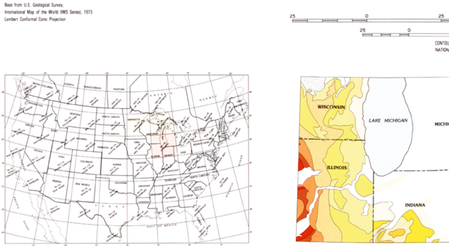
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH THE
ILLINOIS STATE GEOLOGICAL SURVEY, INDIANA GEOLOGICAL SURVEY
DEPARTMENT OF GEOLOGY AND GEOPHYSICS, UNIVERSITY OF WISCONSIN
DEPARTMENT OF GEOLOGICAL SCIENCES, UNIVERSITY OF MICHIGAN AND THE
DEPARTMENT OF GEOLOGY AND MINERALOGY, OHIO STATE UNIVERSITY

INDEX TO INTERNATIONAL MAP OF THE WORLD 1:1,000,000 TOPOGRAPHIC SERIES

Showing location of the Quaternary Geologic Map of the Chicago 4° x 6° Quadrangle, and [1] U. Geological Survey, Miscellaneous Investigations Series, Map I-1420 (NK-16)] and other published maps in the Quaternary Geologic Atlas of the United States in yellow.



LOESS DISTRIBUTION AND THICKNESS, IN METERS

SCALE 1:1 000 000

0 25 50 75 100 KILOMETERS

CONTOURS IN METERS ABOVE MEAN SEA LEVEL
NATIONAL GEODETIC VERTICAL DATUM OF 1929

RELATIONSHIPS OF LATE WISCONSIN GLACIAL LOBES, SUBLOBES AND ADVANCES WITHIN LOBES AND SUBLOBES.

Numbers indicate relative ages of surface tills in respective lobes and sublobes (oldest to youngest) in this quadrangle. Hachures indicate readvance limits shown on Quaternary geologic map. Arrows indicate generalized ice flow within lobes and sublobes.

RESPONSIBILITY FOR STATE COMPILATIONS

(1) ILLINOIS STATE GEOLOGICAL SURVEY
(2) INDIANA GEOLOGICAL SURVEY
(3) DEPARTMENT OF GEOLOGY AND GEOPHYSICS, UNIVERSITY OF WISCONSIN
(4) DEPARTMENT OF GEOLOGICAL SCIENCES, UNIVERSITY OF MICHIGAN
(5) DEPARTMENT OF GEOLOGY AND MINERALOGY, OHIO STATE UNIVERSITY

QUATERNARY GEOLOGIC MAP OF THE CHICAGO 4° × 6° QUADRANGLE, UNITED STATES

State compilations by
Jerry A. Lineback, Ned K. Bleuer, David M. Mickelson, William R. Farrand, and Richard P. Goldthwait

Edited and integrated by
Gerald M. Richmond David S. Fullerton

1983

QUATERNARY GEOLOGIC ATLAS OF THE UNITED STATES

LIST OF MAP UNITS

HOLOCENE

lc LAKE CLAY AND SILT UNDER LAKE MICHIGAN
ls LAKE SAND AND GRAVEL UNDER LAKE MICHIGAN

HOLOCENE AND LATE WISCONSIN

al ALLUVIUM
hs SWAMP DEPOSIT
hp PEAT
es EOLIAN SHEET SAND
ed DUNE SAND
el LOESS
ca COLLUVIUM AND SHEETWASH ALLUVIUM

LATE WISCONSIN

lca LAKE CLAY AND SILT
lsa LAKE SAND AND GRAVEL
ogi OUTWASH SAND AND GRAVEL
gs OUTWASH SAND
kg ICE-CONTACT SAND AND GRAVEL

Till in Wisconsin, Michigan, Indiana, and Ohio

CLAYEY TILL
tc Ground moraine
tce End moraine

CLAYEY TILL
tcb Ground moraine
tcbe End moraine

LOAMY TILL
tl Ground moraine
tle End moraine

LOAMY TILL
tlg Ground moraine
tlge End moraine

SANDY LOAMY TILL
td Ground moraine
tde End moraine

Till Members of Wedron Formation in Illinois and under Lake Michigan, and Equivalent Till in Adjacent Wisconsin and Indiana

tac CLAYEY TILL (MANITOWOC TILL MEMBER UNDER LAKE MICHIGAN)

tad CLAYEY TILL (SHOREWOOD TILL MEMBER UNDER LAKE MICHIGAN)

