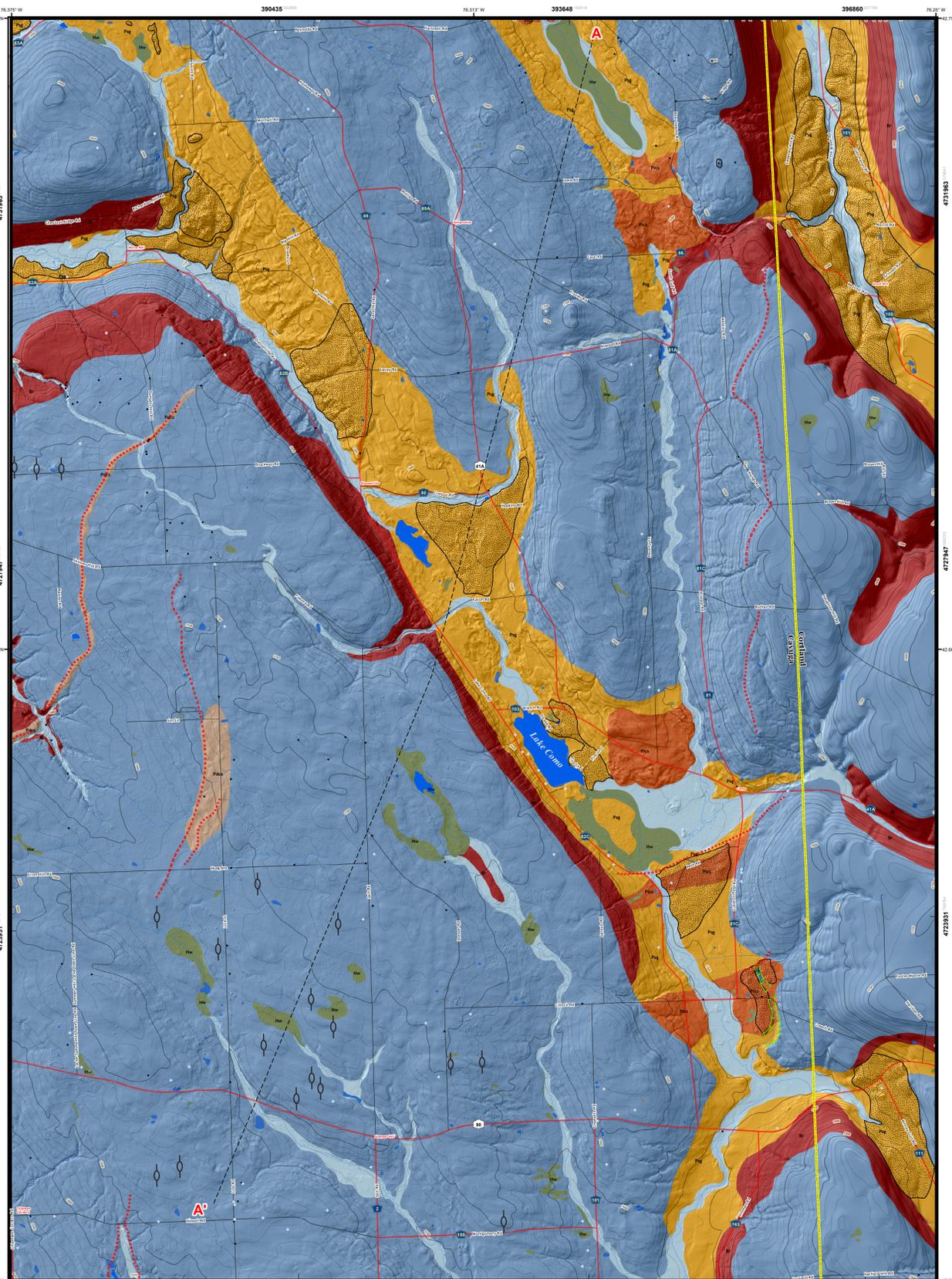


SURFICIAL GEOLOGY OF THE SEMPRONIUS 7.5-MINUTE QUADRANGLE, CAYUGA AND CORTLAND COUNTIES, NEW YORK

prepared by
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Introduction

The surficial geology of the Sempronius 7 1/2 minute quadrangle was mapped in 2014-15 as part of a National Cooperative Geologic Mapping Program funded StateMap project (award G15AC00340). This map is part of a larger project of the New York State Geological Survey to map all of Cayuga County, New York. The purpose of this map was to identify and delineate various surficial materials in the Sempronius quadrangle with the intent that this information can guide municipalities in land use, environmental, and natural resource decisions.

