Quaternary Geologic Map of the Richmond Quadrangle

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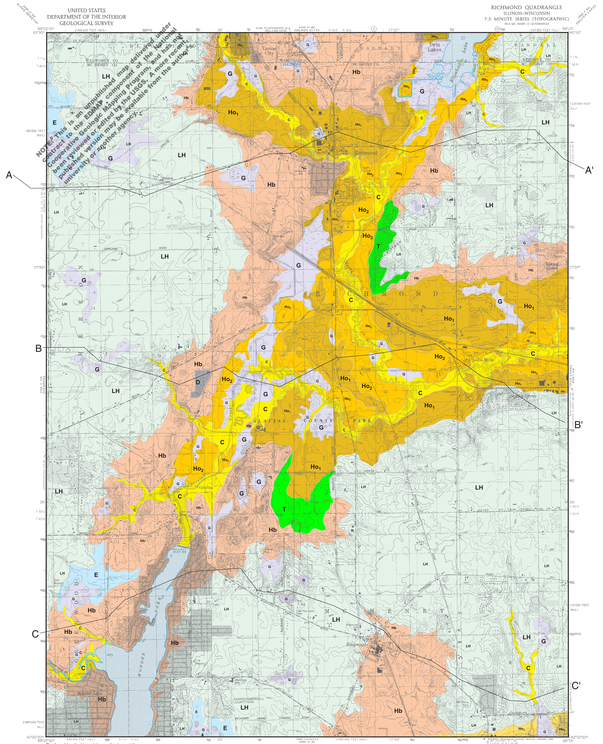

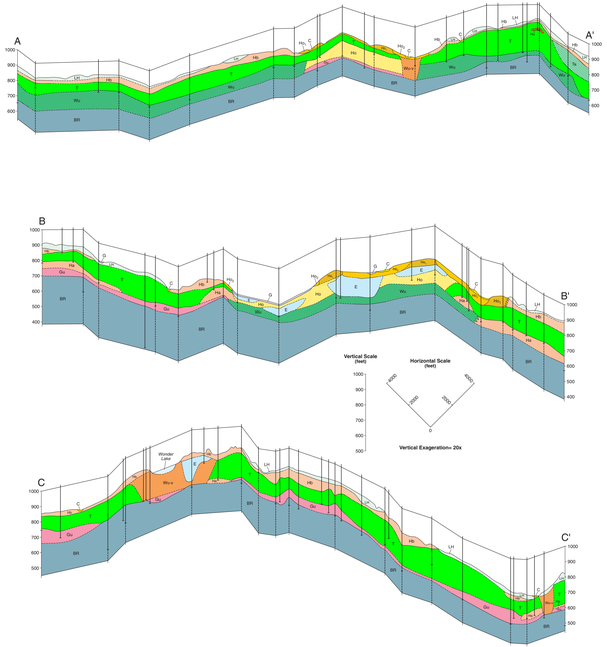

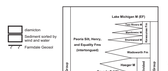

Fig. 1: Stratigraphic relationships for the late Wisconsinan Wedron and Mason Groups. The Wedron Group consists primarily of unsorted or poorly sorted diamictons (subglacial tills and diamictons in end moraines) that are interbedded with the sorted sediments (loess, fluvial outwash, and lacustrine deposits) of the Mason Group. (from Hansel and Johnson, 1996)

Map Units and Correlations

Hudson Episode Units (Holocene)

- **D** — Disturbed or made land (quarries and gravel pits).
- **G** — Grayslake Peat - Peat and organic rich fluvial or lacustrine sediment (locally marl) deposited in glacial and holocene lake basins or on shallow gradient flood plains.
- **C** — Cahokia Formation - Alluvium; primarily silt and sand or courser sediment reworked from Wisconsin episode outwash.

Wisconsin Episode Units

Mason Group Deposits

- **E** — Equality Formation - glacial lacustrine silts and clays of differing ages.
- **Ho_3** — Henry Formation outwash - stratified sand and gravel - may correlate to late stage formation of the Fox Lake Moraine or to the Valparaiso Moraine to the east (lowest elevation outwash surface).
- **Ho_2** — Henry Formation outwash - stratified sand and gravel - may correlate to late phase Haeger ice of the Fox Lake Moraine (low elevation outwash surface).
- **Ho_1** — Henry Formation outwash - stratified coarse to very coarse sands and gravels - outwash trains formed during the retreat of Haeger ice from the Woodstock Moraine (intermediate elevation outwash surface).
- **Ho_0** — Henry Formation - proglacial stratified coarse sands and gravels - extensive outwash plain or coalescing outwash fans related to formation of the Woodstock Moraine - LHw (highest elevation outwash surface).
- **Hb** — Henry Formation - (Beverly tongue) stratified sands and gravels underlying the Haeger member of the Lemont Formation.
- **Ha** — Henry Formation - (Ashmore tongue) stratified sands and gravels underlying the Tiskilwa Formation.
- **Wo-v** — Wonder Lake Valley fill - complex sequences of glacial-fluvial sands and gravels, and Equality formation lacustrine sediments that accumulated episodically throughout the Wisconsin episode in the Wonder Lake tunnel valley system. Also includes Henry Formation surface and near surface outwash deposits.
- **Hu** — Henry Formation - undifferentiated sands and gravel (in subsurface).
- **Wu** — Wisconsin episode deposits - undifferentiated. Wedron Group diamictons and Mason Group stratified sediments mostly from the earliest part of the Wisconsin episode.