CLAYEY TILL (WADSWORTH TILL MEMBER IN ILLINOIS AND EQUIVALENT IN INDIANA)
tah Ground moraine
tahe End moraine and moraine under Lake Michigan
tad Lake Michigan

SANDY LOAMY TILL (HAGER TILL MEMBER IN ILLINOIS AND EQUIVALENT IN WISCONSIN)
tea Ground moraine
teae End moraine

CLAYEY TILL (YORKVILLE TILL MEMBER IN ILLINOIS AND EQUIVALENT IN INDIANA)
taj Ground moraine
tae End moraine

CLAYEY TILL (SNIDER TILL MEMBER IN ILLINOIS AND EQUIVALENT IN INDIANA)
tan Ground moraine
tane End moraine

LOAMY TILL (TISKILWA, DELAVAN, AND FAIRGRANGE TILL MEMBER IN ILLINOIS, FAIRGRANGE TILL MEMBER EQUIVALENT IN INDIANA)
tkd Ground moraine
tkde End moraine

EARLY WISCONSIN

tlj LOAMY TILL (CAPRON TILL MEMBER OF WINNEBAGO FORMATION IN ILLINOIS EQUIVALENT IN WISCONSIN)

SANDY LOAMY TILL (ARGYLE TILL MEMBER OF WINNEBAGO FORMATION IN ILLINOIS AND EQUIVALENT IN WISCONSIN)
tej Ground moraine
tejj End moraine

WISCONSIN

lcd LAKE SILT AND CLAY

LAKE CLAY AND SILT
lci Lake Michigan
LAKE SAND AND SILT
lsp Lake Michigan
gsi OUTWASH SILT, SAND, AND GRAVEL
kgi ICE-CONTACT SAND AND GRAVEL
tal CLAYEY TILL (RADNOR AND STERLING TILL MEMBERS OF GLASFORD FORMATION IN ILLINOIS)
tag CLAYEY TILL (ESMOND TILL MEMBER OF GLASFORD FORMATION IN ILLINOIS)

CLAYEY TILL (LEE CENTER TILL MEMBER OF GLASFORD FORMATION IN ILLINOIS)
tke Ground moraine
tkee End moraine
tkm LOAMY TILL (OGLE, HULICK, AND VANDALIA TILL MEMBERS OF GLASFORD FORMATION IN ILLINOIS; OGLE TILL MEMBER EQUIVALENT IN WISCONSIN)

CLAYEY TILL (WINNSLOW TILL MEMBER OF GLASFORD FORMATION IN ILLINOIS AND EQUIVALENT IN WISCONSIN)
tam Ground moraine
tame End moraine

PLEISTOCENE

cr COLLUVIUM

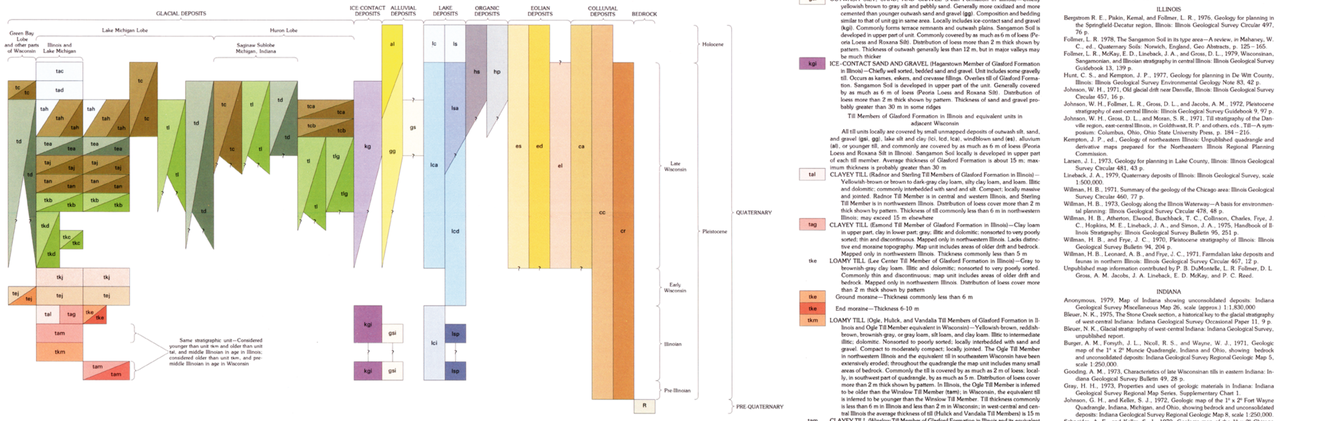
QUATERNARY

cc COLLUVIUM

PRE-QUATERNARY

R BEDROCK

CORRELATION OF MAP UNITS



EXPLANATION OF MAP UNITS

HOLOCENE

lc LAKE CLAY AND SILT UNDER LAKE MICHIGAN (Waukegan, Lake Forest, and Winnetka Members of Lake Michigan Formation of the Illinois State Geological Survey)—Brownish-gray to gray, calcareous, massive to laminated silty clay and clay (50–70 percent clay). An offshore and deep-water facies of the lake deposits. Thickness generally 1–5 m, but as much as 18 m in places

