New York State Museum & Science Service

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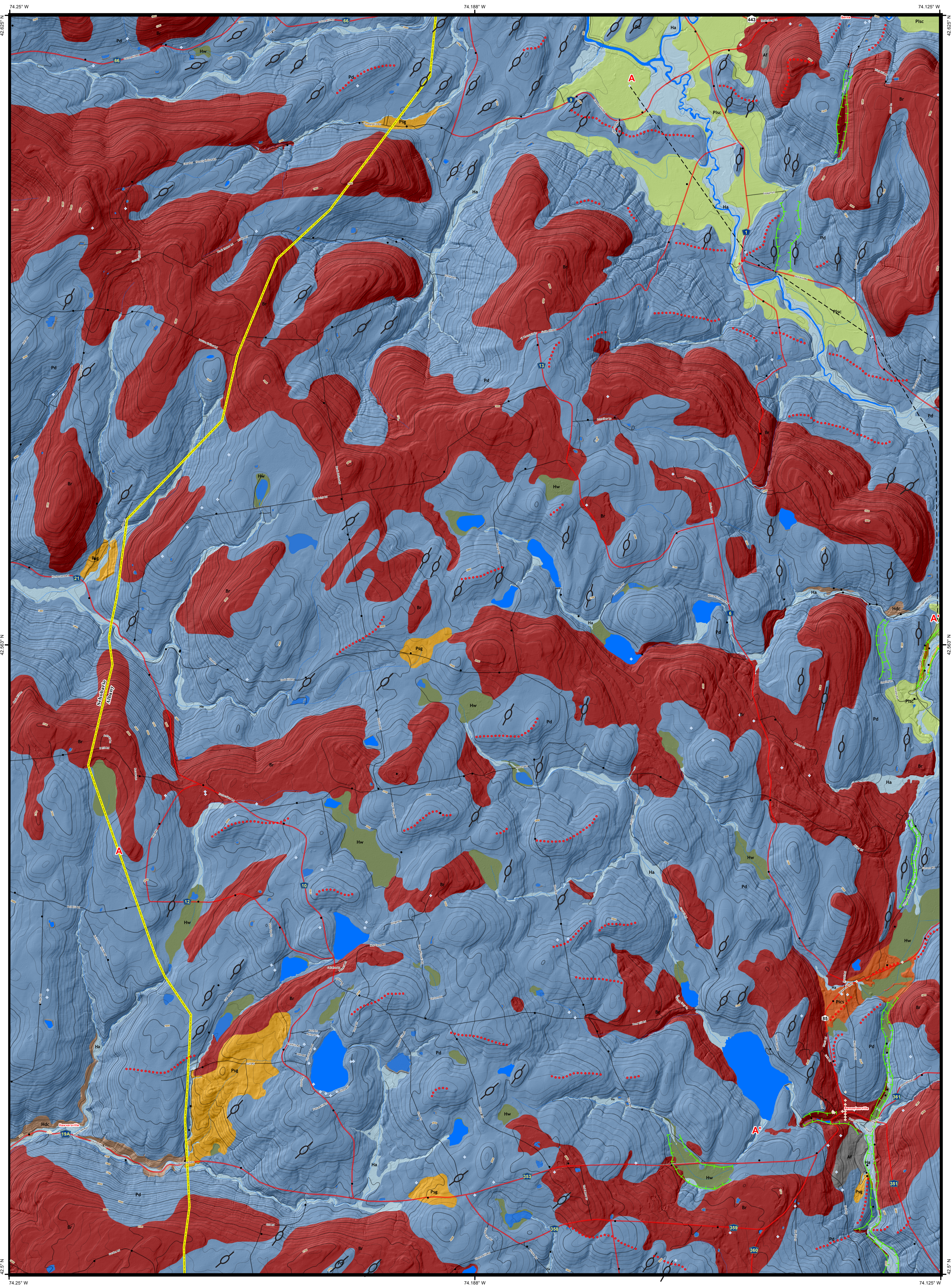
New York State Geological Survey



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 Albany and Schoharie Counties:
(https://gis.ny.gov/gisdata/inventories/member.cfm?OrganizationID=108)

Geographic data layers from 2020 TIGER/Line shapes for transportation and hydrography:
(https://www.census.gov/cgi-bin/geo/shapefiles/index.php)

Shaded relief from FEMA 2019, and Schoharie 1m 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

