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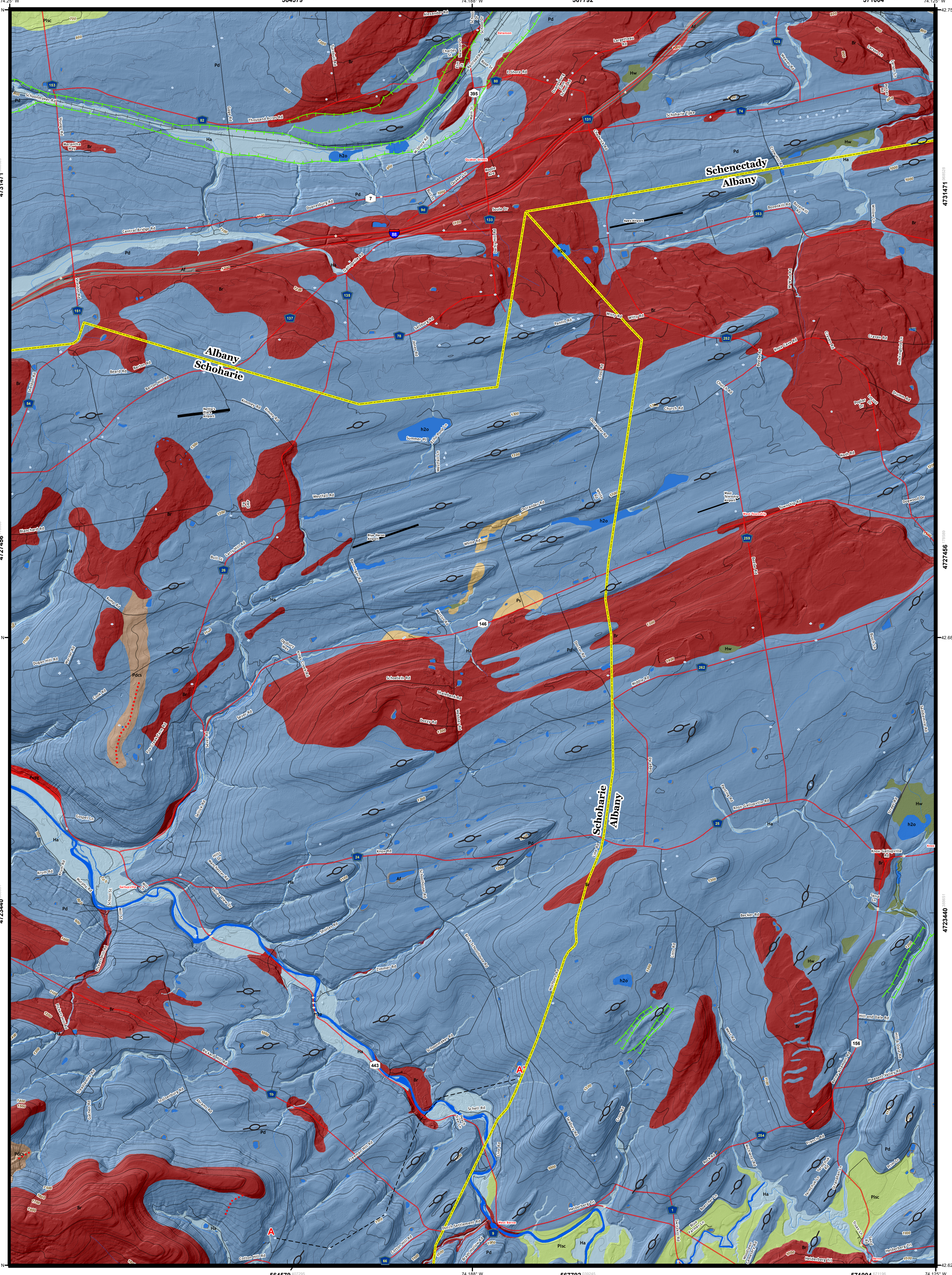
SURFICIAL GEOLOGY OF THE GALLUPVILLE 7.5-MINUTE QUADRANGLE, ALBANY, SCHENECTADY AND SCHOHARIE COUNTIES, NEW YORK

prepared by
James R. Leone and Karl J. Backhaus

Supported in part by the U.S Geological Survey Cooperative Agreement Number G19AC00249
National Cooperative Geologic Mapping Program (STATEMAP)



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

Hygrology, and planimetry layers from the New York State DOT Raster Quadrangle separates for Albany, Schenectady and Schoharie Counties (https://gis.ny.gov/gisdata/inventories/member.cfm?OrganizationID=108).

