New York State Museum
Mark Schaming, Director

New York State Geological Survey

SURFICIAL GEOLOGY OF THE AUBURN 7.5-MINUTE QUADRANGLE, CAYUGA COUNTY, NEW YORK

prepared by
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Supported in part by the U.S Geological Survey's
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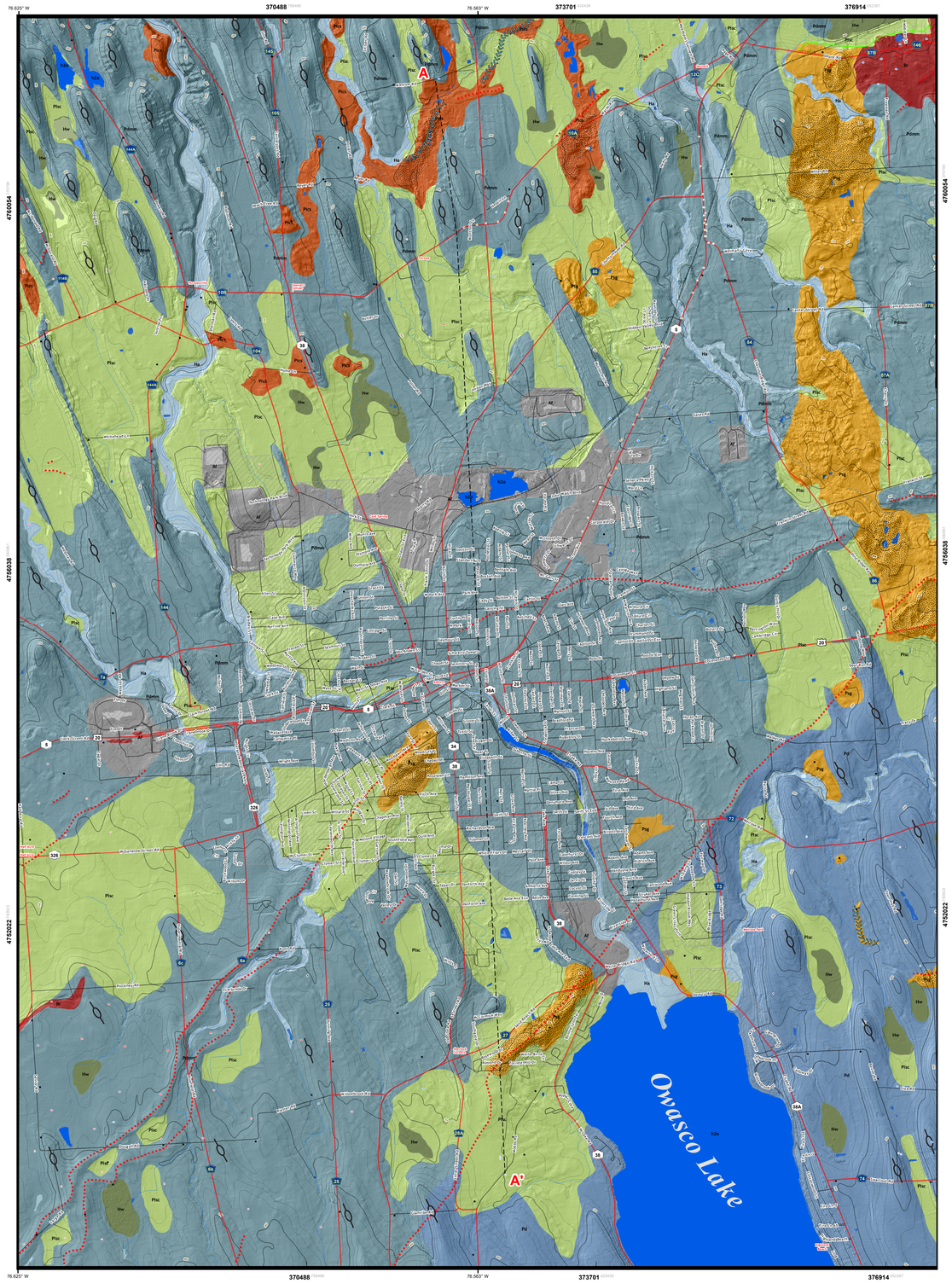

Universal Transverse Mercator, Zone 18 N
North American Datum of 1983

Hygrology, and planimetry layers from the New York State DOT Raster Quadrangle separates Cayuga County (https://gis.ny.gov/gisdata/inventories/member.cfm?OrganizationID=108). Geographic data layers from 2018 TIGER/Line shapes for transportation and hydrography (https://www.census.gov/cgi-bin/geo/shapefiles/index.php)

