Illinois County Geologic Map
ICGM Henry-SG

Surficial Geology of Henry County, Illinois

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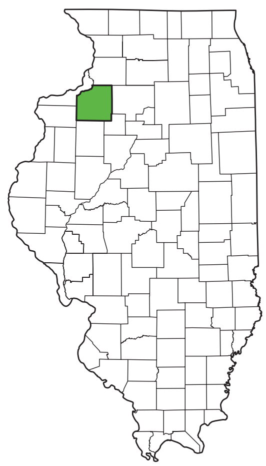

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Background and Methods

The surficial geology of Henry County initially was mapped in detail by the late Dr. Richard C. Anderson primarily in the 1970s and 1980s. These 1:24,000-scale quadrangle maps were subsequently digitized and compiled by Barbara J. Stiff and staff at the Illinois State Geological Survey. The compilation of this map, legend, and text were finalized by Xiaodong Miao along with the addition of aggregate sites and optically stimulated luminescence (OSL)/radiocarbon ages. This map provides a general view of surficial geology. It does not replace the need for detailed investigations at specific sites.

This compilation contains two major reinterpretations that were introduced by Miao. First, multiple map units that referred to the same geological materials were merged together as one unit. For example, the Parkland facies of the Henry Formation on this compilation was mapped by Anderson on various quadrangle maps as three separate units: Parkland sand, Henry Formation (hp, pl); dune facies of the Parkland sand, Henry Formation (hp-d, pl-d); and dune facies of the Batavia member, Henry Formation (hb-d). Second, the Edwards unit, an informal unit solely used by Anderson within the vicinity of the Edwards River valley, is a geomorphic unit that is used to map different strath-like landforms on four different levels of terraces that constitute the "Iowan Erosion Surface". Because this term is no longer used, the Edwards unit is adopted as a facies and classified as p(a): Peoria Silt Edwards facies, to be consistent with other lithostratigraphic units.

Surficial Geology

Henry County, Illinois, contains a variety of geological deposits underlying floodplains, sloped valley sides, and level uplands. The landscape of the county has been shaped by three major geological agents: continental glaciers, rivers, and wind. These agents were all active during the Pleistocene and Holocene Epochs, together known as the Quaternary Period. Gravity (to form slope wash deposits or colluvium) and human activities (such as surface mining) also have modified the landscape of the county, but in minor roles. The pre-Quaternary bedrock consists of Silurian dolomite, Devonian limestone and black shale, and Pennsylvanian sandstone, siltstone, coal, and shale (Anderson 1968, 1980; Larson et al. 1995, Kolata 2005).

The continental glaciers of the Pleistocene Epoch (from 2.6 million to 12,000 years before present) came across Illinois several times, and deposits of the previous glaciations have been removed by subsequent erosion. The last two glaciations are the Wisconsin and Illinois Episodes, respectively. The Illinois Episode glaciation, advancing from the east into Henry County, covered the entire county; during the Wisconsin Episode, glacial ice did not reach the county. When the Wisconsin glacier retreated, however, the meltwater deposited large volumes of sand and gravel deposits in the Green River Lowland in northeastern Henry County.

The oldest Quaternary sediments exposed near the surface are mapped as Glasford Formation and Pearl Formation, and these were deposited during the Illinois Episode. The Glasford Formation is predominantly compact diamicton, composed mainly of poorly sorted sand, silt, and clay with gravels; the Glasford may include underlying pre-Illinois Banner Formation in places. The Glasford is yellowish brown to dark gray and is calcareous, except for the uppermost 2 to 3 m (6 to 10 feet), where the Sangamon Geosol may be present. The Sangamon Geosol is clayey, reddish brown at exposures, gray beneath flat interfluves, and less than 1 m (1 to 2 feet) thick. Materials deposited by glacial meltwater are referred to as glaciofluvial outwash. Such deposits usually consist of sand and gravel with less silt and become progressively finer grained in the downstream direction. The Pearl Formation is an outwash deposit and is composed of sand and gravel. Both Glasford and Pearl Formations are exposed along the Green, Edwards, and Rock Rivers and in recently eroded gullies. Both formations were often buried by subsequent eolian deposits.

The Henry Formation is the Wisconsin Episode outwash counterpart of Illinois Episode Pearl Formation. The thickness of the Wisconsin Episode outwash ranges from 9 to 15 m (30 to 50 feet) on average and up to 60 m (200 feet) in some locations. The sand and gravel also serves as an excellent aquifer for groundwater. The Henry Formation generally overlies diamicton, but may interfinger with the Equality Formation.

Equality Formation is primarily silt, with some fine-grained sand, deposited in glacial Lake Milan, which was formed when glacial ice blocked the Mississippi River Valley (Anderson 1968, 1999, 2005; Reinertsen et al. 1975) The Equality is exposed at the surface only in terraces, and its maximum thickness is about 6 m (20 feet) on the south side of the Rock River valley.