ls LAKE SAND AND GRAVEL UNDER LAKE MICHIGAN (Ravinia Sand Member of Lake Michigan Formation of the Illinois State Geological Survey)—Brown to gray, calcareous, moderately to poorly sorted, fine to coarse sand with some gravel. Beach and nearshore facies of the lake deposits. Thickness generally 1–5 m, rarely 10 m

HOLOCENE AND LATE WISCONSIN

al ALLUVIUM (Cahokia Alluvium in Illinois; alluvium of Maumee Formation in Indiana; unnamed elsewhere)—Brown to gray silt, sand, and gravel. Noncalcareous to calcareous; moderately to well sorted; stratified. Texture variable laterally and vertically; may be mixed or interbedded. Upper part commonly silt and fine sand; lower part commonly sand and rounded gravel. Lithologies mixed and variable, reflecting composition of bedrock and sediments that it matrasses. Overbank deposits on channel deposits; underlies flood plains, low stream terraces, and alluvial fans. Map unit locally includes undifferentiated fine-grained, mainly clayey deposits that shown on map) and swamp deposits (hs); commonly overlies outwash sand and gravel (gs, gsi). Thickness generally 1–5 m

hs SWAMP DEPOSIT—Dark-brown to black muck, mucky peat, and organic residues mixed with fine-grained mineral sediment in abandoned drainageways, glacial channels, ice-block depressions, and other shallow depressions and poorly drained areas. In places underlain by gray, fine-grained, carbonate marl (hm) and(or) with mollusc fragments. Thickness generally 1–5 m, rarely as much as 15 m

hp PEAT—Brown fibrous peat and decomposed plant remains. Commonly overlies lake deposits; locally occupies ice-block depressions. Mapped only where very widespread. Thickness generally 2–10 m

es EOLIAN SHEET SAND (Part of eolian sand facies of Atherton Formation in Indiana; part of Parkland Sand in Illinois; unnamed elsewhere)—Pale-brown, noncalcareous, well-sorted, medium to fine sand; locally silty. Commonly occurs downwind from areas of dune sand (ed) or outwash sand and gravel (gs, gsi); commonly overlies outwash sand and gravel (gs, gsi) or lake clay and silt (lca). Forms blanket like deposit of windblown sand. Includes blowout or parabolic dunes too small to be mapped as unit ed. Thickness generally 1–3 m

ed DUNE SAND (Dune facies of Atherton Formation in Indiana; part of Parkland Sand in Illinois; unnamed elsewhere)—Pale-brown, crossbedded, well-sorted, weakly calcareous, well-sorted, medium to fine sand. Chiefly forms low, sandy ridges, with some heavy minerals. In Michigan, occurs chiefly as massive dune ridges parallel to present-east shore of Lake Michigan, but dune sand mantles throughout the map area on lake bed plains and outwash plains. Most is stabilized by vegetation; locally, where vegetation has been removed (mostly near shore of Lake Michigan), some sand is actively moving. Mapped only where extensive; includes some eolian sheet sand (es). Thickness 1–30 m

el LOESS (Peoria Loess in Illinois)—Gray to yellowish-brown windblown silt and silt loam. Calcareous where thick; weakly compact and jointed. Occurs chiefly on uplands adjacent to major outwash deposits. Peoria Loess commonly overlies Farmdale Soil developed on more compact, leached, brown or reddish-brown to dark-gray Rosana Silt. Loess is mapped separately only where total thickness of all loess is at least 1 m

ca COLLUVIUM AND SHEETWASH ALLUVIUM:
Colluvium—Brown to reddish-brown, noncalcareous to weakly calcareous, nonsorted, nonstratified to faintly stratified, sandy to silty clay containing angular to subangular clasts of sandstone, dolostone, limestone, and chert. Deposits of colluvium are chiefly on valley sides and are separated by scarps; commonly, on extensive outcrops of sandstone, dolomite, and limestone
Sheetwash alluvium—Brown to reddish-brown, noncalcareous to weakly calcareous, poorly sorted to well-sorted sand, silt, and clay containing local layers of subangular to subrounded boulders in pebbly sandstone, dolomite, limestone, limestone, and chert. Sheetwash alluvium is chiefly on lower slopes of valley sides and on valley floors The colluvium and sheetwash alluvium cannot be distinguished at the scale of this map. Both deposits are 1–3 m thick, and commonly are covered locally by windblown loess (el) or windblown sand (ed, es)