Geographic data layers from 2019 TIGER/Line shapes for transportation and hydrograpghy (https://www.census.gov/cgi-bin/geo/shapefiles/index.php)

Shaded relief from 2008 Capital District 2m, 2014 Schoharie County 1m and NYS 10m DEM (http://gis.ny.gov/elevation/index.cfm)

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

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 and K. Backhaus, 2020
Digital data and cartography, K. Backhaus and J. Leone, 2020

MN GN
13' 14' 235 MILS
0' 33' 10 MILS
UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

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

James R. Leone, Karl J. Backhaus and Andrew L. Kozlowski
2020

INTRODUCTION:
The Gallupville 7.5-Minute Quadrangle was mapped as part of the 2019 National Cooperative Geologic Mapping Program funded STATEMAP project (award #G19AC00249). This quadrangle was one of eighteen partial and full quadrangles mapped as part of the Albany County Surficial Geologic mapping project being undertaken by the New York State Geological Survey. This county-wide mapping project started in 2016 and is scheduled to conclude sometime in the early to mid-2020's. The purpose of this map was to identify and delineate various surficial and geologic materials with the intent that this geologic information may serve as a guide to municipalities when making decisions regarding land use, environmental and natural resource considerations across its roughly 55 square mile area.

The Gallupville quadrangle lies within northwestern Albany, southwestern Schenectady, and northeastern Schoharie counties as a triple junction in the north-central part of the quadrangle. The quadrangle is approximately 17 miles northwest of the City of Albany and about 10 miles west of the City of Schenectady. New York State Route 443 runs through the southern portion of the quadrangle along Fox Creek, which flows west out of the quadrangle. In the north, State Route 7 and Interstate 88 run parallel to each other in a roughly west to east orientation. The hamlet from which the quadrangle is named for, Gallupville, is in the southwest portion of the quadrangle. This is in the town of Wright in Schoharie County. The Village of Delanson and hamlet of Quaker Street lie within the boundaries of the Town of Duanesburg in the Schenectady County section of the quadrangle. The towns of Knox and Berne are in the Albany County section of the quadrangle. The hamlet of West Berne is situated near the Schoharie-Albany county lines. Much of the quadrangle is rural vacant farmland, with the Delanson and Gallupville being the two main residential areas and former industrial areas of the former Delanson rail yard of the Delaware and Hudson Railroad.

The physiographic setting of the quadrangle is the extreme northeastern edge of the Allegheny Plateau and the northern extent of the Catskill Mountains. A ridgeline in the extreme southwest corner of the quadrangle has the highest elevation at approximately 1,870 feet (569 meters) above mean sea level. The southwest portion of the quadrangle is also where the lowest elevation at 665 feet (203 feet) above mean sea level, where Fox Creek flows westward out of the quadrangle.

The bedrock in the region has been mapped for STATEMAP previously by Stander and others (2014) at 1:24,000. Their study agreed with the findings of the 1:250,000 scale Hudson Mohawk sheet of the Geologic Map of the New York State by Rickard and Fisher (1970). The main differences between the maps was the extent and contacts of these units. Both maps agree that the bedrock units within the Gallupville quadrangle span the Late Ordovician through the Middle Devonian, bedrock in the quadrangle consists of sedimentary rocks. The northern portion of the quadrangle is Ordovician sandstones of the Schenectady Formation. As elevation increases to the south the strata decrease with age up to the Devonian Marcellus Sub-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 sand and gravels and lacustrine silt and clays (Cadwell and Dineen, 1987). No higher resolution studies have been conducted in this area until this study.

