Surficial Geologic Map of Genesee County, Michigan

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> Cartography by Eric M. Clark 2002

Description of Map Units



RECENT ALLUVIUM DEPOSIT

Mostly thinly bedded sands, silts and clays with some organics deposited along modern rivers and streams. Generally thin deposits (< 3 meters) in narrow floodplains.



SWAMP AND MARSH DEPOSIT

Mostly decaying organic material with mixed fine sand and silt. Locally may include standing water Thickness is generally around 1-2 meters occupying depressions formed in abandoned glacial drainages, kettles, and shallow depressions in poorly-drained land. Also includes some bogs in depressions fed only by surface water runoff.

Pleistocene



FLINT RIVER TERRACE DEPOSIT

Mostly trough-bedded and cross-bedded fine to coarse sand, and gravel, and silt. Associated with the deposition and incision of the Flint River. Deposits rarely exceed 3 meters in thickness and appear to be strath terraces. The majority of these terraces are graded to successively lower levels of glacial lakes in the Saginaw lowlands after glacial Lake Saginaw (i.e. after 13,000 years ago).



BEACH DEPOSIT:

Mostly well-sorted, irregularly-bedded fine to coarse sand and occasional silt. Associated with various stages of Glacial Lake Saginaw. These deposits rarely exceed 2 meters in thickness and exist in intermittent, narrow bands along shorelines of glacial lakes. Principally seen in the northeast part of the county.



Horizontally-bedded fine sand and silt. Contains minor lenses of clay. Locally exceeds 12 meters in thickness. Deposits consist mostly of finely-laminated fine sand and silt but also includes numerous fining-upward sequences of ripple-drift lamination that grade from medium sand to clay. Exists at elevations of 221 meters ASL and below.



FLUSHING DELTA DEPOSIT, PROXIMAL FACIES

Mostly deltaic and top-set bedded (Gilbert-type) and cross-bedded fine to coarse sand and silt. Locally may included beds of gravel. Exists at elevations of 224 meters ASL and below, locally exceeding 12 meters in thickness. Distal portions of the delta contain some ripple-drift deposits. It appears that the Delta was initially fed by the Flushing Channel and subsequently cut by the Channel, indicating that the Channel continued to operate after base level dropped below the proximal part of the delta.



FLUSHING CHANNEL DEPOSIT

Probably a prodelta facies of Qfd.

Horizontally bedded to cross-bedded fine to coarse sand, silt, and gravel. Associated with westward draining into early Glacial Lake Saginaw. This channel is graded to the Qdf and Qff deposit. The channel carried overflow from the Lake Erie basin (probably from Lake Maumee II). Deposits rarely exceed 3 meters in thickness and are limited to about 2 kilometers in width. The channel bifurcates and cuts into the proximal part of the Qfd (Flushing Delta deposit).

Horizontally bedded to cross-bedded fine to coarse sand, silt, and gravel.

probably represents a continuation of outflow from the Flushing Channel

before development of the breach in the Flint Moraine allowed flow to be

redirected to the northwest toward Flushing and early Lake Saginaw.

Probably also drained overflow from Glacial Lake Kearsley.

Variable thickness generally not in excess of 10 meters.

Associated with westward drainage along ice margin. This deposit



SAND AND GRAVEL UNDIFFERENTIATED: Mostly fine to coarse sand and pebble to cobble gravel; localized horizontal bedding-to-cross bedding present; may also include localized boulders and till. Thickness may exceed 25 meters. Potentially associated with kame and crevasse development also includes two eskers (one each in Atlas and Forest Townships).



LACUSTRINE UNDIFFERENTIATED:

SWARTZ CREEK CHANNEL DEPOSIT:

Mostly horizontally-bedded and thinly-laminated fine sand and silt associated with ponded water resulting from blocked drainage. Locally may contain clay lenses.



CORUNNA CHANNEL DEPOSIT:

Horizontally-bedded fine to coarse sand and silt. Associated with subsidiary drainage along the ice margin in the reentrant formed by ice-margin retreat from the Flint moraine to the Owosso moraine. Relatively thin in Genesee County (does not exceed 6 meters thickness) and probably contains both fluvial and lacustrine deposits. Generally occupies the valley in the east-west portion of Lennon Drain from 232 - 236 meters ASL. In many places is overlain by 2-3 meters of diamict that appears to be debris-flow deposits.