LATE WISCONSIN

lca LAKE CLAY and SILT (Part of Lacustrine Facies of Equality Formation in Illinois; lacustrine facies of Atherton Formation in Indiana; unnamed elsewhere)—Yellowish-brown to brown or bluish-gray to gray clay and silt. Well bedded; soft; commonly thinly laminated, locally varved. Chiefly in basins of glacial lakes; some are in small, separate lake basins; a few are in stack-water valleys tributary to major valleys. Thickness ranges from a few centimeters in some areas. Deposits include some undifferentiated areas of lake sand and gravel (lsa) and some washed or crossbedded sand. Overlies, in places, the unmapped Richland Loess in Illinois, thin eolian sand (es), swamp deposits (hs), or alluvium (al). Thickness generally 1–10 m

lsa LAKE SAND AND GRAVEL (Lacustrine facies of Atherton Formation in Indiana; Dolton Member of Equality Formation in Illinois; unnamed elsewhere)—Pale-brown to gray, well-sorted to poorly sorted, locally forset-bedded or crossbedded, fine to coarse sand or pebbly sand with some gravel. Sand commonly contains beds or lenses of rounded gravel; beaches and offshore bars locally are gravelly. Clasts chiefly dolomite, limestone, and sandstone in Wisconsin; limestone and dolomite in Illinois and Ohio; limestone, dolomite, and shale in Indiana; and sandstone, limestone, and shale in Michigan. Deposits on beaches, bars, spits, and deltas, all locally forset bedded, and other nearshore or shallow-water deposits of former glacial lakes; in Ohio, beach ridges and bars are shown by symbol where narrow. Mapped areas locally include some lake clay and silt (lca). In places sand is covered by unmapped loess or windblown sand (ed, es). Thickness 1–30 m

gg OUTWASH SAND AND GRAVEL (Batavia and Mackinaw Members of Henry Formation in Illinois; outwash facies of Atherton Formation in Indiana; unnamed elsewhere)—Pale-brown to gray, fine to coarse sand or pebbly sand alternating with layers or beds of granule to cobble gravel and minor beds of silt; locally boulders. Clasts rounded. Textures variable laterally and vertically, interlayered thick and thin beds; commonly well sorted within beds and poorly to well stratified; locally crossbedded. Deposits are commonly capped and locally supplemented by the eolitors to produce this quadrangle map and map explanation. Associated diagrams were prepared by the editors. Significant geologic problems requiring changes in the map or addition of information were resolved at meetings with the compilers, who reviewed the map prior to its submittal for publication. Other reviewers, to whom the editors are indebted, were W. Hilton Johnson, University of Illinois, and Harold E. Malde, U.S. Geological Survey.

gs OUTWASH SAND (Oshawah facies of Atherton Formation in Indiana; unnamed elsewhere)—Pale-brown to gray, well-sorted, well to poorly stratified, fine to coarse sand or pebbly sand; locally, with beds or lenses of granule to pebble gravel or lenses of silt. Clasts rounded. Commonly, mixed with a few to as much as 10 percent gravel (gg) in some area. Occurs principally beneath outwash plains; locally overlain by unmapped thin windblown sand (ed, es), swamp deposits (hs), or alluvium (al). Thickness 1–20 m

kg ICE-CONTACT SAND AND GRAVEL (Kame facies of Atherton Formation in Indiana; unnamed elsewhere)—Pale-brown to gray, fine to coarse sand and gravel with minor silt and local lenses of till. Texture very laterally and vertically. Gravel ranges from granules to boulders; clasts rounded to subangular. Poorly sorted; poorly to well stratified; commonly with beds, folds, and faults of steep and chaotic attitudes. Deposition the same as that of outwash sand and gravel (gg, gs) in same area; larger clasts chiefly limestone and dolostone, but some are of granite, gneiss, and other crystalline rocks. Deposits form kame ridges, mounds, hummocks, terraces, deltas, eskers, and ice- thickness fillings; surface locally pitted with ice block depressions. Map unit locally includes small overlying deposits of outwash sand and gravel (gg, gs), swamp deposits (hs, peat (hp), alluvium (al), or till. In Illinois, all Wisconsinan ice-contact sand and gravel deposits are too small to map separately and are included in the undelying till unit. Thickness generally 5–30 m