METHODOLOGY:
To create the surficial geology map of the Gallupville 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. 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 (below the topsoil). Another tool used is an entrenching shovel and pick. This tool was used to remove topsoil and/or eroded sediments from outcrops or exposures to expose fresh sediments for analysis. At each field stop, the coordinates (latitude and longitude in decimal degrees) were taken using a Garmin GPS 66st, descriptive notes on the sediment found, whether a sample and/or a high-resolution, scaled photo were taken, and the time at which the stop was taken were logged into a field notebook (TPK_FN6).

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. Sedimentological data from sieve analysis of field samples is available upon request.

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 its symbol was colored according to its respective RGB color value in the NYSGS Surficial Geologic Unit Legend. The final map was drafted in Adobe Illustrator and exported as a PDF file

RESULTS:
A total of 165 field stops were taken, with 109 samples for grain-size analysis (see Appendix), within the quadrangle. Some stops contained more than one sample as they exhibited stratigraphy either in an exposure or at depth with the hand-auger. The final count for lithologies found during field sampling was: 114 stops were diamicton, 33 were bedrock, eight stops were glaciolacustrine silt, fine sand and clay, four were sand and gravel, two were fine to medium sand, one was cemented gravel and one was alluvium. 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, large, raised roadbeds for bridges and former factory/railroad shops 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 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.

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 New York State Route 443, Switzkill Road and in the northwestern corner of the quadrangle on Youngs Road.

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 (Psg), likely due to a decrease in energy during deposition. Well-sorted sands were observed in outcrop and in hand-auger samples on Ostrander Road and the intersection of Ostrander Road, Benninger Road and New York State Route 143.

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 deposited directly beneath the glacier. It is generally matrix supported, sand-dominant, and blue and purple brown in color. 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.

Pleistocene Diamicton (Clast Supported) (Pdcs)
The unit is an admixture of unsorted sediment ranging from clay to boulders. Generally, clast supported, massive and clast rich. Interpreted as till. A small ice margin that crosses Cook Road has a slightly different till fabric than the adjacent diamicton on either side.

SUMMARY AND CONCLUSIONS:
The Gallupville Quadrangle has two distinct areas. North of Fox Creek Valley till drumlins and flutes dominate the streamlined landscape with sections of bedrock exposed in escarpments like ledges. The Fox Creek Valley and south has a rugged ridgeline and is one of the northern most of edges of the Catskill physiographic province. A distinct meltwater channel known, and the Delanson channel is cut through till and bedrock in the northern portion of the quadrangle (Fairchild, 1912).

SUMMARY AND CONCLUSIONS: Continued...
Bedrock is exposed around the quadrangle. Late Ordovician Schenectady Formation is the most widespread bedrock unit in the Gallupville Quadrangle. Late Silurian and Early Devonian aged carbonates that form Helderberg escarpment are well exposed along the eastern section of Township Road and is exposed in outcrops westward across the middle section of the quadrangle. The Middle Devonian Onondaga Limestone forms an escarpment across the southern portion of the quadrangle and is well exposed along Rickard Hill Road. A raised flat bedrock surface in the southeast portion of the quadrangle was investigated on foot. This mesa-like formation has steep sides formed by the Onondaga Limestone and hosts several karstic features such as sinkholes and caves. The feature draws attention as it is vaguely foot shaped with small continuous ridges across them. These ridges were made up of till are most likely annual moraines. Karst features are not limited to mesa, sinkholes can be found throughout the quadrangle wherever Helderberg or Onondaga are present. The youngest Middle Devonian of the Marcellus Sub-Group overlay the Onondaga Limestone as elevation increases and they form the bedrock in the ridgeline in the southeast corner of the quadrangle.

Most of the surface of the quadrangle is covered in a brown till that varies slightly in composition. It is primarily a variation of brown matrix supported and clast rich with some exotic gravel to boulder clasts, but most clasts are angular to sub-rounded local bedrock. Tills in the quadrangle are not limited to this description. The area around Beebe Road were very clay and silt rich diamicton with some sand and little gravel present. These unconsolidated sediments in the area are thin, and this can be observed in the field and on the lidar maps where bedrock ledges can be inferred from the blocky angles. The most distinct till exposures in the quadrangle are along the bank of Fox Creek. This lodgment till is very dense and greyish white in color. The exposures observed are extremely large. A linear exposure of approximately 140 meters and a height over 15 meters, located where the cross-section in Figure 1. It is notable that a package of bedded sands and silts were observed within the till unit. The extreme height and vertical nature of the cliffs made access and inspection of the laminated layers unsafe.