KILOMETERS 1 0.5 0 1 2
METERS 1000 500 0 1000 2000
MILES 1 0.5 0 1
FEET 1000 500 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

CONTOUR INTERVAL: 10 FEET

Geologic mapping by J. Leone, A. Alrubay and A. Kozlowski, 2021
Digital data and cartography, K. Backhaus and J. Leone, 2021

MN GN
13' 12' 235 MILS
0' 33' 10 MILS

UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SURFICIAL GEOLOGY OF THE RENSSELAERVILLE 7.5-MINUTE QUADRANGLE, ALBANY AND SCHOHARIE COUNTIES, NEW YORK

James R. Leone and Andrew L. Kozlowski
2021

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prepared by
James R. Leone and Karl J. Backhaus

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National Cooperative Geologic Mapping Program (STATEMAP)

INTRODUCTION:
The Rensselaerville 7.5-Minute Quadrangle was mapped as part of the 2020 National Cooperative Geologic Mapping Program funded STATEMAP project (award #G19AC00249). This quadrangle is one of 18 full and partial quadrangles to be mapped as part of the Albany County Surficial Geologic mapping project currently being undertaken by the NYSGS started in 2016 and concluding sometime in the early to mid-2020s. The purpose of this map was to identify and delineate various surficial and geologic materials with the intent that this information can guide municipalities in land use, environmental and natural resource decisions across its roughly 55 square mile area.

The Rensselaerville quadrangle is situated in southwestern Albany and eastern Schoharie Counties. The quadrangle is approximately 20 miles west of the City of Albany while the Hamlet of Rensselaerville is the largest residential area in the quadrangle. New York State Route 85 ends at the intersection with Albany County Route 351 within the hamlet. The towns of Rensselaerville and Berne in Albany County and the towns of Wright and Broome within Schoharie County occupy portions of the quadrangle. The quadrangle is mainly forest lands with rural vacant farmland and recreational properties with large portions of the quadrangle are comprised of New York State Land with few private nature preserves.

The quadrangle is situated in the northern Catskill Mountains Physiographic Province on what is known as the Helderberg Plateau. The historic highpoint of Albany County is known as Henry Hill, just north of Peasly Road. This hilltop was removed due to a quarry operation and is currently below today's highpoint. Henry Hill is located just south of Peasly Road near the Partridge Run State Forest land at an elevation 2164 feet (660 meters) above mean sea-level (amsl). The lowest elevation at 888 feet-amsl (270 m-amsl) is the Fox Creek floodplain in which the creek flows north out of the quadrangle. The high points and the other hill tops that are oriented roughly west to east in the central portion of the quadrangle forms a section of the drainage divide that separates the Schoharie Creek Watershed that drains to the Mohawk River and the Catskill Creek Watershed that drains to the Hudson River.

The bedrock in the quadrangle has been mapped for STATEMAP previously by Charles Ver Straeten (2010) at 1:24,000 scale. The bedrock within the Rensselaerville quadrangle consists of sedimentary rocks of the Middle Devonian Age. The bedrock units in the quadrangle are roughly flat-lying and subtly dip towards the south. A small amount of Devonian Age Onondaga Limestone is exposed just north of New York Route 443. The remainder of the quadrangle is comprised of the Devonian Hamilton Group.

The surficial geologic units in this quadrangle were previously mapped at 1:250,000 scale and were reported to be kame, lacustrine sand, recent deposits (alluvium), till, kame moraines, outwash sands and gravels, and lacustrine silt and clay (Cadwell, et. al., 1986). Dineen (1986) speculated that the quadrangle was completely covered with glacial ice during the Rosendale readvance, then the assumption that stagnating ice remained covering the landscape until it was overridden by the Middleburgh readvance. Lack of multiple reliable age date and having mapped the area prior to reliable Lidar data likely makes these assumptions subject to change with better age constraints. The immediately observable geomorphic feature in the quadrangle is the streamlined hills commonly known as drumlins and the much longer hills known as flutes. These landforms were possibly formed by the Helderberg Sub-lobe, but it is to be noted that these drumlins are not as well defined on the landscaped compared to flutes and drumlins in areas north and east of the quadrangle.

