New York State Museum
Mark Schaming, Director

New York State Geological Survey

SURFICIAL GEOLOGY OF THE OWASCO 7.5-MINUTE QUADRANGLE, CAYUGA AND ONONDAGA COUNTIES, NEW YORK

prepared by
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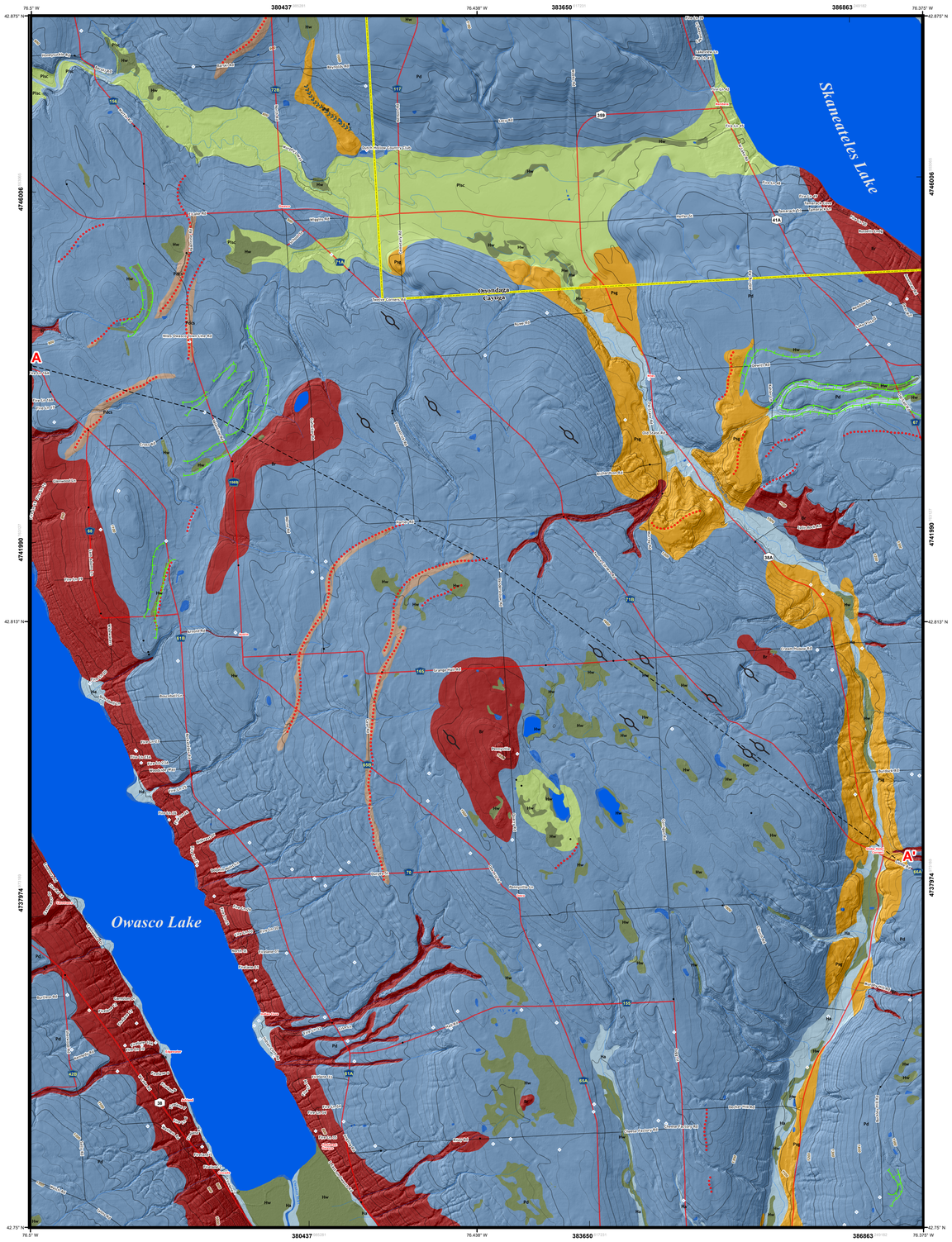
Supported in part by the U.S Geological Survey's
National Cooperative Geologic Mapping Program STATEMAP Award Number G16AC00293



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 Onondaga Counties
(https://gis.ny.gov/gisdata/inventories/member.cfm?OrganizationID=108).
Geographic data layers from 2019 TIGER/Line shapes for transportation
and hydrography (https://www.census.gov/cgi-bin/geo/shapefiles/index.php)

Shaded relief from Cayuga County 2-m,
NYS 10m DEM, and Onondaga 3-meter 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

Geologic mapping by Brian Bird and Karl Backhaus, 2017-2018
Digital data and cartography, B. Bird and Karl J. Backhaus, 2017 & 2018.