Shaded relief from Cayuga County 2m and NYS 10m DEM lidar data sets (http://gis.ny.gov/elevation/index.cfm)

Magnetic declination from the NOAA online Declination Calculator: http://www.ngdc.noaa.gov/geomag-web/#declination

SCALE 1:24,000

1 0,5 0 KILOMETERS 1 2
1000 500 0 METERS 1000 2000
1 0,5 0 1
MILES
1000 500 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000
FEET

CONTOUR INTERVAL: 10 FEET

UTM GRID AND 2016 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

Geologic mapping by B. Bird, K. Backhaus and B. Rebeor, 2015
Digital data and cartography, B. Bird and K. Backhaus, 2015 & 2019.

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2015

Introduction

The surficial geology of the Auburn 7 ½ minute quadrangle was mapped in 2014-15 as part of a National Cooperative Geologic Mapping Program funded StateMap project (award # G14AC00360). This map is part of a larger project of the New York Museum/New York State Geologic Survey to map all of Cayuga County, New York. The purpose of this map was to identify and delineate various surficial materials in the Auburn quadrangle with the intent that this information can guide municipalities in land use, environmental, and natural resource decisions.

The Auburn quadrangle is located in central New York just south of the Interstate 90 corridor about 30 miles west of Syracuse, NY. Included within the quadrangle is the city of Auburn, where most of the population is centered, as well as the towns of Aurelius, Fleming, Owasco, Sennett, and Throop. Outside the city limits this portion of the county is mostly rural with large tracts of forest and agriculture. Owasco lake in the southeastern portion of the quadrangle is developed with many vacation residences.

Situated in the Ontario Lowlands physiographic province the landscape is generally subdue, rolling topography with the greatest elevation on drumlin tops at 951 feet above sea level in the southeastern portion of the quadrangle with the lowest being 446 feet in the Owasco Outlet channel in the northwestern portion of the map. Drumlins are testament to the glaciers that once covered the entire quadrangle. An accumulation of glacial sediment in excess of 100 feet is reported mostly in the northern portion of the quadrangle. Sediments include diamicton (interpreted as till), sorted clay, silt, sand, and gravel from glacial meltwater and glacial lakes and post glacial alluvium and wetland deposits. The lithologic units that comprise the quadrangle are highly variable in thickness and character although generally are expressed geomorphological as similar features. For instance the drumlins are generally diamicton.

Bedrock is exposed in limited areas in the southwest and northeast portions of the quadrangle and according to various drilling logs the depth to bedrock ranges from 6 to 125 feet across the quadrangle. An average depth to bedrock for the quadrangle is about 28 feet. The bedrock beneath the glacial sediments in the quadrangle is mapped as Silurian and Devonian in age (Fisher et al, 1970). The northern area is underlain by Syracuse and Akron Dolostone Formations. The southern portion of the quadrangle is underlain by the Skaneateles, Marcellus, Onondaga, and Port Ewen Formations. Drillers' logs indicate the bedrock is layered sedimentary rock of shale or limestone and gray, black, green or red in color.

Surficial Map Units

The Auburn quadrangle is covered by a variety of sediment types deposited by the glacier directly, meltwater from the glacier or post-glacial streams and lakes. These can be grouped into five major categories including diamicton, sand and gravel, fine sand, silt and clay, recent organic deposits, and recent sand and gravel deposits. Diamicton covers the largest percentage of the quadrangle with fine grained sand, silt and clay and sand and gravel comprising the bulk of the rest. Urban and commercial areas in and around the City of Auburn have undergone reworking and change during the holocene and is noticably different from when it was deposited.

Pd & Pdmm

This unit is a mixture of unsorted sediment ranging from clay to boulders. In the Auburn quadrangle all diamicton encountered is interpreted to be glacial till, sediment deposited directly by the glacier and can be upwards of 100 feet thick. Where exposed the diamicton is matrix supported. Color ranges from red to reddish brown to reddish gray to gray. Hand auger samples generally are sandier and less compact than exposures which are very hard, over compacted with a larger percentage of fine silt and clay. This unit is associated with the drumlins in the area and research in this area supports the diamicton is till (Gentoso et. al., 2012; Hopkins et. al., 2014).