Illinois Episode Units (Pleistocene)

- **Gu** — Glasford Formation undifferentiated (subsurface only) loam to sandy loam diamicton; pinkish brown to yellow brown; locally contains beds of stratified silts, sands, and gravel (Pearl Formation - outwash deposits); of variable thickness due to erosion by succeeding glacial advances; directly overlies bedrock in this area.

Bedrock Units (Paleozoic)

- **S** — Silurian: dolomite; preserved as erosional remnants on bedrock highs.
- **Om** — Ordovician Maquoketa Formation; interbedded shales, shaley carbonates and limestones.

Wedron Group Deposits

- **LHw** — Haeger Member (Lemont Frn) - sandy diamicton and interstratified sand and gravel beds; Woodstock Moraine - locally may consist of only an ice contact slope against which HO1 accumulated.
- **LH** — Haeger Member (Lemont Frn) - sandy subglacial diamicton with numerous interstratified sand and gravel beds, also becomes sillter towards the south.

Present in the subsurface

- **LY** — Yorkville Member (Lemont Frn - subsurface only) - silty clay to silty clay loam diamicton, gray, oxidizes to olive brown; contains lenses of gravel, sand (outwash), and interbedded silt and clay (lacustrine); middle diamicton of the Lemont Formation.
- **T** — Tiskilwa Formation (subsurface only) loam to clay loam diamicton, gray to pinkish gray, oxidizes to red brown, brown, or yellow brown; locally contains thick beds of silt, sand, and gravel (or underlying Peddicord Tongue outwash); lowermost diamicton of the Wedron Group.

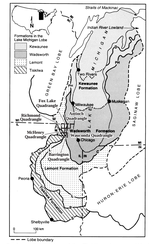

Fig. 2: Surface distribution of the Tiskilwa, Lemont, Wadsworth, and Kewaunee Formations of the Wedron Group and location of the McHenry quadrangle NE Illinois. Also shown are the maximum ice margin positions during glacial phases of the Lake Michigan Lobe: M-Marengo, S-Shelby, P-Putnam, L-Livingston, W-Woodstock, C-Crown Point, PH-Port Huron, and T-Two Rivers. (from Hansel and Johnson, 1996 and Foster and Colman, 1992)

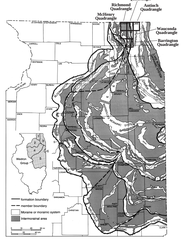

Fig. 3: Areal distribution of end moraines and boundaries for formations and prominent members of the Wedron Group and Trafalgar Formation in Illinois. Sublobe areas for the Lake Michigan and Huron-Erie Lobes are shown in the inset map: 1-Harvard, 2-Princeton, 3-Joliet, 4-Peoria, 5-Decatur, and 6-Huron-Erie. (modified from Willam and Frye, 1970 and Hansel and Johnson, 1996)

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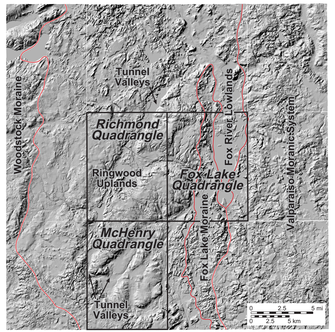

Fig. 4: Digital elevation model of the upper Fox River region of northeastern Illinois.

QUATERNARY GEOLOGY

Bedrock in the study area consists of Ordovician shales and shaley carbonates (Maquoketa Group), and Silurian dolomites which dip gently towards the east (Wilman, et.al., 1967; Grease, et.al., 1988). Glacial drift thicknesses are substantial however (50 to 150m), and natural bedrock outcrops are absent within the map area.

The oldest Quaternary deposits preserved in the subsurface consist of Illinois Episode Glasford Formation diamictons deposited primarily as subglacial tills and correlative proglacial outwash sands and gravels of the Pearl Formation. No buried morainal facies are present in this region, and the topography or morphology of the top of the Illinoisan deposits does not appear to be reflected at the surface. The Illinois Episode dates from approximately 180,000 to 130,000 years ago but the specific time of deposition in the study area is unknown. A major unconformity is indicated (in only a few widely scattered cores) by the deeply weathered Sangamon Geosol, which formed in both the Glasford and Pearl formation deposits between about 130,000 to 55,000 years ago (Curry, 1989; Curry and Pavich, 1996). Wisconsin episode glacial erosion however has stripped much of the geosol as seen in quarry exposures and as reconstructed from cored strata.