DIAMICT, UNDIFFERENTIATED/ARGENTINE OUTWASH DEPOSIT

Mostly plane-bedded and cross-bedded fine to coarse sand and pebble to cobble gravel; thickness ranges from approximately 2-15 meters. Overlain by discontinuous sheet of mostly silt to fine sand rich diamict with smaller amounts of course sand and gravel, ranging in thickness from approximately 1-2 meters. This unit is extensively collapsed, making reconstruction of the outwash surface difficult.



GLACIAL LAKE FENTON DEPOSIT

Map Symbols

Minor Civil Divisions ——— State and US Highways ——— Major County Roads

Horizontally bedded lacustrine silt and clay with occasional drop stones. Localized bedded fine-to-coarse sand deposits are also evident. The pervasive lakes and swamps within this map unit indicate collapse from deposition on underlying ice. Exact relationships are difficult to determine due to the extensive collapse, but it appears that this lake was dammed by ice to the north and drained to the south with a surface elevation of around 271 meters ASL.



TILL UNDIFFERENTIATED:

Mostly clay-rich till with smaller amounts of sand and gravel. Includes significant amounts of sand, gravel, and debris flow deposits near morainal uplands. Generally flat to low relief terrain. Water-well data indicates this unit ranges from 10 – 22 meters in thickness and covering large parts of the county and can be in contact with bedrock.



TILL UNDIFFERENTIATED:

Mostly silt- and sand-rich till with smaller amounts of gravel. Includes significant amounts of sand, gravel, boulders, and debris flow deposits in morainal uplands. Contains collapse features along margins. Thickness ranges from 6 – 9 meters.

LANDFORM OVERPRINTS

MORAINAL-UPLANDS:

Relief typically is less than 8 meters/kilometer.



TILL WAVE-BEVELED (GLACIAL LAKE SAGINAW):

Areas dominated by till (Qt2) subsequently reworked by wave-action of the various stages of Glacial Lake Saginaw at elevations below 207 meters ASL in north west corner of the county. May have up to a meter of lacustrine sand at the surface.

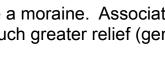


TILL-WAVE BEVELED (GLACIAL LAKE KEARSLEY):

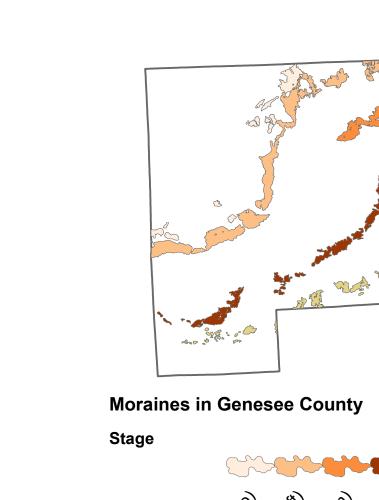
Areas dominated by till (Qt2) subsequently reworked by wave-action of Glacial Lake Kearsley at elevations below 240.5 meters ASL in a large part of the eastern half of the county. Presumably developed while ice still occupied the Flint moraine and blocked drainage east. May have overflowed to the west via Swartz Creek Channel (Qsc). A significant amount of sand and gravel (3 - 6 meters) exists intermittently at the surface near Holloway Reservoir, where, presumably, the glacial Flint River entered Glacial Lake Kearsley.



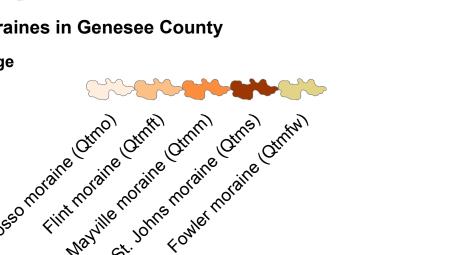
Overprint pattern indicates constructional morphology in a landscape dominated by glacial till and debris-flow deposits interpreted to be in an ice-marginal position