The Sempronius quadrangle is located in central New York south of the Interstate 90 corridor and East of the Interstate 81 corridor about 40 miles southwest of Syracuse, NY. Included within the quadrangle are the towns of Sempronius, Scott, Homer, Summerhill, Locke, and Moravia. This area is rural with large tracts of forest and agriculture. Situated on the Allegheny Plateau physiographic province the landscape is generally rolling topography with deeply incised glacial troughs. The greatest elevation is 1805 feet above sea level in the northeastern portion of the quadrangle with the lowest being 960 feet in the Groat Brook channel flowing into Skaneateles Lake in the extreme northeastern portion of the map. 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 geomorphologically as similar features. For instance sorted sands and gravels are located in the deep glacial troughs.

Bedrock is exposed throughout the quadrangle mostly on hill tops and steep hillsides. According to various drilling logs the depth to bedrock ranges from 0 to 142 feet across the quadrangle. An average depth to bedrock for the quadrangle is about 40 feet. The bedrock beneath the glacial sediments in the quadrangle is mapped as Devonian in age (Fisher et al., 1970) and includes the Genesee Group, Tully Limestone, and Hamilton Group. 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 Sempronius 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.

Pd and Pdc

This unit is a mixture of unsorted sediment ranging from clay to boulders. In the Sempronius quadrangle all diamicton encountered is interpreted to be glacial till, sediment deposited directly by the glacier and can be upwards of 85 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. Pdc's is a clast-supported diamicton that comprises the moraines visible at the surface. The clast-supported nature of this diamicton is caused by the deposition of coarser sediment during the building of these moraine structures across the highlands in this quadrangle.

Pisc

This unit comprised of bedded fine sand, silt, and clay. The thickness of this unit is highly variable where drill logs indicate that this unit can be as thick as 30 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 a glacial lake which would have flooded the glacial troughs as the glacier retreated northward (Bird and Kozlowski, 2014).

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 35 feet thick. Psg is distributed in the glacial troughs and mark areas where the ice front would have stalled for some period of time and meltwater would have deposited sand and gravel in the trough ahead of the glacier forming the fan. Pics is found in the same areas as Psg, but its much coarser and is inferred to be an ice-contact facies associated with meltout along the ice margin. Other areas of stratified sand and gravel likely represent water washing across the land surface, depositing sediments into the glacial lake within the trough. 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 (Dwyer, 1995) The organic sediments (Hw) are coincident with wetlands across the area while the alluvium (Ha) is associated with fluvial processes along Fall Creek, Mill Brook, Dresserville Creek, and Bear Swamp Creek.

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 while other samples were collected from excavated areas such as drainage ditches, road and stream cuts, and construction sites. Each of these locations (124 total) was recorded with a global positioning system (Garmin 72H in NAD 81 UTM 18N coordinates) and the sediment

encountered was noted. Water wells (24 total wells) from the Department of Environmental Conservation (NYDEC) were also used to decipher the subsurface of the Sempronius 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 central portion of the map from A to A'. 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 Sempronius 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 melt water channels and then glacial lakes. The lower troughs filled with fine grained lacustrine sediments as well as coarser sand and gravel nearer the glacier margin.

Acknowledgments

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DESCRIPTION OF MAP UNITS

Holocene

- 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-glacial 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.

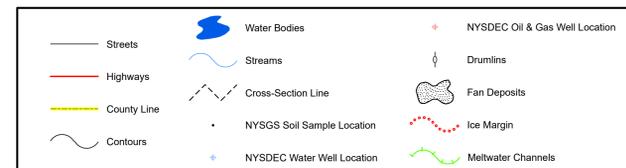
Pleistocene

- Pisc** Silt and Clay (Pisc)
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, rhythmites, 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 till).
- 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.
- Pdc** Diamicton (Pdc)
An admixture of unsorted sediment ranging from clay to boulders. Generally clast supported, massive and clast-rich.