The Parkland facies sand consists of geomorphologically distinct dune sand and relatively flat sand sheet in inter-dune areas, mostly in the Green River Lowland. The Parkland sand is a very well-sorted, medium- to fine-grained sand and contains no gravel (Miao et al. 2010). Most dunes have a parabolic, compound-parabolic, transverse, or dome form and are stabilized by vegetation cover under the current climate regime. Trees and grass live mostly on the uplands. Dune orientation and internal cross-bedding structure consistently indicate that winds from the northwest-west were responsible for dune construction, similar to the current prevailing wind direction in this region. Some dunes preserve one or two buried soils, indicating landscape stability. Five OSL ages from dune sand indicate that a major dune construction event in the county occurred around 17,000 to 18,000 years ago (table 1). The OSL ages (table 1) and

Table 1 Equivalent dose (D_e), rate data, and optical age estimates in Henry County.

Field site	UNL Lab no.	Depth (m)	U (ppm)	Th (ppm)	K_20 (wt %)	In situ H_20 (%)[1]	Dose rate (Gy/ka)	D_e (Gy) ± 1 std. error	Aliquots (n) [2]	Optical age ± 1σ
Atkinson	UNL-1672	1.0	0.6	2.5	1.2	3.5	1.37 ± 0.08	3.72 ± 0.06	21/23	2,710 ± 200
41º28'56.25"N, 90º01'04.28"W	UNL-1862	2.4	1.1	5.2	1.4	10.8	1.68 ± 0.15	6.63 ± 0.47	21/23	3,960 ± 490
	UNL-1673	3.7	0.8	4.0	1.2	5.3	1.49 ± 0.10	25.31 ± 0.66	20/23	17,030 ± 1400
	UNL-1674	4.3	0.6	2.5	1.3	4.3	1.37 ± 0.09	24.87 ± 0.60	20/23	18,140 ± 1490
	UNL-1675	12.0	0.6	2.8	1.3	5.9	1.32 ± 0.10	23.75 ± 0.52	21/23	17,950 ± 1610
Annawan	UNL-2026	0.3	0.6	2.6	1.4	5.0	1.57 ± 0.11	1.31 ± 0.32	23/25	840 ± 210
41º27'53.03"N, 89º54'21.25"W	UNL-1863	1.4	0.5	2.2	1.2	1.1	1.37 ± 0.08	9.66 ± 0.31	22/23	7,060 ± 550
	UNL-1864	1.5	0.7	3.1	1.4	1.2	1.65 ± 0.09	11.19 ± 0.22	23/25	6,790 ± 500
	UNL-1865	3.0	0.7	3.2	1.3	5.0	1.46 ± 0.10	24.62 ± 0.61	26/27	16,820 ± 1380
Bill Farm	UNL-1869	0.6	0.5	2.2	1.1	1.2	1.36 ± 0.08	7.47 ± 0.18	20/22	5,490 ± 410
41º27'14.49"N, 89º54'28.07"W	UNL-1870	1.5	0.6	2.8	1.3	5.2	1.44 ± 0.10	13.78 ± 0.38	22/23	9,570 ± 810
Colona	UNL-2135	0.5	0.8	3.4	1.5	5.2	1.74 ± 0.12	0.75 ± 0.18	21/25	430 ± 110
41º29'9.97"N, 90º20'57.73"W	UNL-2024	0.5	0.8	3.4	1.5	5.2	1.74 ± 0.12	0.74 ± 0.18	20/24	430 ± 110
	UNL-2025	4.0	0.8	2.9	1.7	10.9	1.70 ± 0.15	30.08 ± 1.02	24/24	17,700 ± 2100

[1] Assumes 100% error in measurement.

[2] Accepted disks/all disks.

Table 2 Radiocarbon ($\delta^{13}C$ and ^{14}C) and calibrated age estimates for soils formed in the dune sand.

Lab number	Sample	Depth (m)	Material	$\delta^{13}C$	^{14}C age	Calibrated age
ISGS6081	Atkinson S1	0.4	Pyrolysis residue of SOM[2]	–16.9	460 ± 70	480 ± 80[1]
ISGS6082	Atkinson S1	0.4	Pyrolysis volatile of SOM	–16.9	590 ± 70	590 ± 40
ISGS6074	Atkinson S2	2.2	Pyrolysis residue of SOM	–17.5	2880 ± 70	3,040 ± 100
ISGS6079	Atkinson S2	2.2	Pyrolysis volatile of SOM	–16.4	2680 ± 70	2,760 ± 100
ISGS6167	Annawan1	0.7	Total SOM	–16.8	1760 ± 70	1,680 ± 80

[1] Calibration using OxCal program v3.9. 480 is rounded from 475.5; the middle number of 95% 2σ range from 316 to 635.80 is rounded from 79.8, the quarter step of the 2σ range.

[2] Abbreviation: SOM, soil organic matter.

three radiocarbon ages (table 2) indicate that the dunes were reactivated episodically in the Holocene, implying a high potential for future sand activation, regardless of human-induced climate changes and associated global warming (Miao et al. 2010).