Late Wisconsinan sediments in NE Illinois consist of subglacial diamictons (tills) and morainal deposits of the lower and middle Wedron Group as well as correlative interbedded glacial-fluvial and lacustrine sediments of the Mason Group (Hansel and Johnson,1996). Various sublobes of the Lake Michigan lobe in NE Illinois have also been defined on the basis of geographic expression of ice flow from two differing sources. The Harvard and Joliet sublobes are fed solely from an ice source flowing southward down the Lake Michigan trough (Harvard ice restricted to the trough and trough margins, Joliet ice expanding laterally out of the trough onto the plains). The Princeton sublobe results from Lake Michigan flow augmented and deflected to the SW by ice flow from the Huron-Erie Lobe (Hansel and Johnson,1996).

The initial late Wisconsinan advance of ice into the map area (Marengo phase) resulted in deposition of the Tiskilwa formation diamicton and stratified sands and gravels of the Ashmore Tongue between 25,000 and 23,500 radiocarbon years before present. During this phase, an ice margin stabilized to form the prominent Marengo moraine to the west of the quadrangle. Curry, et.al. (1997) suggest that ice retreat from the Marengo moraine resulted in the deposition of a second moraine in eastern McHenry County that was later buried by subsequent readvances. Portions of the "Ringwood Upland" in the map area may consist of a buried morainal topography expressed at the surface.

Ice marginal positions for the Shelby Phase (Batestown Member) are well established across central Illinois but the Batestown Member is absent from the subsurface here, probably because of glacial erosion during subsequent readvances. An alternative explanation is that Shelby ice was prevented from advancing across McHenry County by residual Marengo ice (Curry, et.al., 1997).

The Barlina moraine was deposited to the southwest of the quadrangle during the Livingston phase (Yorkville Member). The Yorkville Member is present in the subsurface and is believed to represent substantial deposition of subglacial diamicton during this phase.

During the Woodstock Phase, ice overrode much of McHenry County, originally depositing the sandy Haeger diamicton as subglacial till ("ground moraine" of LH). The ice margin then retreated and stabilized to construct the Woodstock moraine (LHw). This moraine consists primarily of stratified sands and gravels that are indistinguishable from Henry Formation outwash at some localities. LHw is mapped as a moraine primarily on the basis of its topographic expression. It may be a sequence of ice contact stratified deposits, or it may be an older moraine (a palimpsest moraine) that was buried by subsequent deposition of outwash sands and gravels (Curry, et.al., 1997). Subsequently, the ice margin retreated to the central portion of the Barrington quadrangle (to the east) and stabilized to form the Fox Lake moraine.

Thereafter, the ice retreated to the central part of the Lake Michigan trough and then readvanced into Illinois during the Crown Point Phase. This phase was characterized by a prolonged episode in which the ice margin persisted in the eastern portion of the Barrington quadrangle to form the Valparaiso "morainic system" (Wadsworth Formation), a complex topographic and stratigraphic sequence of moraines bordering Lake Michigan.

Following deglaciation, the youngest geological materials to accumulate in the study area consist of Holocene alluvial deposits (Cahokia Formation) and Grayslake peat, which accumulated in wetlands that developed in the closed depressions and shallow gradient drainages of this area.

MAPPING METHODS

Initial reconnaissance was conducted using 1:40,000 scale color infra-red aerial photography in conjunction with the definition of landform physiographic characteristics that were observable from the topographic base. Definition of the initial map units was also aided by the soils data and soils maps of Ray and Wascher (1965) and the "stack unit" maps of Berg and Kempton (1988). Field investigations, ground truth verification, and sampling were conducted primarily by shallow (2-5m) hydraulic coring using a Giddings Probe. Lithologic logs from ISGS control wells (just west of the quadrangle), 8 "Power Probe" cores (6-20m), engineering borings, and numerous water well logs, were also used as an aid to defining the subsurface distribution of map/stratigraphic units. Several shallow excavations in developing subdivisions were also examined.

This geologic map also represents an extension of general geologic mapping completed for environmental planning in McHenry County (Curry et al., 1997) and 3-D mapping in quadrangles to the NE (Berg, et.al., 2000). The criteria for differentiating surficial map units and the stratigraphic nomenclature used here is adopted and expanded from those studies and from Hansel and Johnson (1996). Texture (grain size), sedimentary structures, clast lithology, and clay mineralogy where the primary characteristics used for differentiation and correlation of stratigraphic units. Glacial-fluvial terraces were mapped on the basis of elevation and morphostratigraphic sequence.

Subsurface data for the cross sections are based upon scattered deeper borings including 1) "Power Probe" cores obtained under this study, 2) control wells with lithologic logs completed by the ISGS, 3) unpublished engineering borings from bridges and the road beds, and 4) driller's logs from water wells completed within the quadrangle (on file with the ISGS).