Plsc

This unit comprised of bedded fine sand, silt, and clay covers about 33 percent of the quadrangle. The thickness of this unit is highly variable where drill logs indicate that this unit can be as thick as 60 feet while hand auger samples have encountered areas as thin as 1 feet thick over diamicton. It is interpreted that this material was deposited in glacial Lake Iroquois which would have flooded the entire landscape as the glacier retreated northward (Bird and Kozlowski, 2014). Fine sediment suspended in the lake would have settled across the area with thickest accumulations in the low areas between drumlins, thinning on the drumlins.

Psg and Pics

Characterized by stratified sand and gravel with occasional cobbles this unit is interpreted to be deposited by glacial meltwater at or very near the glacier and can be upwards of 80 feet thick. Psg is distributed in a swath along the eastern edge of the quadrangle. An esker, comprised of Pics, can be found in the town of Owasco east of the outlet of Owasco Lake. This esker ridge extends about 0.3 miles southward toward an inferred fan at the eastern edge of the quadrangle. Another esker can be found in the northern portion of the map that is segmented about a mile. The sand and gravel deposits mark an area where the ice front would have stalled for some period of time and subglacial meltwater would have discharged subglacially, depositing sand and gravel in the subglacial channel forming the esker and ahead of the glacier forming the fan. Other areas of stratified sand and gravel likely represent a similar environment without a well preserved esker/fan complex. Barrow pits are common in this unit with very limited large scale gravel mining operating at the time of mapping in the quadrangle.

Ha and Hw

Post glacial sediments occupy the low areas and along the shoreline The organic sediments (Hw) are coincident with wetlands across the area while the alluvium (Ha) is associated with fluvial processes along Owasco Lake Outlet, North Brook, Crane Brook, and Sucker Brook.

Methods

For this map multiple methods were used to gather surface and subsurface data. For field mapping a two meter long hand auger was used to collect samples below the soil to refusal in 65 locations and another 43 samples were collected from excavated areas such as drainage ditches, road and stream cuts, and construction sites. Each of these locations was recorded with a global positioning system (Garmin 72H in NAD 83 UTM 18N coordinates) and the sediment encountered was noted.

Water wells (33 total wells) from the Department of Environmental Conservation (NYSDEC), New York Department of Transportation (NYSDOT) borings(64), and NYSDEC gas and oil well records (8) were also used to decipher the subsurface of the Auburn quadrangle.

Working with the NYDEC water well records, the sediment lithologies were simplified from drillers' descriptions to more concise, uniform descriptions. The thickness of each lithology and bedrock depth was recorded and the location plotted. The uppermost layer under the topsoil was used to delineate the surficial geology while the stratigraphy was used to create a geologic cross section which extends north-south along the eastern margin of the map from A to A'. The same process was followed for the NYSDOT and engineering borings.

Field data were digitized in ArcMap 10.2. Polygons were created based upon the lithology of the surface material and the sample and boring locations were plotted. The cross section was created using Adobe Illustrator CS6 with a topographic profile from ArcMap and wells and boring.

Conclusions

The pattern and character of surficial sediments in the Auburn quadrangle are a result of a retreating glacier across the area. The diamicton was deposited directly by the ice during advance and subsequent retreat of the glacier, in the process forming drumlins. On the final retreat across the area copious amounts of meltwater flooded much central New York creating meltwater channels and then glacial Lake Iroquois. Fine sand, silt and clay washed into the lake from wave erosion of the drumlins and also from subglacial meltwater which then settled on the bottom of the lake. A tract of stratified sand and gravel deposits stretch across the eastern portion of the quadrangle. This tract was deposited as subglacial meltwater exited from beneath the glacier. Three distinct ice marginal positions on the map can be better described as grounding lines as the margin was in contact with glacial Lake Iroquois. After the ice margin retreated and glacial Lake Iroquois drained, organic deposits began to build in the low, wet areas which still persist today.

Acknowledgments

The NYSM/NYSGS would like to thank the staff at Cayuga County Parks and Trails and the City of Auburn. We also thank local land owners and municipalities for access to their prop¬erty and/or data. This mapping was funded by in part by the United States Geological Survey StateMap Grant, Award number G14AC00360

References

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DESCRIPTION OF MAP UNITS

Holocene

- **Af** — **Artifical Fill (Af)** Surficial sediment composed of coarse/fine and or crushed rock anthropogenically transported and used for construction purposes.
- **Ha** — **Stratified silt, sand and gravel (Ha)** Sorted and stratified silt, sand, and gravel, deposited by rivers and streams. May include cobbles and boulders. Inferred as post-glaical alluvium and includes modern channel, over-bank and fan deposits
- **Hw** — **Wetland Deposit (Hw)** Peat, muck, marl, silt, clay or sand deposited in association with wetland environments. Various sediments can be present at transitional boundaries from one facies to another

