, or clay. Typical thickness: 5 to 45 feet (thickens to west in McHenry County)	Tiskilwa Formation t	**Subglacial and ice-marginal sediment (till and reworked sediment)** deposited beneath glacial ice; discontinuous unit in the subsurface; where present, it may lie either on older sediments or directly on bedrock

Base map compiled by the Illinois State Geological Survey from digital data (2009 TIGER/Line Shapefiles) provided by the United States Census Bureau. Hillshade from 2009 LiDAR elevation data provided by Lake County GIS and Mapping Division, Cook County Department of Geographic Information Systems, and the Illinois Height Modernization Program.

North American Datum of 1983 (NAD 83)
Projection: Transverse Mercator

Recommended citation:
Barnhardt, M.L., et al., 2015, Surficial Geology of Lake County, Illinois and adjoining areas: Illinois State Geological Survey, USGS-STATEMAP contract report, 2 sheets, 1:62,500.

This map is a compilation of twelve individual 1:24,000-scale maps that were completed between 2001 and 2011. Michael L. Barnhardt, Andrew J. Stumpf, Jason F. Thomason, Steven E. Brown, and Ardith K. Hansel mapped the geology, while Barbara J. Stiff, Jennifer E. Carrell, Jane E.J. Domier, Donald E. Luman, Dawn V. Heckmann, and Virgie J. Amacher provided support for data base development and management, cartographic design and production, and LiDAR processing and development. Funding for this mapping was provided in part by grants from the U.S. Geological Survey National Cooperative Geologic Mapping Program (STATEMAP, USGS award number G11AC20477), the Great Lakes Geologic Mapping Coalition, and general revenue funds for the State of Illinois.

This map has not undergone the formal Illinois County Geologic Map review process. Whether or when this map will be formally reviewed and published depends on the resources and priorities of the ISGS.

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Great Lakes
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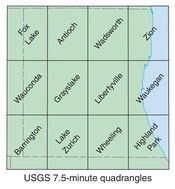

USGS 7.5-minute quadrangles

SCALE 1:62,500
1 0 1 2 3 4 5 MILES
1 0 1 2 3 4 5 6 7 KILOMETERS

31°
TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 2015

ROAD CLASSIFICATION
Interstate Route
U.S. Route
State Route
Other paved roads

Introduction

Most of the counties in northeastern Illinois are among the most rapidly growing areas of population in the state and some communities are among the most rapidly growing in the nation. Although some communities of this region draw the majority of their drinking water from Lake Michigan, a significant portion, including most within the rapidly-growing areas, rely upon groundwater from Quaternary sand and gravel deposits or from shallow bedrock. Currently, there is considerable debate occurring regarding the long-term viability of the water supply provided by the shallow Quaternary deposits and the shallow bedrock. Communities are faced with an alternative to this water source—requesting a water allocation from Lake Michigan. Huge financial investments will be required to construct the infrastructure and abandon current municipal wells.

This digital compilation of the surficial geology of Lake County, Illinois, and adjacent surroundings, is the culmination of mapping efforts initiated in late 1999 through the establishment of the USGS Great Lakes Geologic Mapping Coalition (GLGMC)." Its intent is to further the development and application of three-dimensional mapping to better investigate and understand both the areal and vertical extent of surface and subsurface geologic units (lithology and stratigraphy). To that end, we systematically reviewed all current driller's records for boreholes within and adjacent to Lake County archived in our survey databases following a priority listing of the 12 USGS topographic quadrangles that cover the county. Then we applied for and received annual funding from STATEMAP to map the surficial geology for individual quadrangles beginning in FY00 and concluding in FY10. Results from those individual projects, including maps of surface geology, detailed explanatory text, cross sections, geophysical, mapping unit characterization, mapping techniques, and other information by quadrangle are available in hard copy and online through the Illinois State Geological Survey (ISGS) website (Barnhardt, 2005, 2008, 2009, 2010, 2011; Barnhardt, Stumpf, and Pugin, 2001; Stumpf, 2004, 2006; Stumpf and Barnhardt, 2005; Stumpf, Barnhardt, and Hansel, 2004; Thomason and Barnhardt, 2007).