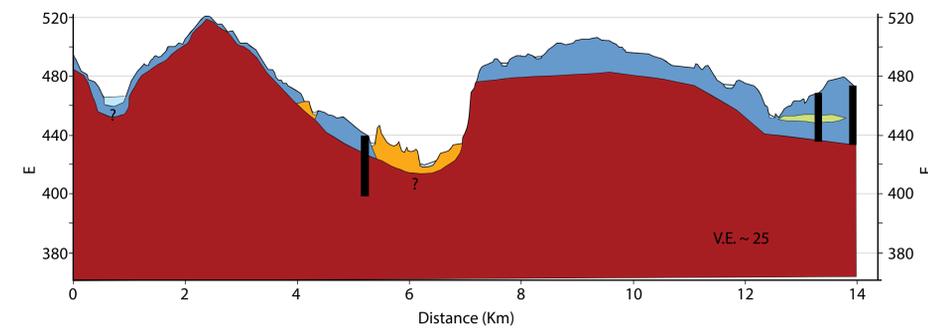
Pre-Pleistocene

- 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.

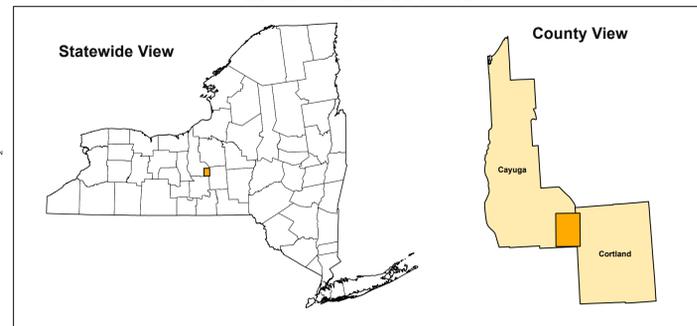
SYMBOLS



CROSS-SECTION A-A'



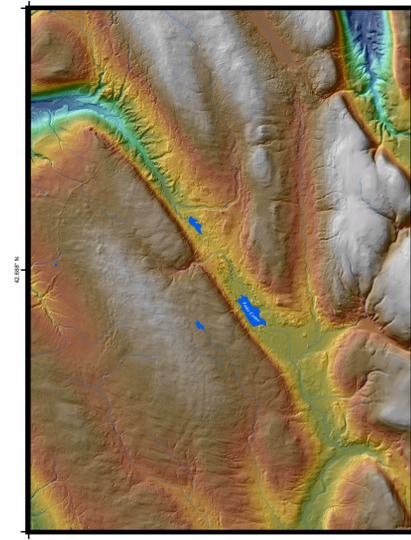
QUADRANGLE LOCATION



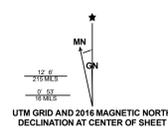
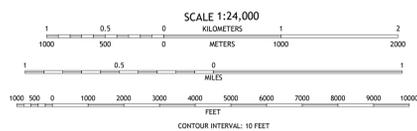
ADJOINING QUADRANGLES

Owasco	Spartford	Owasco Valley
Moravia	Sempronius	Homer
West Groton	Groton	Cortland

QUADRANGLE ELEVATION



Universal Transverse Mercator, Zone 18 N
North American Datum of 1983
Hydrology, and planimetry layers from the New York State DOT Raster Quadrangle separates for Cayuga and Cortland Counties
(<http://nys.gov/dot/raster/quadrangle/separates>)
Geographic data layers from 2015 TIGER/Line shapefiles for transportation and hydrography
(<http://www.census.gov/geographic/tiger/index.php>)
Shaded relief from the Cayuga County 2-meter and the NYS 10m DEM lidar data sets
(<http://nys.gov/geo/remote/index.cfm>)
Magnetic declination from the NOAA online Declination Calculator:
<http://www.ngdc.noaa.gov/geomag-web/#declination>



Geologic mapping by Brian Bird and K.J. Backhaus, 2015 & 2018
Digital data and cartography, B. Bird and K. Backhaus, 2015 & 2018.

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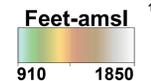
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2016

NOTICE

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1:75,000 scale; 2x vertical exaggeration
Shaded relief generated from 2000 Cayuga County 2-meter and the New York State 10-meter lidar data sets.