The streamlined landforms of the drumlins and flutes throughout the quadrangle suggest the flow direrction of the Hudson Lobe of the Laurentide Ice Sheet through the area. The general trend is northeast to southwest. In the southeast portion of the quadrangle the drumlins diverge southward. This divergence begins at the section of the Helderberg Escarpment in the eastern end of Township Road and then entered the low-lying area of the Switzkill and Fox Creek valleys. A V-shaped drumlin located between Litts Road and Cross Road was investigated, the limbs of the drumlin are made up of till while the middle lower section is more sorted with silt to medium sand with little gravel. Drumlins continue south across the Fox Creek Valley and diverge again at the base of the prominent bedrock ridge south of Abrams Hill Road. The area south and west of Abrams Road could be representative of an ice margin abutted against the north edge of the mountains. This ice margin may be related the subtle margin identified crossing Cook Road.

The wide flat areas of the Fox Creek and Switzkill valleys may have held a temporal glacial lake as evidenced by the glaciolacustrine sediments of clay, silt and fine sand collected. The lake was likely constrained by glacial ice as the Hudson Lobe retreated down into the present-day Hudson and Mohawk river valleys and the mountains to the south and west. Where this lake drained has not been delineated from mapping the Gallupville quadrangle. A narrow bedrock channel on Fox Creek may have been the lake outlet but the lake may have also drained southward down the Switzkill Valley in the Rensselaerville quadrangle, further mapping will be required. Lake sediments were reported in two of the water well records used in the B to B' cross-section. These fine-grained lake sediments are between two till units.

Bedded cemented gravels and coarse sands are found on the west end of Route 443 exiting the quadrangle. This unit is approximately five meters in height and can be observed at the road level east to west for about 400 meters. This was the only locality of the formation's exposure, several water well records nearby logged drilling through cemented gravels at depth and probably represent a continuation of this formation or deposition of a similar package of sediment.

At first glance the Gallupville Quadrangles appears to be a map of mostly till and bedrock. Field mapping efforts reveal that portions of the quadrangle are more complex. The streamlined landforms help understand the flow direction of the Hudson Lobe through the quadrangle. The small amount of lake sediment in the extreme northwest of the quadrangle and the lone outcrop of cemented gravels and coarse sands in the Fox Creek Valley are units that could not be differentiated by remote sensing alone. Future mapping in the adjacent quadrangles will improve the understanding of these sediments. The potential glacial lake in the southern section of the quadrangle could hold clues to the timing of the receding ice sheets out of the region. The fine-grained lake sediments in the water well record shows evidence of at least two glacial cycles that stagnated within the area. The very dense till that outcrops along Fox Creek could be the deeper till unit in the in the well record. Further work to constrain the age of the lakes and the stratigraphy of till units is required to better understand glacial history in the Gallupville Quadrangle.

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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-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

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

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.

Pcsg — **Cemented Sand and Gravel (Pcsg)**
Poorly sorted and matrix supported in most locations. Matrix consists of well-sorted sand cemented with well developed calcite or silicate rinds around clasts. Clasts are predominately from local Paleozoic bedrock but include exotic lithologies of granite and gneiss and range in size widely from pebble gravel to cobbles. Inferred to be subaqueous or proglacial outwash deposits.