Tills in Wisconsin, Michigan, Indiana, and Ohio

tc CLAYEY TILL—Chiefly clay loam, silty clay loam, silty clay, and clay. Reddish brown in Wisconsin and Michigan; near Lake Michigan, elsewhere yellowish brown or brown to light or dark gray. Calcareous; nonsorted to very poorly sorted. Commonly contains less than 2 percent of pebbles, cobbles, and boulders. Pebbles and cobbles are chiefly sandstone, limestone, and dolomite east and west of Lake Michigan; sandstone, limestone, and shale to the east in Michigan and adjacent Indiana. Map unit includes small areas of outwash and ice-contact sand and gravel (gg, gs, kg). In places it is thinly covered by unmapped outwash sand and gravel (gg, gs), lake clay and silt (lca), or alluvium (al). In Wisconsin, covered locally by unmapped loess (el). Thickness 2–20 m

tca Forms broad, low ridges, locally with hummocky topography. In Ohio, the till commonly contains 2–10 times more boulders than till of ground moraine; in Indiana, boulder accumulations appear to be only a surface or near-surface phenomenon. Thickness 3–25 m

tcb CLAYEY TILL—Chiefly brown or brownish gray to gray clay loam and silty clay loam; similar to unit tca, but less clayey

tcb Ground moraine—Thickness 2–20 m

tcbe Ground moraine—Forms broad, low ridges, locally with hummocky topography. In Ohio, the till commonly contains 2–10 times more boulders than till of ground moraine; in Indiana, boulder accumulations appear to be only a surface or near-surface phenomenon. Thickness 3–35 m

tl CLAYEY TILL (Tiskilwa Formation in Illinois; unnamed till in Michigan)—Yellowish-brown to light- or dark-gray loam, silty clay loam, silty clay, and clay. Noncalcareous to calcareous; nonsorted to very poorly sorted; locally stratified. Contains scattered to common pebbles, cobbles, and boulders; clasts chiefly granite, gneiss, and quartzite. In central and eastern Illinois the till locally is a thin and discontinuous mantle of sediment, underlain by loam till (t). Map unit includes small areas of lake clay and silt (lca)

tle Ground moraine—Thickness 2–20 m

tlg End moraine—Forms broad, low ridges, locally with hummocky topography. In Ohio, the till commonly contains 2–10 times more boulders than till of ground moraine; in Indiana, boulder accumulations appear to be only a surface or near-surface phenomenon. Thickness 3–35 m

tlg CLAYEY TILL—Yellowish-brown or brown to light- or dark-gray loam and silt loam; in Ohio, also silty clay loam and clay. Calcareous; nonsorted to very poorly sorted. Commonly pebbly; pebbles, cobbles, and small boulders are chiefly limestone and dolostone. Deposits on beaches, bars, spits, and deltas, all locally forset-bedded, small areas of clayey till, sandy loamy till, and outwash and ice-contact sand and gravel (gg, kg, gs). Commonly covered by loess (el) as much as 1 m thick

tlge Ground moraine—Thickness 2–30 m

td SANDY LOAMY TILL—Chiefly yellowish brown to light or dark gray sandy clay loam, sandy loam, and loamy sand; locally reddish brown. Calcareous; nonsorted to poorly sorted. Pebbles, cobbles, and small boulders are chiefly dolomite, limestone, and sandstone in Wisconsin; dolomite, limestone, and shale in Michigan; large boulders are chiefly crystalline igneous and metamorphic rocks, quartzite, and dolomite. Deposits locally resemble outwash sand and gravel (gg), owing to an abundance of well-rounded clasts; they are nonstratified and include lenses of stratified sediment. Map unit locally covered by loess (el) as much as 2 m thick

tde Ground moraine—Thickness 2–30 m

td End moraine—Somewhat more bouldery than ground moraine, and locally contains included masses of stratified sand and gravel (gg); otherwise, till is similar to that of ground moraine. Thickness 5–35 m

Till Members of Wedron Formation in Illinois and Under Lake Michigan, and Equivalent Till in Adjacent Wisconsin and Indiana

