Illinois Preliminary Geologic Map
IPGM Wauconda-SG

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Surficial Geology of Wauconda Quadrangle

Lake and McHenry Counties, Illinois

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Introduction

The Surficial Geology map of the Wauconda 7.5-minute Quadrangle, Lake and McHenry Counties was developed for the United States Geological Survey's STATEMAP, National Cooperative Geologic Mapping Program with support from the Central Great Lakes Geologic Mapping Coalition (CGLGMC). The initial purpose of this mapping is to provide geological information for Illinois land use development and management. The Wauconda quadrangle is located in northeastern Illinois and encompasses parts of western Lake County and eastern McHenry County that include the villages of Wauconda, Island Lake, and Lakemoor, and also unincorporated areas. The map area is located entirely within the drainage of the Fox River system.

The Surficial Geology map delineates geologic materials at the land surface, classified by their lithology (sediment type or rock type) and stratigraphy (relative position and age). The stratigraphic nomenclature used here is from Willman and Frye (1970) and Hansel and Johnson (1996). These geologic materials in northeastern Illinois have a complex but mappable pattern. They are the source of important water and earth resources and can present not only hazards to property owners, but to the construction and maintenance of transportation systems.

Mapping Methods

The source material used to construct the surficial geology map is derived from an extensive field program that includes new drilling, description of exposures of sediment in gravel pits and at construction sites and gamma logging of private water wells. We also used geologic information contained in the drillers' logs of water-well and engineering boreholes, and data included in the soil surveys of Lake and McHenry Counties.

A digitized version of the individual soil maps from the Soil Survey of Lake County, Illinois (Paschke and Alexander, 1970) was provided from the Lake County GIS/ Mapping Division. A pre-publication version of the SSURGO-certified digital soil survey of McHenry County was provided to us courtesy of the U.S. Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS). We initially grouped the polygons of individual soil series by parent material class (cf. Fehrenbacher, et al., 1984). This preliminary map of parent materials was then substantially modified based on information gathered during our fieldwork.

The original soil series data layer is too complex for geologic mapping because it contains polygons that are very small and represent too shallow a depth (generally 6 to 10 feet below ground surface) for constructing cross sections. The original soil series data layer is, however, very helpful in identifying locations where subtle changes in the character of surface materials may not be easily identified either by drilling or analysis of topographic maps.

The core descriptions were used to determine the character of the surface/near surface geologic materials and to help establish the geologic mapping units. Continuous cores of sediment, from ground surface through unaltered C-horizon parent materials (in some cases to bedrock) were collected on a variety of geomorphic positions using the CME 75 wire-line rig and an AMS PowerProbe. In total, about 1760 ft of core was acquired from 13 drill holes that reached depths ranging from 30 to 251 feet. In some areas, shallow subsurface borings (less than 8 feet deep) were made using a hand auger to better define boundaries of peat and lake deposits, especially around modern wetlands. The map legend provides additional discussion on the variability of sediment.

Regional Setting

The Quaternary geology of the Wauconda Quadrangle is predominantly the result of continental glaciers and glacial meltwaters of the last (Wisconsin Episode) glaciation. The Quaternary deposits are 100 to 250 feet thick and represent at least three major glacial events that occurred between about 25,000 and 14,000 yr. B.P. (radiocarbon years before present). Lithologically distinct diamictons interpreted as tills comprise units of the Tiskilwa, Lemont (Haeger Member), and Wadsworth Formations that were deposited by the Lake Michigan lobe during the three events (Hansel and Johnson, 1996). Locally, proglacial outwash and lake deposits are present between the tills of the three events and are classified as tongues of the Henry and Equality Formations, respectively (Figure 1).

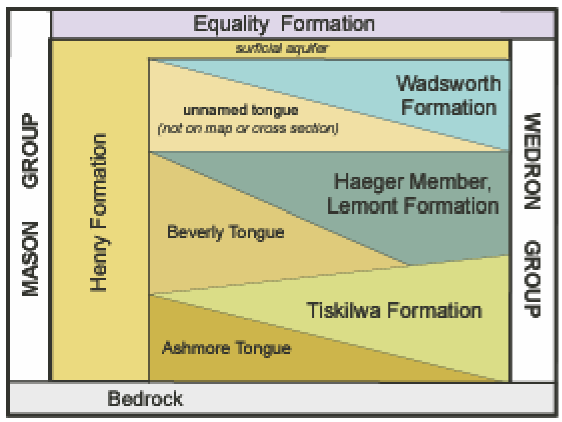

Figure 1: Intertonguing between proglacial outwash deposits (left wedges) and till units (right wedges).