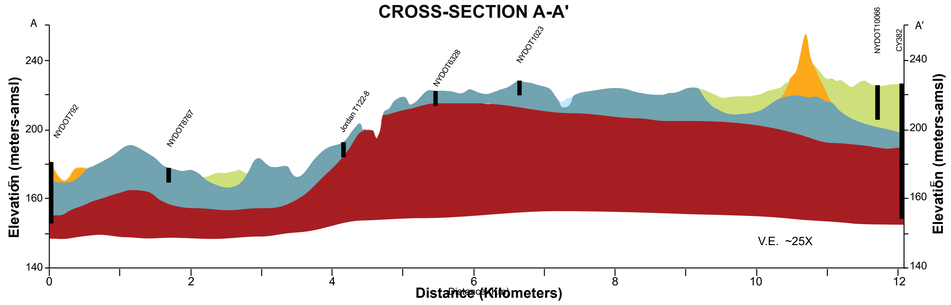
Pleistocene

- **Plsc** — **Silt and Clay (Psc)** Stratified, fine-grained sediment consisting of fine sand, silt and clay size particles. Inferred to be deposited in mid shore to deepwater settings of glacial lakes. May include marl, rythmites, and varves.
- **Pics** — **Cobbles to Sand (Pics)** Stratified ice contacted deposits, variable coarse-grained sediment consisting of boulders to sand size particles. Inferred to be deposited along an ice-margin. May include, interbedded coarse lenses of gravel and clast supported diamictons (flow tills).
- **Psg** — **Stratified sand and gravel (Psg)** Well-sorted and stratified sand and gravel. May include cobbles and boulders. Inferred to be delta, fan or lag deposits in glacial channels or near ice margins.
- **Pd** — **Diamicton (Pd)** An admixture of unsorted sediment ranging from clay to boulders. Generally matrix supported, massive and clast-rich.
- **Pdmm** — **Diamicton (Pdmm)** An admixture of unsorted sediment ranging from clay to boulders. Generally matrix supported, massive and clast-rich.

Pre-Pleistocene

- **Br** — **Bedrock (Br)** Non-glacially derived, hard rock, pre-pleistocene in age. May be covered up to a meter in diamicton, sand and gravel, or sand and clay in areas marked as Br.

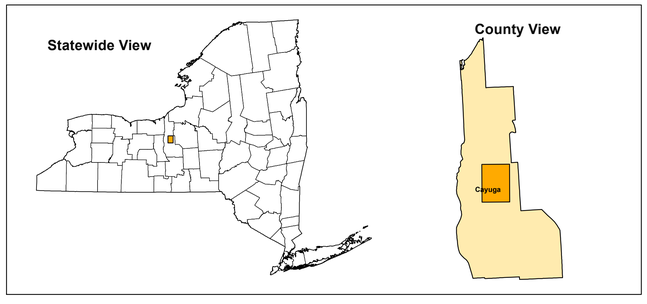
CROSS-SECTION A-A'



SYMBOLS

- Streets
- Highways
- Railroads
- Contours
- Water Bodies
- Streams
- Cross-Section Line
- Urban Area
- NYSGS Soil Sample Location
- NYSDEC Water Well Location
- NYSDOT Boring Location
- NYSDEC Oil & Gas Well Location
- Drumlins
- Meltwater Channel
- Eskers
- Ice Margin
- Fan Deposits

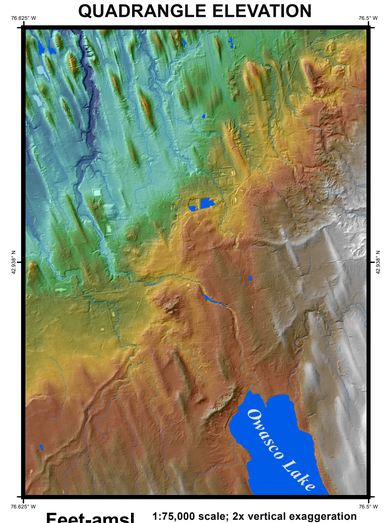
QUADRANGLE LOCATION



ADJOINING QUADRANGLES

Montezuma	Weedsport	Jordan
Cayuga	Auburn	Skaneateles
Union Springs	Scipio Center	Owasco

QUADRANGLE ELEVATION



Feet-amsl
440 980

1:75,000 scale; 2x vertical exaggeration

Shaded relief generated from the 2000 Cayuga County 2-meter lidar data set.

New York State Museum Map & Chart No. 82

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