METHODS:
Field mapping in the quadrangle took place during the Spring of 2021. Field mapping was undertaken by traverses either in a state vehicle and/or by foot. Surficial soil sampling employed the use of a five-and-a-half-foot hand auger to allow sampling below the variably thick organic soil horizon. An entrenching tool was also used to expose fresh sediments for collection and consists of a shovel and pick. At each field stop, the coordinates (latitude and longitude in decimal degrees) were taken (using a handheld Garmin 66st GPS unit), descriptive notes on the sediment found, whether a high-resolution photo and/or sample was/were taken, and the time at which the GPS coordinates were logged into a field notebook (Leone_21, TPK_FN6). A dry erase note card was used in each photo to denote the field stop.

At most of the field sampling sites, a soil sample was taken for grain-size analysis. This employs the use of either one or two processes: dry-sieve or wet-sieve analysis. These processes followed the procedure outlined by Bowles (1978), while only using a seven-tiered sieve stack (#5, #10, #18, #35, #60, #120, #230, and Pan) for both dry- (mechanical) and wet- (hydrometer) sieve analysis. The predominantly cohesive (fine-grain dominant) samples were sorted using the wet-sieve analysis, while the cohesionless (coarse-grain dominant) samples were sorted using the dry-sieve analysis.

To create the surficial geology map of the Rensselaerville quadrangle, preliminary field maps were created using the ESRI ArcMap 10.7 software and consisted of all available topographic data (roads, lidar surface terrain, and hydrography) to plot all field data on including field stops, bedrock outcrops, and important site information. The information plotted on the field map was transferred onto mylar and materials-based polygons were drafted by hand. When the hand-drawn map was finalized, it was scanned on a large format scanner into an image file to be digitized.

The final surficial geologic map, cross-section, and elevation maps were produced using the ESRI ArcMap and Adobe Illustrator CS6 programs. The subsurface and surface units were compiled using 171 water wells from the New York State Department of Environmental Conservation and 27 engineering boreholes by the New York State Department of Transportation. The cross-sections were created in ArcMap using the XActo Cross-section 10 tool developed by Jennifer Carell, formerly of the Illinois Geologic Survey, and then exporting the cross-section into Adobe Illustrator to connect the stratigraphic units. The surficial geologic map was created by producing polygons to digitize the map in ArcMap and colored according to surficial geologic units found within the quadrangle. The final map was drafted in Adobe Illustrator and exported as a PDF file.

RESULTS:
A total of 188 field stops were made with 110 samples collected for grain-size analysis, within the quadrangle. Some stops contained more than one sample as they exhibited stratigraphy either in exposure or at depth with the hand-auger. The final count for lithologies found during field sampling was: 128 stops were diamicton, 36 were bedrock, 11 stops were glaciolacustrine silt, fine sand, and clay, nine were sand and gravel, and three were fine to coarse sand. The surficial geologic units found within the quadrangle are as follows:

Artificial Fill (Af)
This unit is generally composed of coarse/fine, large cement mounds and/or crushed rock anthropogenically transported and used for construction purposes. This material is used in artificial dams, built to retain water and large, raised roadbeds for bridges within the quadrangle.

Holocene Alluvium (Ha) and Holocene Wetland Deposits (Hw)
Post glacial sediments occupy the low areas or land depression throughout the quadrangle. Ha is associated with a fluvial process in creek valleys throughout the quadrangle. This lithology generally consists of stratified silt, sand, and gravel. Hw is associated with low areas and depressions in the highlands of the quadrangle where wetlands form due to poor drainage. This lithology consists of peat, marl, clay, or sand in these areas of poor drainage.

Holocene Diamict Colluvium (Hdc)
Unsorted and unstratified deposit of gravel, sand, silt, clay, with boulders/cobbles possible. Described as a mass-wasting deposit at the base of steep hillslopes and cliffs as part of a slump or hillslope failure. These sediments are prevalent along Schoharie County Route 19a.

Pleistocene Silt and Clay (Plsc)
Stratified, fine-grained sediment consisting of fine sand, silt and clay size particles. Inferred to be deposited in mid-shore to deep-water settings of glacial lakes. May include marl, rhythmites, and varves. Plsc is found in the low-lying areas along Switzkill Road, and Gifford Hollow Road along the eastern side of the quadrangle.

Pleistocene 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. Mostly adjacent to the Pics deposits and these deposits are found mainly in the south-central and western portions of the quadrangle.