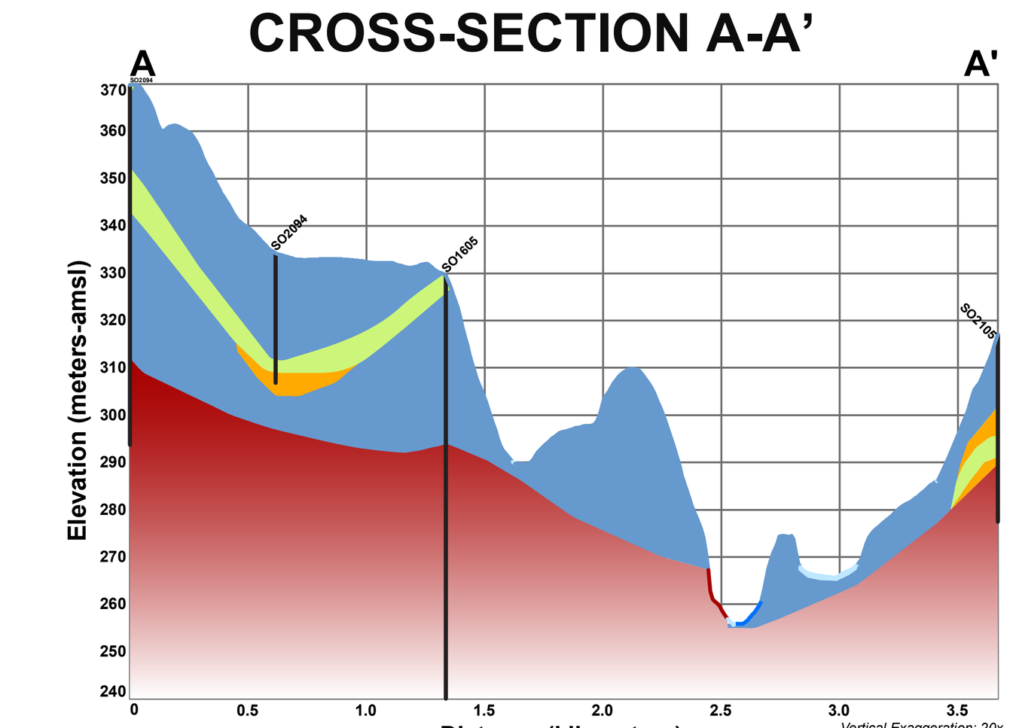
Pd — **Diamicton (Pd)**
An admixture of unsorted sediment ranging from clay to boulders. Generally matrix supported, massive and clast-rich.

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, rock, pre-Pleistocene in age. Areas mapped as bedrock may have up to a meter of glacial drift (till, sand, silt) mantling the rock surface in some locations.