Peoria Silt and Roxana Silt, both eolian in origin, cover most of the county and constitute one of the major parent materials for surface soils, especially on the uplands. Loess thickness is generally less than 6 m (20 feet). In most places, loess mantles the surface on which it was deposited and has no distinctive topography of its own.

The Edwards unit is an informal subunit of the Peoria Silt. The Edwards consists of eolian silt and sand. This unit was poorly defined by Anderson and appears to be mapped on the basis of its surface geomorphology, specifically, by changes in slope. The unit is not on terraces, but is best described as strath-like landforms. This unit was only mapped within the Edwards River valley and some of its tributaries. In some areas, up to four levels are mapped and correlated. Anderson correlated these landforms with the formerly named Iowan Erosion Surface and considered the highest unit to be the oldest and successively lower units to be successively younger.

The Cahokia Formation alluvium, deposited on the floodplains by present-day streams, ranges in grain size from clay and silt to pebbly sand. Four varieties of Cahokia alluvium can be recognized: (1) alluvium and flood deposits in oxbows and abandoned channels; (2) alluvium deposits in alluvial fans; (3) alluvium and flood deposits in natural levees and bars; and (4) alluvium and flood deposits in point bars. Cahokia alluvium is distinguished from the underlying Henry Formation on the basis of its finer grain size.

Peyton colluvium is a poorly sorted mixture of silt, sand, clay, and pebbles that has accumulated largely by gravity at the base of steep, unstable slopes. It is mapped only where it is extensive and easily recognized on aerial photographs,

Table 3 Location of active aggregate producers in Henry County, Illinois

Operators	Commodity	Geological unit	Location
Miller's Trucking and Excavating Colona Pit	Sand and gravel	Parkland sand; Henry Formation outwash	Sec. 14, T17N, R14E
Jayson Lowe Lowe Farms	Sand and gravel	Henry Formation outwash	Sec. 14, T17N, R14E
Oberlander Sand Company	Sand and gravel	Parkland sand; Henry Formation outwash	Sec. 1, T17N, R1E
Riverstone Group, Inc. Cleveland Quarry MC31	Limestone, sand, and gravel	Racine Formation (Silurian) Wapsipinicon (Devonian)	Sec. 31, T18N, R2E

such as along the Rock River valley in northwestern Henry County.

Aggregate Industry and Groundwater Resources

The sand and gravel resources in Henry County are relatively abundant due to thick glaciofluvial deposits mapped as Henry Formation and Pearl Formation. The Henry Formation constitutes the most important sand and gravel resource in Henry County as well as in Illinois. Due to the lack of a large metropolis in the county, the demand for aggregates can be readily supplied by the existing sand and gravel pits, which may operate intermittently (Anderson 1967), and a single stone quarry. Occurrences and thicknesses of sand and gravel are fairly well-known over most of the county, although multiple layers of sand and gravel are sometimes interbedded with fine-grained diamicton. The single stone quarry is near Colona, where Silurian dolomite is mined as crushed stone (table 3).

Sand and gravel deposits also constitute important groundwater aquifers for potable water in Henry County. There are two major aquifers. The surficial, unconfined aquifer is the Tampico aquifer in the Green River Lowland (Larson et al. 1995). The Tampico aquifer is Wisconsinan in age and is assigned to the Henry Formation. It also includes the Parkland sand where these eolian sediments are saturated. The thickness of this aquifer ranges from less than 3 m (10 feet) to more than 30 m (100 feet) and is generally about 15 m (50 feet). The potential for groundwater contamination is high because the top of the Tampico aquifer is at the surface. The other major aquifer, the Princeton Bedrock Valley aquifer (Larson et al. 1995), is deeper and consists of sand and gravel directly overlying the Silurian and Pennsylvanian bedrock. The thickness of this aquifer ranges from less than 15 m (50 feet) to more than 60 m (200) feet. Because it is deeply buried, the Princeton Bedrock Valley aquifer is less likely to be contaminated. The sediments separating the Tampico aquifer and the Princeton Bedrock Valley aquifer consist mostly of thinly bedded lacustrine clay and silt and include diamicton in some places (may contain some very fine-grained sand). This confining unit is an aquitard that is generally less than 8 to 15 m (25 to 50 feet) thick and defines the upper boundary of the Princeton Bedrock Valley aquifer. In the areas where this confining unit of aquitard is missing, for example, in northeastern Henry County, the two aquifers form one hydraulic unit, making it the thickest aquifer between Hooppole and Atkinson in the northeastern Henry County.

Most public groundwater supplies in Henry County are derived from sand and gravel aquifers. These aquifers are also tapped by many private wells for domestic and agricultural use, Irrigated cropland is an important component of the agricultural economy in the county. With the increasing population and development of the land, it is anticipated that Henry County will have increased interest in exploiting both aggregate and water resources.

Acknowledgments

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