Pleistocene Sand (Ps)
Well-sorted and stratified sand, deposited by fluvial, lacustrine or eolian processes. Inferred as deposits associated with distal glacial environments. Well-sorted sand deposits were observed down-slope from deposits of coarser sand and gravel deposits.

Pleistocene Ice-Contact Cobbles and Sand (Pics)
Stratified ict 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). Deposits of this type are found along the Delaware Turnpike at an ice-marginal outwash fan.

Pleistocene Diamicton (Pd)
This unit is a mixture of sediment grains that range from clay to boulders in size. In this quadrangle, all diamicton is interpreted to be glacial till sediment is deposited directly beneath the glacier. It is generally matrix-supported, sand-dominant, and blue and purple, brown. Diamicton is found throughout the quadrangle independent of elevation, underlies much of the other surficial geologic units, and makes up the drumlins within the quadrangle.

SUMMARY AND CONCLUSIONS:
The Rensselaerville quadrangle's dominant surficial geologic unit is diamicton (interpreted as glacial till or till). Devonian bedrock is also well exposed throughout the quadrangle as erosion-resistanting benches of limestone, sandstones, siltstones, and shale. Valleys and ravines throughout the quadrangle are lined with alluvium with large gravel to boulders -sized clasts present. Wetlands are not limited to just wide valley bottoms as many wetlands also occur at higher elevations. Near the top of Henry Hill lies a large, isolated wetland to the southwest of its peak. Glaciolacustrine fine-grained sediments can be found within the Switzkill Valley and along Gibson Hollow Road. Bedded sand deposits are located on the eastern edge of the quadrangle adjacent to Holocene wetland deposits. Gravel and sand deposits are found sporadically throughout the quadrangle.

The dominant bedrock lithologies in the area are mostly Middle Devonian aged Hamilton Group's clastic rock and limestone. Except for a section of older Middle Devonian Onondaga Limestone exposed in the extreme northeast corner of the quadrangle near the Town of Berne highway garage. Exposures of bedrock are not limited to the hilltops as it is well exposed in creeks and in many locations where thin soil or till covers the surface.

Drumlins in the Rensselaerville quadrangle are broader and more irregular in shape compared to the highly streamlined drumlins and flutes in the Westerlo Quadrangle (Leone and Kozlowski, 2020). It can be inferred that the Helderberg Sub-lobe of the Hudson Lobe formed these landforms in the general NNE to SSW direction as it moved through the region. The irregular shape of these streamlined features and the high elevation of the quadrangle may represent a decrease in velocity of the Helderberg Sub-lobe. Another possibility for the irregular shape of the drumlins is that these landforms may be palimpsest as remnants of prior glacial advances through the region. Striations with a strike of

SUMMARY AND CONCLUSIONS: Continued...
220° can be found on bedrock located on Gordon Road in the very southwestern edge of the quadrangle. These striations are oriented in the same direction as the streamlined landforms.

Small continuous ridgelines that are oriented perpendicular and on top of the streamlined landforms appear to be a series of recessional moraines. Based on lidar and field observations there may be up to ten of these recessional moraines deposited across the quadrangle oriented roughly west to east. The direction of retreat may have varied in orientation from the direction the sub-lobe advanced. The dates of these advances and retreats are difficult to constrain due to lack of datable material between them. These moraines can also be observed in the lower elevations of the Switzkill Valley. An increase in clast size can be observed near the top of the northern-most moraine in the Switzkill Valley. The most prominent bedrock exposures in the quadrangle are also on trend with these recessional moraines and may be representative as ice margins as well.

Glaciolacustrine sediments, specifically at the northern end of the Switzkill Valley near the Town of Berne which likely represent temporal Glacial Lake Fox Creek proposed by Dineen (1986). Glacial Lake Fox Creek may have existed while the Helderberg Sub-lobe was retreating northeast into the Hudson Valley and may be the culmination of a series of smaller recessional pro glacial lakes along the eastern edge of the quadrangle. New York DEC water wells reports in the Switzkill Valley report sections of thick lake sediments with bedrock depths deeper than 200 feet from the surface.

Field observations along Gifford Hollow Road and in a tributary branch of the Switzkill Creek yielded a variety of sediments that represent a series of possible ponding of small lakes along the flanks of the valley. Outwash sand and gravel deposits are also found that were deposited in a meltwater channel that likely emptied south. An Optically Stimulated Luminescence (OSL) sample was collected in a bedded sand deposit along this meltwater pathway, of which the results are pending at the time of this report.