MN
GN
-12° 9'
216 MILS
0° 59'
17 MILS
UTM GRID AND 2016 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

Introduction

The surficial geology of the Owasco 7 ½ minute quadrangle was mapped in 2016-17 as part of a National Cooperative Geologic Mapping Program funded StateMap project (award # G16AC00293). 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, geologic materials in the Owasco quadrangle with the intent that this information can guide municipalities in land use, environmental, and natural resource decisions.

The Owasco quadrangle is located in central New York south of the Interstate 90 corridor about 20 miles southwest of Syracuse, NY. Included within the quadrangle are the towns of Owasco, Skaneateles, Niles, and Moravia, and Spafford. This portion of the county is rural with large tracts of forest and agriculture. Owasco Lake in the southwestern portion of the quadrangle and Skaneateles Lake in the northeast are developed with many vacation residences.

Situated in the Allegheny Plateau physiographic province the landscape is generally rolling topography with some steep sided gullies along the lake shores and Dutch Hollow Creek. The greatest elevation is in the central portion of the quadrangle at 1,608 feet above sea level with the lowest being 717 feet, Owasco Lake. Glacial sediment is generally thin across the area The thickest from NYDEC water well logs being 73 feet on the edge of the Dutch Hollow Creek in Niles. 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.

Bedrock is exposed or thinly covered across about 8.5 percent of the quadrangle and according to various drilling logs and surface exposures the depth to bedrock ranges from 0 to 73 feet with an average depth for the quadrangle at about 28 feet. The bedrock beneath the glacial sediments in the quadrangle is mapped as Devonian in age (Fisher et al, 1970). The rocks include those of the Genesee Group specifically the West River Shale, Tully Limestone and Hamilton Group, namely the Moscow, Ludlowville, and Skaneateles 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 Owasco 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

This unit is a mixture of unsorted sediment ranging from clay to boulders and covers about 78 percent of the quadrangle. In the Owasco quadrangle all diamicton encountered is interpreted to be glacial till, sediment deposited directly by the glacier, and can be upwards of 35 feet thick. Where exposed the diamicton is matrix supported. Color ranges from reddish brown to reddish gray to gray. Hand auger samples generally are sandier and less compact than exposures which are very hard, with a larger percentage of fine silt and clay. This unit is similar to the till in association with the drumlins to the north of the area and research in that area supports the diamicton is till (Gentoso et. al., 2012, Hopkins et. al., 2014). In some areas the till is less than a meter thick.

Plsc

This unit comprised of bedded fine sand, silt, and clay covers about 5 percent of the quadrangle. The thickness of this unit is highly variable where drill logs indicate that this unit can be as thick as 54 feet. It is interpreted that this material was deposited in a glacial lake which would have flooded the 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 area between Skaneateles Lake and Owasco Lake.

Psg

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 it can be upwards of 34 feet thick and covers about 4.5 percent of the quadrangle. Psg is distributed mostly along the Dutch Hollow Creek. An esker can be found in the town of Owasco near the northern border of the quadrangle. This esker ridge extends about 0.5 miles southward. The sand and gravel deposits mark an area along Duch Hollow Creek where the subglacial meltwater would have discharged, depositing sand and gravel in the channel forming the esker beneath the ice and instead of the glacier forming a fan near the town of Niles. Other areas of stratified sand and gravel along the creek 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 accounting for the remaining map area occupy the low areas and along the Owasco Lake shoreline to the south and basins across the uplands. The organic sediments (Hw) are coincident with wetlands while the alluvium (Ha) is associated with fluvial processes along Owasco Lake inlet and Dutch Hollow 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 top soil to refusal in 45 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 (32 total wells) from the Department of Environmental Conservation (NYDEC), New York Department of Transportation (NYDOT) borings(4), and NYDEC gas and oil well records (1) were also used to decipher the subsurface of the Owasco 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 NYDOT 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 NYDEC water wells and NYDOT borings.