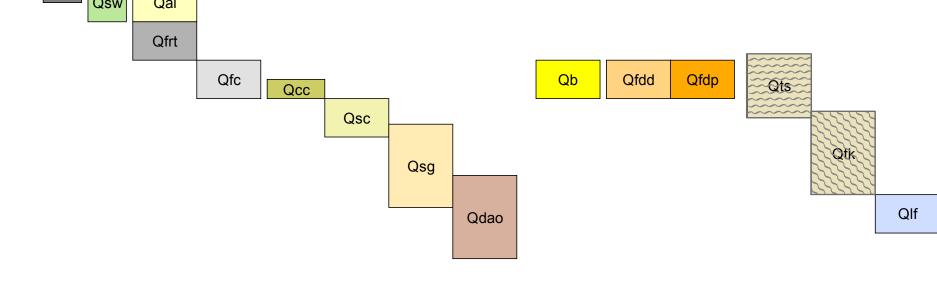


and therefore a moraine. Associated with a stadial of the Saginaw Lobe. Deposits generally similar in texture (and often indistinguishable) to those of the Qt unit but having much greater relief (generally >15 meters/kilometer). (See map below)



Correlation of Units





Discussion

Kilometers

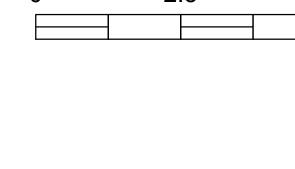
Glacial deposits are at the surface across all of Genesee County. Bedrock subcrop consists of Pennsylvanian sandstone and Mississippian limestone, shale, and sandstone dipping gently to the northwest. Depth to bedrock is lowest in the northwest part of the county and increases to the south and east, despite the fact that the bedrock surface tends to increase in elevation toward a subdued Mississippian cuesta to the southeast. Bedrock depth is generally around 21 meters in Montrose, Flushing, and Clayton Townships, though depths of less than 3 meters are locally reported. In the vicinity of Atlas Township depth to bedrock increases to over 50 meters.

The surficial geology of Genesee County consists entirely of Late Wisconsin glacial deposits with a minor amount of modification due to Holocene processes. The Saginaw lobe of the Laurentide ice sheet is responsible for all of the glacial deposits in the county. Five moraines cross the county and mark ice-margin positions of the Saginaw lobe glacier as it retreated out of the county from southeast to northwest between 14,800 and 13,500 radiocarbon years before present. These moraines (from oldest to youngest: Fowler, St. Johns, Mayville, Flint, and Owosso) consist mostly of poorly-sorted glacial till and display a higher relief than adjacent terrains. The Mayville moraine was thought by Leverett and Taylor (1915) to be a continuation of the Flint moraine. It appears likely that, instead the Mayville moraine marks a reentrant position of the St. Johns moraine.

The majority of the surficial deposits consist of glacial till in what has classically been called a till plain. Certainly in the swath of land between the Glacial Lake Saginaw beveled till plain (Qts) and the Flint moraine the land is relatively flat and resembles a till plain, long thought to be constructed from sub-glacial processes. The Qts unit is an extension of this same landscape, though modified by wave-action. Farm fields in the Qts unit appear to have more stones sticking through the soil surface than fields within the Qt unit, due ostensibly, to the winnowing action of the waves. The same is also true of areas within the boundary of Glacial Lake Kearsley (Qtk). Further studies (e.g. compaction, texture, and clast orientation) are necessary to determine if the Qt unit truly owes its origin to sub-glacial processes.

The southwest part of Genesee County marked as the Qdao unit (till, undifferentiated / Argentine outwash deposit) is atypical for the county in that it is a sand-rich terrain. It is a fluvial deposit overlain through much of the unit by a diamict of highly-variable thickness. The relationship between these units is unclear other than both were deposited on top of stagnant ice that subsequently melted, leaving a highly-collapsed terrain. It is likely that this unit was deposited in an ice-contact environment that intermittently generated both fluvial and debris-flow deposits. According to water-well logs, the fluvial part of this unit is underlain in many places by a "fine sand" which probably indicates lacustrine conditions existed for some time before the local base level was exceeded allowing fluvial conditions to prevail. This complex terrain will require a program of borings and geophysics to adequately predict the distribution of deposits in the subsurface and whether the deposit is associated with the Fowler or the older Lyons moraine that lies to the south.

Leverett, F. and Taylor, F. B. 1915. Pleistocene of Michigan and Indiana, U.S. Geological Survey Monograph 53



Qcc Qt2mo



Scale - 1:100,000

Map projected in Michigan GeoRef meters NAD 1983

Elevation in feet above sea level