Mostly till with associated lenses and beds of sand, gravel, and silt. Includes small unmapped deposits of outwash sand and gravel (gg), ice-contact deposits (kg), peat (hp), and alluvium (al). All members may have a cover of unmapped loess (Richland Loess in Illinois) as much as 6 m thick. Total thickness of Wedron Formation averages about 20 m; maximum thickness may exceed 100 m

tac CLAYEY TILL (Manitowoc Till Member under Lake Michigan)—Reddish-brown clay; intermediate lithe content; dolomitic. Ground moraine and end moraine

tad CLAYEY TILL (Shorewood Till Member under Lake Michigan)—Pinkish-gray, brownish-gray, or reddish-gray clay; ditte and dolomite. Ground moraine and end moraine not differentiated. Maximum thickness greater than 25 m in unmapped submerged end moraine

tah CLAYEY TILL (Wadsworth Till Member in Illinois and its equivalent in Indiana)—Gray clay to silty clay loam. Ilitic and dolomitic; nonsorted to very poorly sorted. Clasts are chiefly pebbles and cobbles, dominantly of dolomite, and fragments of black shale. Clasts decrease in abundance toward Lake Michigan

tah Ground moraine—Commonly 2–15 m thick

tahe End moraine—Forms hummocky to smooth ridges. Thickness commonly 10–25 m

tea SANDY LOAMY TILL (Hagger Till Member in Illinois and its equivalent in Wisconsin)—Chiefly gray to brown gravelly, sandy loam. Ilitic and dolomitic; nonsorted to poorly sorted. Commonly a thin deposit, overlying and interbedded with thick deposits of sand and gravel that are included in the member. Pinches out southward in northwestern Illinois, where it is overlapped by the Wadsworth Till Member

teae Ground moraine—Thickness generally 3–6 m. Thickness of Hagger Till Member, including underlying and interbedded sand and gravel, averages 20 m

End moraine—Thickness generally 6–10 m, including underlying and interbedded sand and gravel; locally 20 m

taj CLAYEY TILL (Yorkville Till Member in Illinois and its equivalent in Indiana)—Gray or greenish-gray clay to silty clay loam. Ilitic and dolomitic; nonsorted to very poorly sorted. Contains abundant small pebbles, chiefly of dolomite, and fragments of black shale. Overlain in many places by lake clay and silt (lca), included in map unit

taje Ground moraine—Thickness 2–15 m

End moraine—Thickness 10–30 m

tan CLAYEY TILL (Snider Till Member in Illinois and its equivalent in Indiana)—Gray to olive-gray clay to silty clay loam. Ilitic and dolomitic; nonsorted to very poorly sorted; coarse, blocky structure. Clasts are predominantly pebbles, chiefly of dolomite, and fragments of black shale

tan Ground moraine—Thickness averages 6 m

tane End moraine—Thickness about 15 m

tkb CLAYEY TILL (Batestown Till Member, Malden Till Member, and Maiden and Snider Till Members undifferentiated in Illinois; Batestown Till Member equivalent in Indiana)—Olive-brown to gray clay loam and silty clay loam. Ilitic, dolomitic; nonsorted to very poorly sorted. Batestown Till Member in east-central Illinois; Malden Till Member in north-central Illinois; undifferentiated Malden and Snider Till Members north of Illinois River in Illinois

tkbe Ground moraine—Thickness averages 6 m

tkc CLAYEY TILL (Park Till Member)—Olive-brown to gray loam to silty clay loam. Ilitic, dolomitic; nonsorted to poorly sorted. Mapped only in east-central Illinois

tkce Ground moraine—Thickness 1–6 m

tkd CLAYEY TILL (Tiskilwa, Delavan, and Fairgrange Till Members in Illinois and Fairgrange Till Member equivalent in Indiana)—Pink, pinkish-gray, gray, brown, and reddish-brown clay loam, silty clay loam, and loam. Pink, pinkish gray, gray, brown, and reddish brown. Ilitic to intermediate Ilitic, and dolomitic; nonsorted to poorly sorted. Tiskilwa Till Member in northern Illinois; Delavan Till Member in central Illinois. Fairgrange Till Member in east-central Illinois. Map unit includes yellowish-gray to pinkish-gray sandy alluvium both in a small area in northeastern Illinois

tkde Ground moraine—Thickness averages 10 m, but may be as much as 30 m in places

End moraine—Thickness locally 30–100 m

EARLY WISCONSIN

Till Members of Winnebago Formation in Illinois and Equivalent Till in Adjacent Wisconsin