The recessional moraines that align perpendicular to the drumlins, give clues of the events during the ice retreat out of the northern Catskills Mountains back to the Helderberg Plateau. The Helderberg Sub-lobe's advance to the south and west of the quadrangle before retreating northward. This retreat resulted in the construction of the recessional moraines present in the Switzkill Valley. These moraines were part of the drainage system associated with the Switzkill/Ten Mile Creek (TMC) valleys. As the lobe receded, ponding of meltwater likely occurred, impounded by ice to the north and till/bedrock hillsides to the east and west. These small lakes drained as the water trapped between the recessional moraines and the valley walls could make its way to the TMC Valley from glacial retreat or the water level rose high enough to spill into the valley. Present-day Lake Myosotis (Proglacial Lake Huyck) was likely the earliest proglacial lake to form in the quadrangle. Proglacial Lake Huyck collected glacial melt water from the adjacent uplands and up ice and as ice retreated north, water began to drain and cut the bedrock canyon that is present today. A temporal glacial lake (Proglacial Lake Gifford) formed just north of Rensselaerville that drained southward through the narrow north-south oriented spillway that contains the present-day headwaters of the TMC. Glacial Lake Gifford continued to fill and drain through the Rensselaerville channel as ice continued to retreat northward up the TMC meltwater system. There is evidence of outwash terraces comprised of outwash sands and gravel, and massive boulders with sporadic glaciolacustrine deposits. These events took place while the Glacial Lake Fox Creek and the Switzkill Valley were filled with ice. Glacial ice likely had to decouple from the northern Catskills along Abrams Road in the Gallupville quadrangle (Leone, et. al., 2020) before water could drain into the Schoharie Valley. Further work collecting sediment cores in isolated wetlands will help better understand the timing of ice melt out in the region.

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DESCRIPTION OF MAP UNITS

Holocene

Af — **Artifical fill (Af)**
This unit is generally comprised of coarse-to-fine materials, such as large cement mounds and/or crushed rock, which have been 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-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

Hdc — **Diamict colluvium (Hdc)**
Unsorted and unstratified deposit of gravel, sand, silt, and clay, with boulders/cobbles possible. Described as a mass-wasting deposit at the base of steep hillslopes and cliffs that was formed as part of a slump or hillslope failure.

Pleistocene

Plsc — **Silt and clay (Plsc)**
Stratified, fine-grained sediment consisting of fine sand, silt and clay size particles. Inferred to be deposited in mid-shore to deep water settings of glacial lakes. May include marl, rythmites, and varves.

Ps — **Stratified sand (Ps)**
Well-sorted and-stratified sand, deposited by fluvial, lacustrine or eolian processes. Inferred as deposits associated with distal glacial environments.

Pics — **Cobbles to sand (Pics)**
Stratified ice contact deposits; variable coarse-grained sediment consisting of boulders to sand size particles. Inferred to have been deposited along an ice-margin. May include, interbedded coarse lenses of gravel and clast supported diamictons (flow tills).

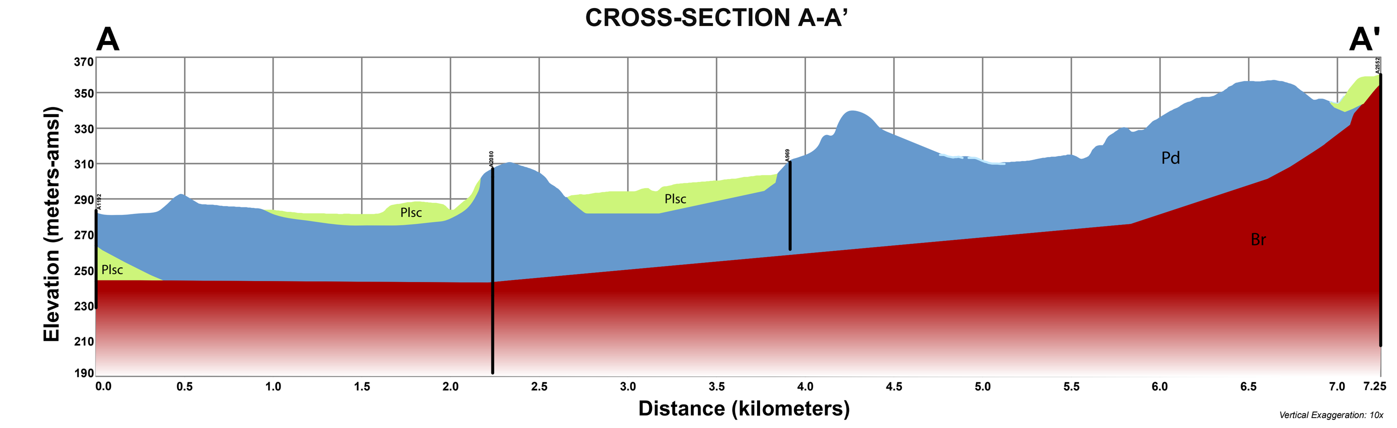
Psg — **Stratified sand and gravel (Psg)**
Well-sorted and stratified sand and gravel. May include cobbles and boulders. Inferred to be delta, fan or lag deposits in glacial channels or near former ice margins.