Overview of Glacial History

Early ice advances that originated in the Lake Michigan basin appear to have scoured to bedrock and removed all or most of the previously deposited sediments in the county. There is little evidence in the sediment records from boreholes drilled in the study area that suggests the presence of significant amounts of sediment much older than 19,000 years. As each glacier moved westward out of the Lake Michigan basin across Lake County, large amounts of sediment were deposited during both the advance and retreat stages resulting in a complex stratigraphy with a considerable range in age that increases with distance from modern Lake Michigan. Sediments older than 29,900 years increase in occurrence and thickness in eastern McHenry County. In addition, the glacier margin was most likely irregular due to localized minor pulses and surges of ice and variable rates of calving and downwasting. Meltwater impounded by ice and sediment drained as outlets opened and closed. These and other factors combined to create significant spatial and vertical differences in sediment thickness, texture, and sequence across the county, especially in the western third from the Chain O'Lakes southward along and east of the Fox River valley. A more detailed analysis and discussion of local sediments and glacial stratigraphy is presented on the individual quadrangles authored by the geologists listed above.

Map of Surface Geology and Selected Cross Sections

Throughout the mapping of Lake County, a master legend of geologic mapping units was developed to maintain consistency for correlation. Considerable variability in material texture, distribution, and thickness was discovered during twelve years of drilling by ISGS geologists. This variability is confirmed by on-going three-dimensional modeling and mapping at the ISGS wherein more than 20,000 location-verified records from boreholes (water well, stratigraphic, test hole, engineering, and other sources) are being used to develop a high-resolution, 3-D model of the sediment of Lake County. This 3-D modeling is part of the GLGMC project that is in the final stages of producing, among other products, an original, detailed visualization of the subsurface stratigraphy of Lake County.

In lieu of that product not yet being available, selected cross sections developed during the initial quadrangle mapping are presented herein. Their locations are noted on both the surface geology map and in Figure 1. The surface geology map was produced in ArcGIS by edge-matching the surface geology maps of the twelve quadrangles and reconciling differences by reviewing field mapping notes and borehole records. Most of the changes were minor and necessary to update some of the older maps. Other changes were cartographic errors or changes resulting from a digital update to the USDA-NRCS county soil survey. Change in map scale (1:24,000 quadrangle to 1:62,500 county) resulted in additional minor changes. This map and related information will be part of the final products developed by the GLGMC project for Lake County.

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Figure 1 Location of cross sections and 7.5-minute quadrangles within Lake County, Illinois.

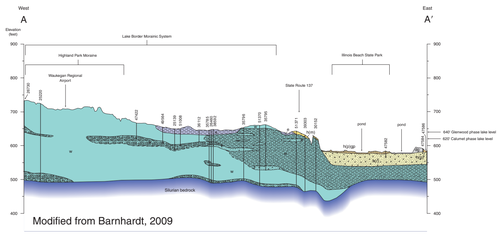
Cross section units

dg	Disturbed ground	w	Wadsworth Formation
c	Cahokia Formation	h(w)	Henry Formation unnamed tongue
gp	Grayslake Peat	h-b	Henry Formation Beverly Tongue
h(r)	Henry Formation Ravina facies	h-a	Henry Formation Ashmore Tongue
e	Equality Formation	t	Tiskilwa Formation
e(l-h)	Equality Formation unnamed tongue	l-h	Lemont - Haeger M
e-u	Equality Formation undivided	l-y	Lemont - Yorkville M
h	Henry Formation	g	Glasford Formation
h-u	Henry Formation undifferentiated or unnamed tongue	os	older sediments
h(m)	Henry Formation Mackinaw Facies		Silurian bedrock

Cross Section

- Gravel
- Sand and gravel
- Sand, may contain some gravel or silt
- Sand and silt
- Laminated silt and clay
- Diamicton, massive silt, or other fine-grained sediment
- Contact
- Inferred contact

Horizontal scale: 1 inch = 5,208 feet
Vertical scale: 1 inch = 200 feet
Vertical exaggeration: 26x