Till with interbedded silt, peat, and gravel present at the surface only in northwestern Illinois and southeastern Wisconsin; separated from Wedron Formation by the Robein Silt and the Morton Loess. Commonly covered by unmapped loess (el) as much as 6 m thick. Thickness of Winnebago Formation is variable, and it is commonly thin and discontinuous. Maximum thickness may be more than 60 m

tlj LOAMY TILL (Capron Till Member in Illinois and equivalent till in Wisconsin)—Sandy clay loam in upper part to clay loam in lower part. Pink; intermediate Ilitic, dolomitic; nonsorted to very poorly sorted. Commonly thin and discontinuous; map unit includes areas of bedrock, especially in Wisconsin. Mapped only in northeastern Illinois and adjacent Wisconsin. Thickness ranges from a veneer to as much as 8 m

tej SANDY LOAMY TILL (Argyle Till Member in Illinois and equivalent till in Wisconsin)—Pink sandy loam and loamy gravel; in places, intermediate Ilitic, dolomitic; nonsorted to poorly sorted; loosely compacted. Pebbles and cobbles, dominantly of dolomite, distributed locally. Commonly thin and discontinuous; map unit includes small areas of older till of similar composition and of bedrock

tejj End moraine—Mapped only in Wisconsin; characterized by distinct ridge topography with drumlinoid forms oriented northeast-southwest. End moraine includes some ice-contact sand and gravel. Thickness 10 to 20 m

WISCONSIN

lcd LAKE SILT AND CLAY—(Part of Cairo Member of Equality Formation in Illinois)—Yellowish-brown to bluish-gray to gray silt and clay. Well bedded; commonly with minor fine sand. Commonly thinly laminated; locally varved. Most deposits are in small lake basins; a few are in stack-water valleys tributary to major river valleys. Thin and discontinuous in some areas; locally, greatly dissected. Commonly overlies Robein Silt and is overlain by loess (el), swamp deposits (hs), or alluvium (al). Thickness generally, 1–6 m; locally more than 15 m

ILLINOIAN

lci LAKE SILT AND CLAY (Tenerife Silt in Illinois)—Yellowish-brown or brown to gray, massive silt and clay; locally silt with beds of sand and clay. Generally leached; calcareous in lower part only where thick. Map unit locally includes some outwash silt, sand, and gravel (gsi), windblown sand (es), and undescribed sheetwash alluvium. Sangamon Soil is developed in upper part of the unit. Commonly covered by loess (el) as much as 6 m thick; Richland Loess and Roxana Silt) as much as 6 m thick. Distribution of loess more than 2 m thick shown by pattern. Thickness of silt and clay less than 1 m to 10 m

lsp LAND AND SILT—Stratified to indistinctly stratified, poorly sorted, reddish-brown to olive-brown sediments. Locally covered by as much as 2 m of loess (el) or by alluvium (al) or undescribed colluvium. Probably deposited contemporaneously with glaciation. Thickness 0.5 to 4 m

gsi OUTWASH SILT, SAND, AND GRAVEL (Pearl Formation in Illinois)—Chiefly yellowish brown to gray silt and pebbly sand. Generally more oxidized and more cemented than younger outwash sand and gravel (gg). Composition and bedding similar to that of unit gg in same area. Locally includes ice-contact sand and gravel (kgi). Commonly forms terrace remnants and outwash plains. Sangamon Soil is developed in upper part of unit. Commonly covered by as much as 6 m of loess (Peoria Loess and Roxana Silt). Distribution of loess more than 2 m thick shown by pattern. Thickness of sand and gravel probably greater than 30 m in some ridges

Till Members of Glasford Formation in Illinois and equivalent units in adjacent Wisconsin

All till units locally are covered by small unmapped deposits of outwash silt, sand, and gravel (gsi, gg), lake silt and clay (lci, lcd, lca), windblown sand (es), alluvium (al), or younger till, and commonly are covered by as much as 6 m of loess (Peoria Loess and Roxana Silt in Illinois). Sangamon Soil locally is developed in upper part of each till member. Average thickness of Glasford Formation is about 15 m; maximum thickness is probably greater than 30 m

tal CLAYEY TILL (Radnor and Sterling Till Members of Glasford Formation in Illinois)—Yellowish-brown or brown to dark-gray clay loam, silty clay loam, and loam. Ilitic and dolomitic; nonsorted to very poorly sorted. Commonly thin and discontinuous; map unit includes areas of older drift and bedrock. Mapped only in northwestern Illinois. Thickness commonly less than 5 m

tke CLAYEY TILL (Lee Center Till Member of Glasford Formation in Illinois)—Gray to brownish-gray clay loam. Ilitic and dolomitic; nonsorted to very poorly sorted. Commonly thin and discontinuous; map unit includes areas of older drift and bedrock. Mapped only in northwestern Illinois. Thickness commonly less than 5 m