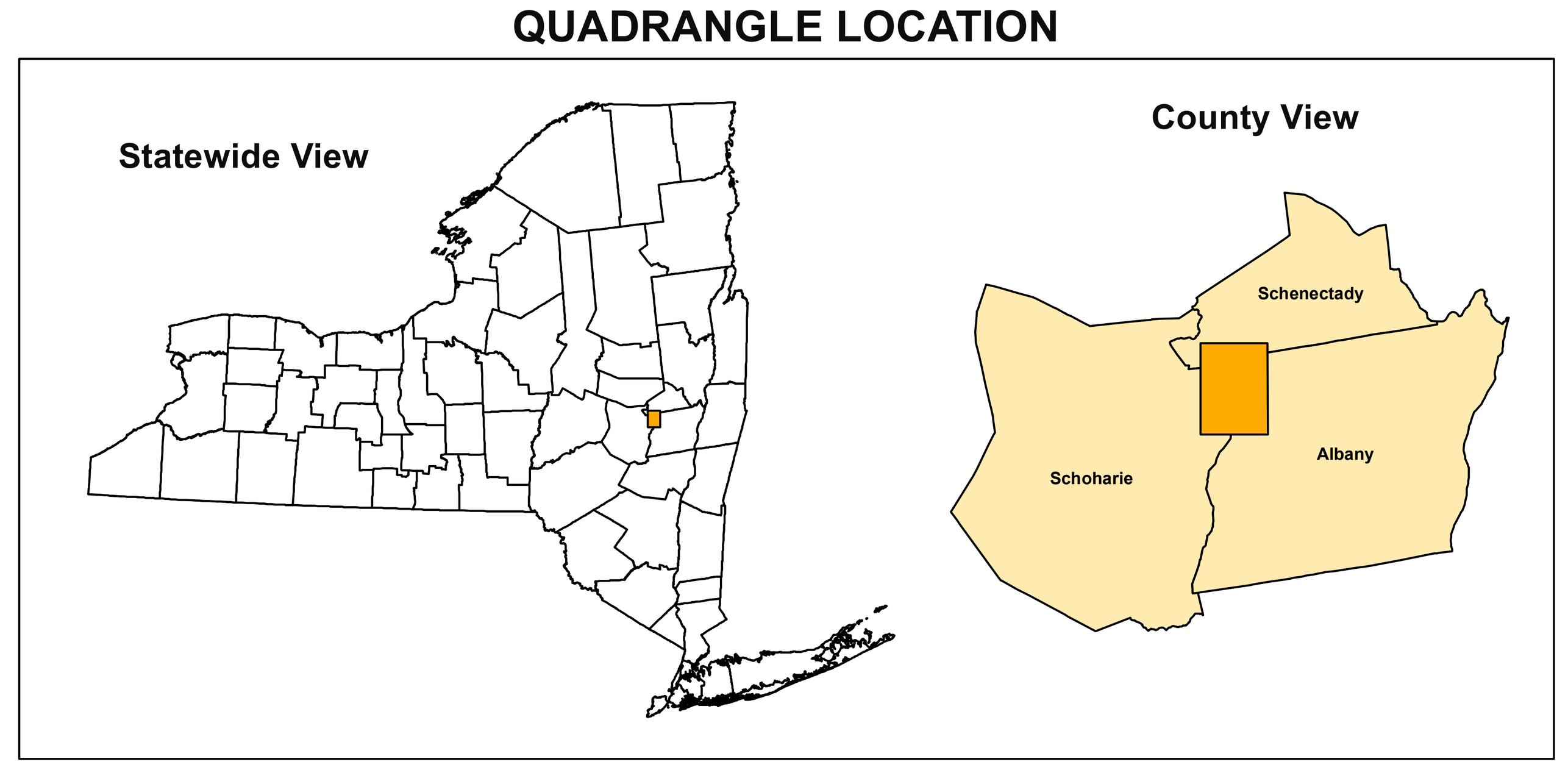
CROSS-SECTION A-A'



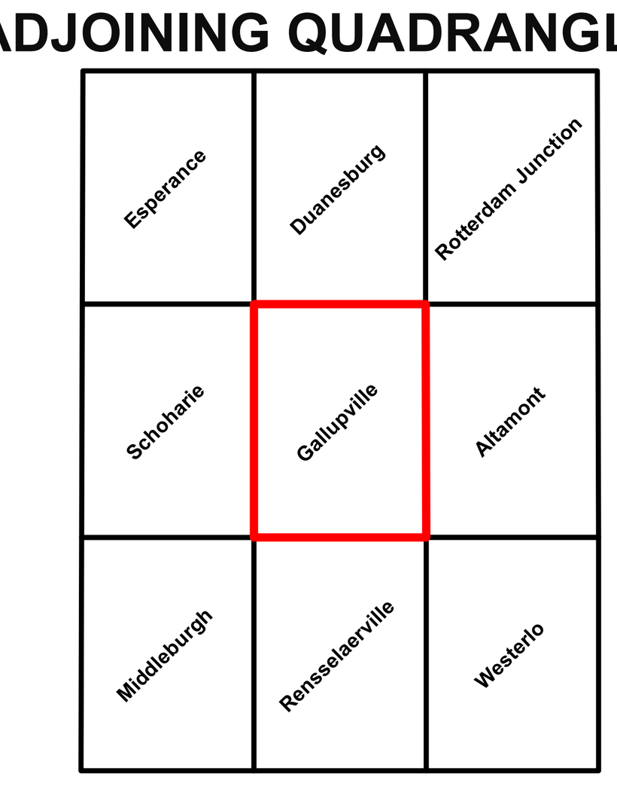
SYMBOLS

Streets — County Lines — Cross-Section Lines — Drumlins
Highways — Water Bodies — NYSGS Soil Sample Location — Ice Margin
Railroads — Streams — NYSDEC Water Well Location — Meltwater Channels
Airport Runway — Contours — NYSDOT Boring Location