In northeastern Illinois, as Wisconsin glaciers melted back toward the Lake Michigan basin, a series of moraines formed at the front of these glaciers (Figure 2). These moraines delineate the position of glacial ice during this period and in some locations are composite in nature (Hansel and Johnson, 1987). On the Wauconda Quadrangle, three moraines deposited during these ice advances are present. In the southwest portion of the map area, west of the Fox River near Burtons Bridge, upland areas mark the position of the recessional ice margin of the Cary Moraine that formed during the Woodstock Phase of glaciation (ending before 15,000 yr. B.P.; Hansel and Johnson, 1992). Typically in this area, sand and gravel of the Henry Formation is exposed at the surface (Curry et al., 1997), however, in some areas this sand and gravel is absent exposing the Haeger till that lies in the subsurface elsewhere.

East of the Fox River, an irregular and hummocky topography delineates the position of the Fox Lake Moraine (Figure 2). The physical character and internal structure of the till comprising this moraine (Haeger Member) are typical of stagnating and in situ melting of an ice lobe. In some places, the hummocky topography includes area of surface collapse; the collapse occurring as buried ice blocks melted (e.g., area northeast of Moraine Hills State Park). In low-lying areas on the moraine, particularly in the area near Volo Bog State Nature Preserve, drainage was ponded behind stagnant ice and/or sediments forming proglacial lakes.

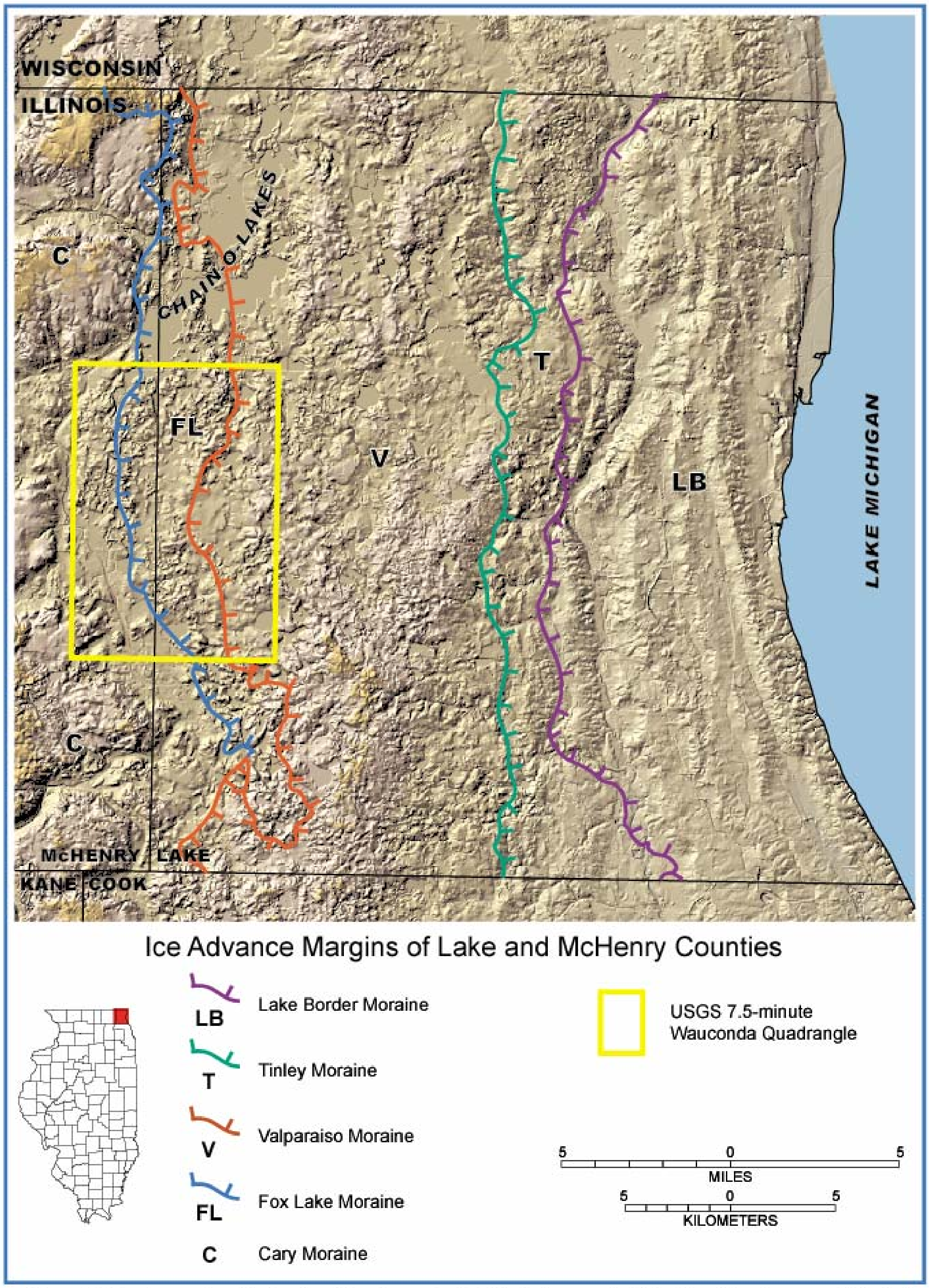

Figure 2. Surface topography of Northeastern Illinois (Luman et al., 2003). The ice margins of the different ice advances are delineated.