tkm LOAMY TILL (Ogle, Hulick, and Vandalia Till Members of Glasford Formation in Illinois and Ogle Till Member equivalent in Wisconsin)—Yellowish brown, reddish brown, brownish gray, or gray loam, silt loam, and clay loam. Ilitic to intermediate Ilitic; dolomitic. Nonsorted to poorly sorted; locally interbedded with sand and gravel. Compact to moderately compact; locally jointed. The Ogle Till Member in northwestern Illinois and the equivalent till in southeastern Wisconsin have been extensively eroded; throughout the quadrangle the map unit includes many small areas of bedrock. Commonly the till is covered by as much as 2 m of loess; locally, in southwest part of quadrangle, by as much as 5 m. Distribution of loess cover more than 2 m thick shown by pattern. In Illinois, the Ogle Till Member is inferred to be older than the Winslow Till Member (tam); in Wisconsin, the equivalent till is inferred to be younger than the Winslow Till Member. Till thickness commonly is less than 6 m in Illinois and less than 2 m in Wisconsin; in west-central and central Illinois the average thickness of till (Hulick and Vandalia Till Members) is 15 m

tam CLAYEY TILL (Winslow Till Member of Glasford Formation in Illinois and its equivalent in Wisconsin)—Yellowish brown to gray or dark-gray clay loam, silty clay loam, and silty clay. Intermediate Ilitic; dolomitic; nonsorted to very poorly sorted; pebbles and cobbles uncommon. Till commonly is covered by as much as 2 m of unmapped loess (el). Mapped areas include many small bedrock outcrops. In Illinois, the Winslow Till Member is inferred to be younger than the Ogle Till Member (tkm); in Wisconsin, the equivalent till is inferred to be older than the Ogle Till Member

tame Ground moraine—Thin and discontinuous. Thickness commonly less than 5 m in Illinois and less than 2 m in Wisconsin, but may exceed 20 m in buried valleys

End moraine—Occurs only in Wisconsin. Forms broad, deeply eroded ridges; includes some unmapped ice-contact sand and gravel. Thickness locally as much as 20 m

PLEISTOCENE

cr COLLUVIUM—Red, reddish-brown, or brown, noncalcareous to weakly calcareous clay, sandy clay, and clayey sand. Poorly sorted to well sorted; massive to well stratified; clast-fair to chaotic boulder rubble. Much of the colluvium is clayey residuum that moved downslope by solifluction and creep. Chert fragments in clayey colluvium commonly occur in lenses, layers, or pebble lines parallel to slopes. Discontinuous; generally thin, patches of fluidic blocky; or stiff structureless residual clay with scattered chert fragments underlie the colluvium and overlie dolomite and limestone bedrock locally. Where derived chiefly from sandstone and quartzite bedrock, the colluvium is sandy clay or clayey sand, with angular to subangular boulders, cobbles, and pebbles of sandstone and quartzite. Locally, in block fields, block streams, and talus are composed of boulders and cobbles of chert, sandstone, quartzite, dolomite, and limestone. Colluvium occurs on nearly all upland slopes steeper than 3–5°. It commonly contains admixed clay derived from a cover of unmapped loess as much as 4 m thick. Locally the colluvium and unmapped loess in turn are covered by unmapped eolian sand as much as 5 m thick. The colluvium in general is 0.5–2 m thick

QUATERNARY

cc COLLUVIUM (Mapped only in Illinois; equivalent to map units cr and ca elsewhere)—Brown or reddish-brown, noncalcareous to weakly calcareous clay to sandy clay. Nonsorted; nonstratified to faintly stratified. Commonly contains angular to subangular clasts of dolomite and chert. Thin and discontinuous, with abundant to extensive bedrock outcrops. Occurs chiefly at bases of slopes steeper than 3–5°. Colluvium commonly contains admixed clay derived from unmapped loess that locally mantles it. Both the colluvium and unmapped loess in turn are covered locally by unmapped eolian sand as much as 5 m thick. Thickness of colluvium generally, 0.5–2 m

PRE-QUATERNARY

R BEDROCK

For purposes of this map, colluvium is a general term for material transported and deposited by mass-wasting processes, chiefly solifluction and creep. Sheetwash alluvium is material transported and deposited by unconcentrated surface runoff. Bedrock is material that underlies or is exposed at the surface in place by solution and decomposition of bedrock, with no appreciable lateral transport.

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INDIANA

Anonymous, 1979, Map of