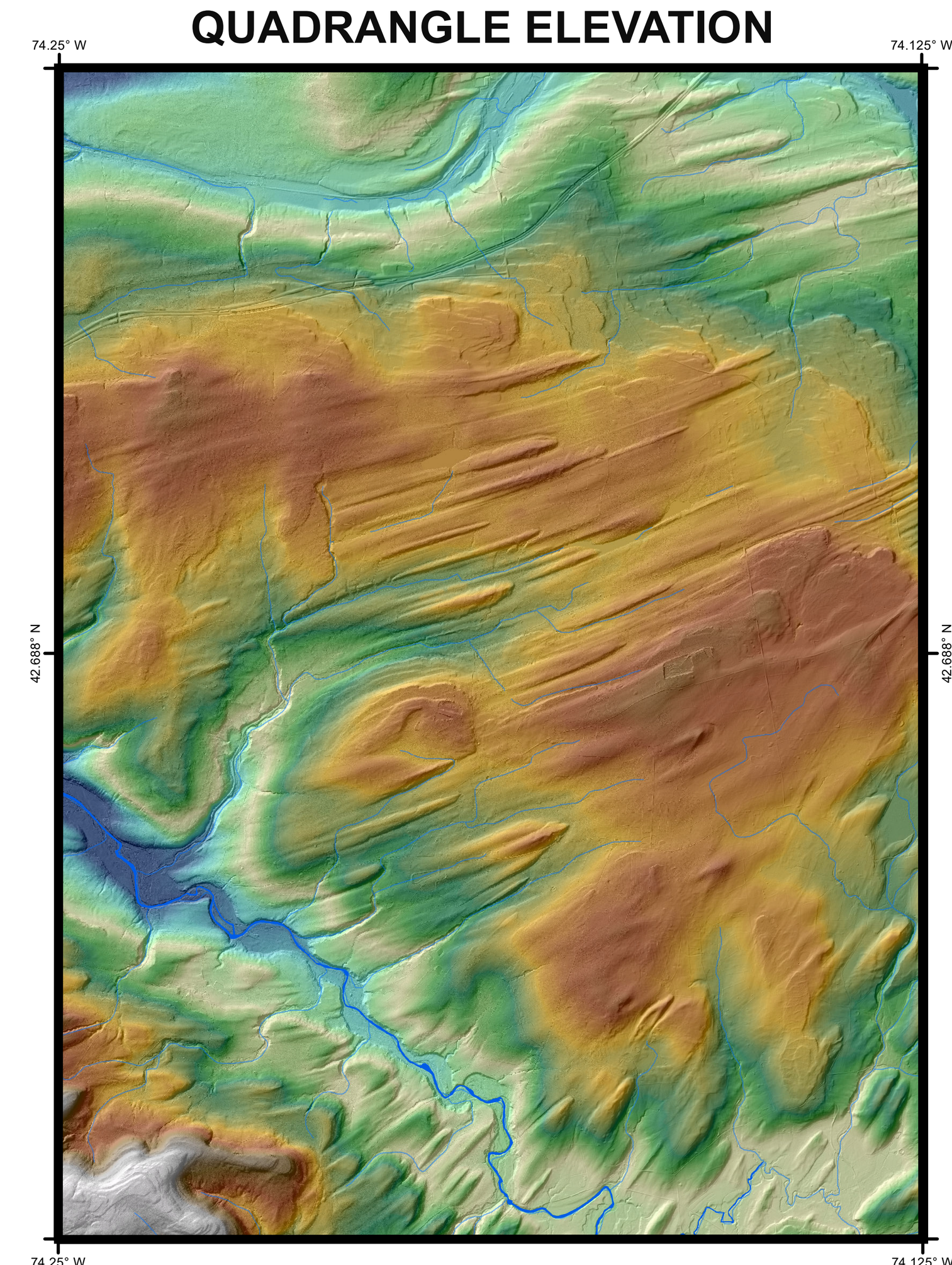
QUADRANGLE LOCATION



ADJOINING QUADRANGLES



QUADRANGLE ELEVATION



1:75,000 scale; 2x vertical exaggeration
Shaded relief generated from 2008 Capital District 2-meter, 2014 Schoharie County 2m and NYS 10m lidar data sets.

NOTICE

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