Conclusions

The pattern and character of surficial sediments in the Owasco 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 Lakes Ithaca, Newberry and Hall (Bird and Kozlowski, 2014). Fine sand, silt and clay washed into the lakes from subglacial meltwater as well as flow from eastern lakes which then settled on the bottom of the lake. Stratified sand and gravel deposits line the Dutch Hollow Creek valley and were likely deposited as subglacial meltwater exited from beneath the glacier or as fans washing into the lake from the uplands. Several distinct ice marginal positions are identified on the quadrangle. These margins are traceable to adjacent quadrangles and are interpreted as recessional in nature. After the ice margin retreated and glacial lakes drained, organic deposits began to build in the low, wet areas which still persist today.

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-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.

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.

Pdcs — **Diamicton (Pdcs)**
An admixture of unsorted sediment ranging from clay to boulders. Generally clast supported, massive and clast-rich.

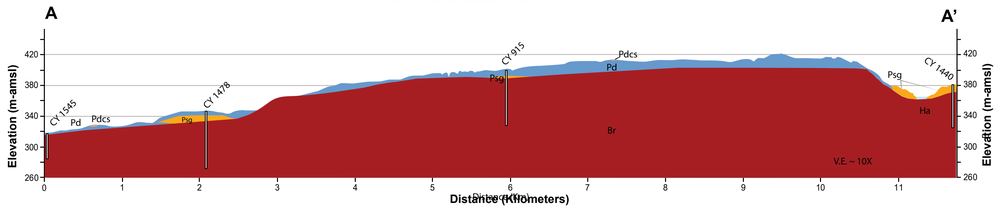
Pre-Pleistocene

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.

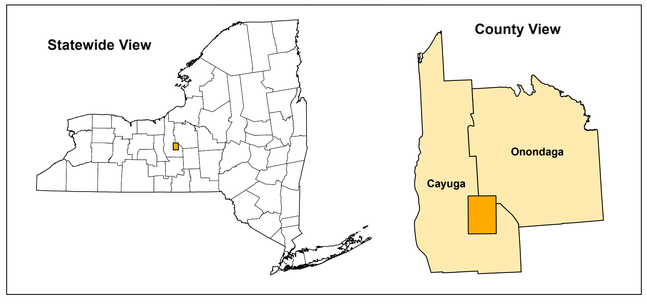
SYMBOLS

Streets
Highways
County Line
Contours
Streams
Water Bodies
Cross-Section Line
NYSGS Soil Sample Location
NYSDEC Water Well Location
NYSDEC Oil & Gas Well Location
NYSDOT Boring Location
Drumlins
Esker
Meltwater Channel
Ice Margin

CROSS-SECTION A-A'



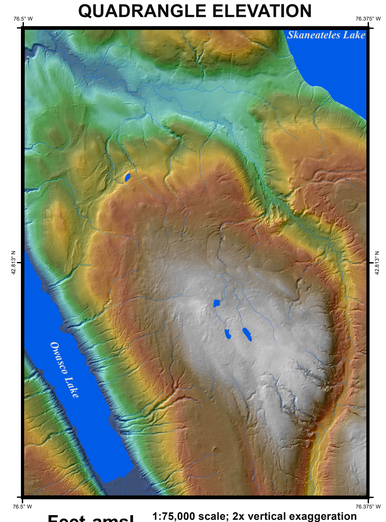
QUADRANGLE LOCATION



ADJOINING QUADRANGLES

Auburn	Skaneateles	Marcellus
Scipio Center	Owasco	Spafford
Genoa	Moravia	Sempronius

QUADRANGLE ELEVATION



Feet-amsl
710 1625

1:75,000 scale; 2x vertical exaggeration

Shaded relief generated from 2000 Cayuga County 1m, 2003 Onandaga County 3m and the New York State 10m lidar data sets provided by the NYS GIS Clearinghouse.

NOTICE

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2016