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

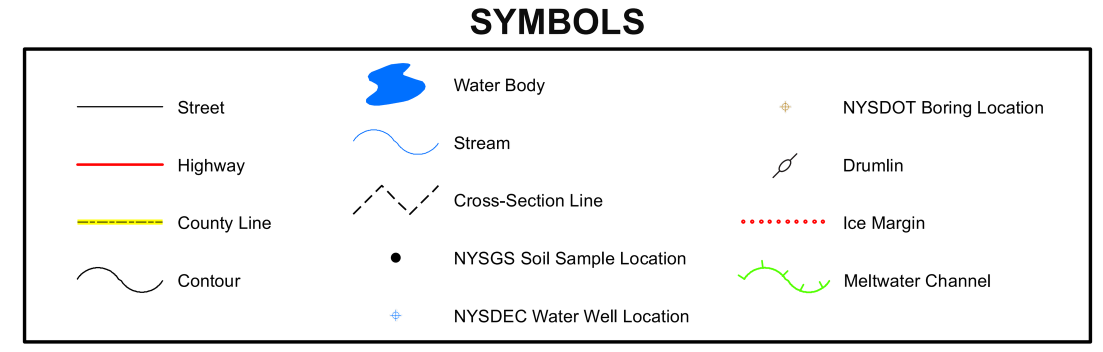
Pre-Pleistocene

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.

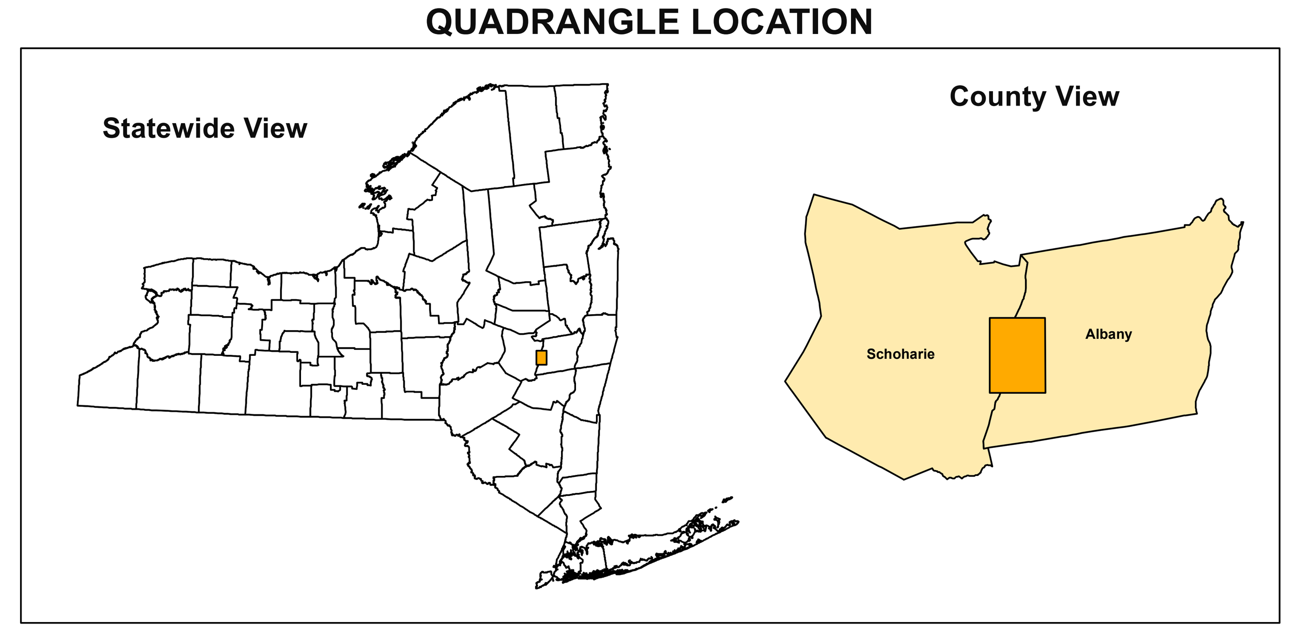
CROSS-SECTION A-A'