The final glacial advance of the Lake Michigan Ice Lobe into the Wauconda Quadrangle occurred approximately 14,000 yr. B.P. This advance onto the eastern part of the quadrangle formed the Valparaiso Moraine (Figure 2). The Valparaiso moraine has an undulating surface that rises from an elevation of 750 ft msl (mean sea level) at its margin toward the east to above 800 ft msl. The moraine is composed primarily of Wadsworth till, but also contains beds of Henry and Equality Formation deposits. Although we map the westernmost extent of the Valparaiso moraine primarily by a rise in the surface topography and the extent of the Wadsworth till, the precise boundary traced on the ground is likely to be slightly different. Along much of the boundary, thick Equality Formation sediments (in some places >50 ft thick) are exposed at the surface and mask the underlying units (e.g., north of the town of Volo). These sediments were deposited in proglacial lakes in front of the Valparaiso ice (e.g., glacial Lake Wauconda; Powers and Ekblaw, 1940).

Unit Characterization and Stratigraphic Relationships

Only the Haeger and Wadsworth tills are present at land surface in the Wauconda Quadrangle; the Haeger till is exposed at the surface over the western part of the quadrangle, whereas the Wadsworth till is at the surface over the eastern half. The Haeger till, which in some areas directly underlies the Wadsworth till, is a much coarser textured diamicton and is highly variable in both its thickness and character. Often the Haeger till contains beds or lenses of sand and gravel or silty clay that are locally deformed (Curry et al., 1997; Stravers et al., 2002). Where the diamicton is especially sandy, it may resemble Henry Formation sands and gravels. In many areas, the Wadsworth till is interbedded with or lies in contact with bodies of sorted sediment, especially silty clay, silt, and fine-grained sand. Both the Haeger and Wadsworth tills are often overlain in the western part of the quadrangle by sandy to gravelly deposits (proglacial outwash) of the Henry Formation (Masters, 1978).

Over much of the Wauconda Quadrangle, postglacial fluvial activity, erosion, and disturbance by humans have modified the surface topography. Modern river and stream sediments (Cahokia Formation) are present as terraces and floodplain deposits along the Fox River valley and its tributaries (e.g., north and east of the Village of Burtons Bridge). At the base of steep slopes on moraines and floodplains, slopewash sediments (Peyton Formation) have accumulated forming small aprons or fans (e.g., north of Wauconda). Some low-lying areas also filled with peat or muck (Grayslake Peat) and lake sediments (Equality Formation).

After the glaciers melted, areas of the quadrangle were likely covered by a layer of wind-deposited silt (loess). This material, the Peoria Silt (Hansel and Johnson, 1996), is not mapped because the silt layer deposited was probably very thin (<4 feet) and has since been modified by erosional and pedogenic processes.

Economic Resources

In the Wauconda Quadrangle, several active and inactive sand and gravel operations exist on the Fox Lake and Valparaiso moraines. The largest operations include the Petersens Sand & Gravel Incorporated and Meyer Material Company pits at Lilymoor. Smaller sand and gravel deposits occur elsewhere and are being operated by private landscape companies and concrete manufacturers.

Groundwater is used as household, public, and industrial water supplies in Wauconda Quadrangle. The most significant drift aquifers are present in the Beverly and Ashmore tongues of the Henry Formation (see Figure 2). Less frequently are wells developed in the Henry Formation sand and gravel deposits at ground surface and within or beneath the Wadsworth till. Aquifers present below the Wadsworth and Haeger tills have some of the best groundwater supplies because the water-bearing sediments are often protected from surface contamination by silty or clayey sediments.

The potential for contamination of aquifers by surface pollutants is an important issue in the quadrangle where all communities exclusively use groundwater supplies for their drinking water. Contamination is especially important since drinking water is pumped from significant, near-surface aquifers. In some areas over the western part of the quadrangle, the potential threat to these groundwater supplies is considered high because water-bearing sand and gravel deposits are exposed at ground surface and not overlain by thick clayey or silty sediments (aquitards) that would protect aquifers from contamination by surface pollutants (See Berg et al., 1984). In the eastern part of the quadrangle the potential threat to groundwater supplies is generally lower. Here, silty clay deposits of the Equality and Wadsworth Formations overlie water-yielding sediments.

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