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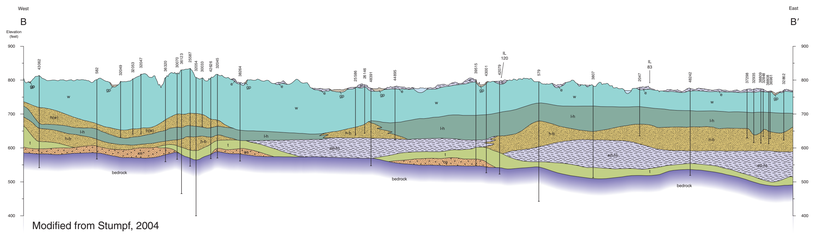

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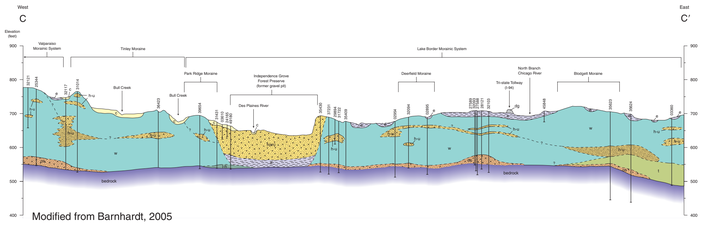

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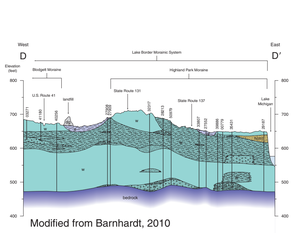

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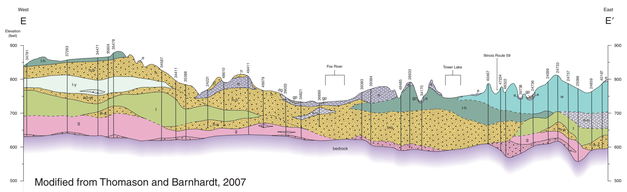

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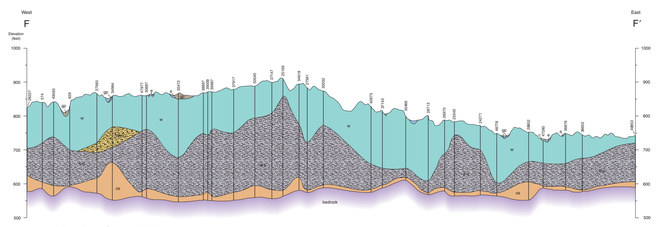

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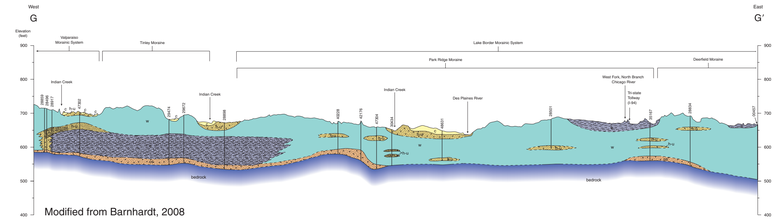

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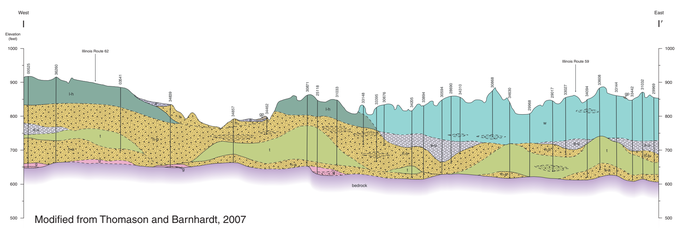

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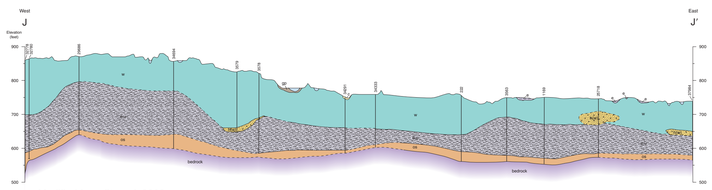

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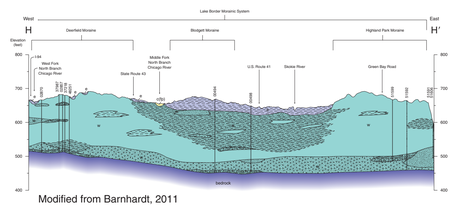

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