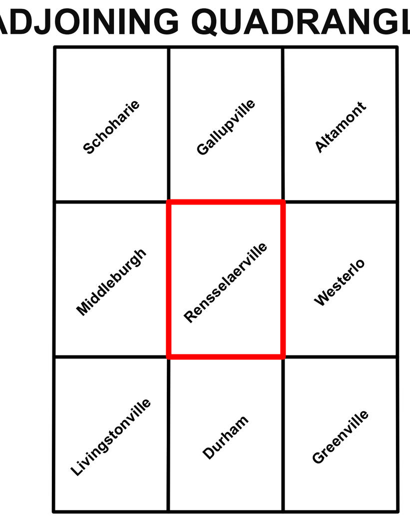
SYMBOLS



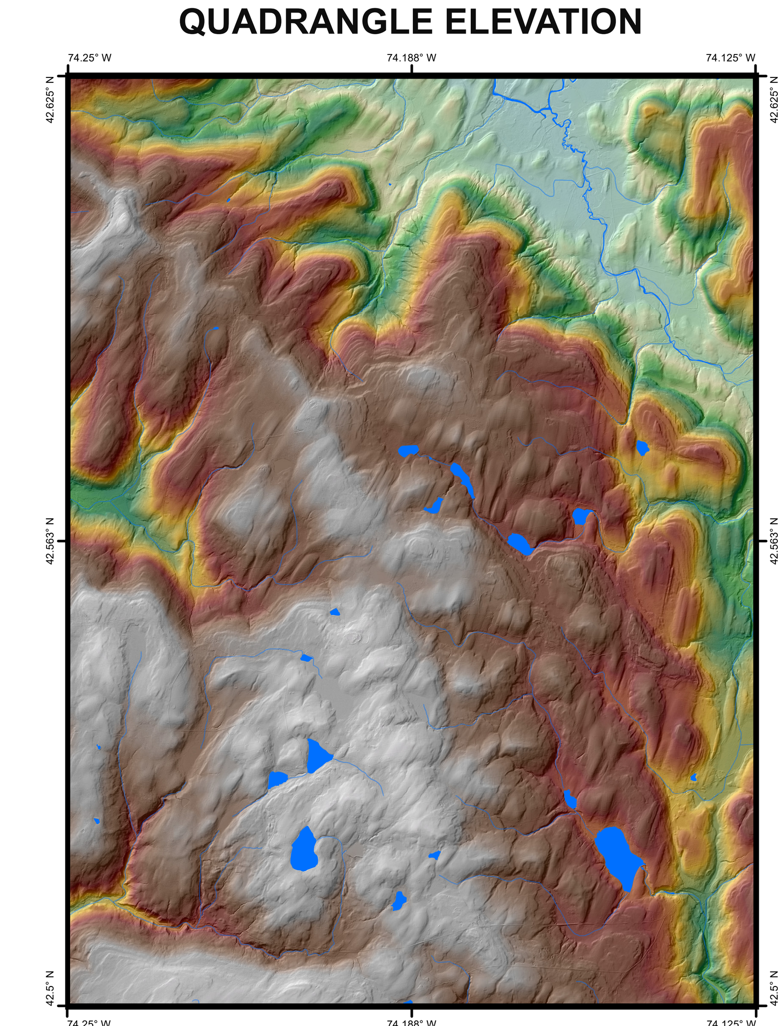
QUADRANGLE LOCATION



ADJOINING QUADRANGLES



QUADRANGLE ELEVATION



1:75,000 scale; 2x vertical exaggeration

Shaded relief generated from 2019 FEMA 1-meter and the 2014 Schoharie 1-meter lidar data sets

New York State Museum Map & Chart No. 139

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