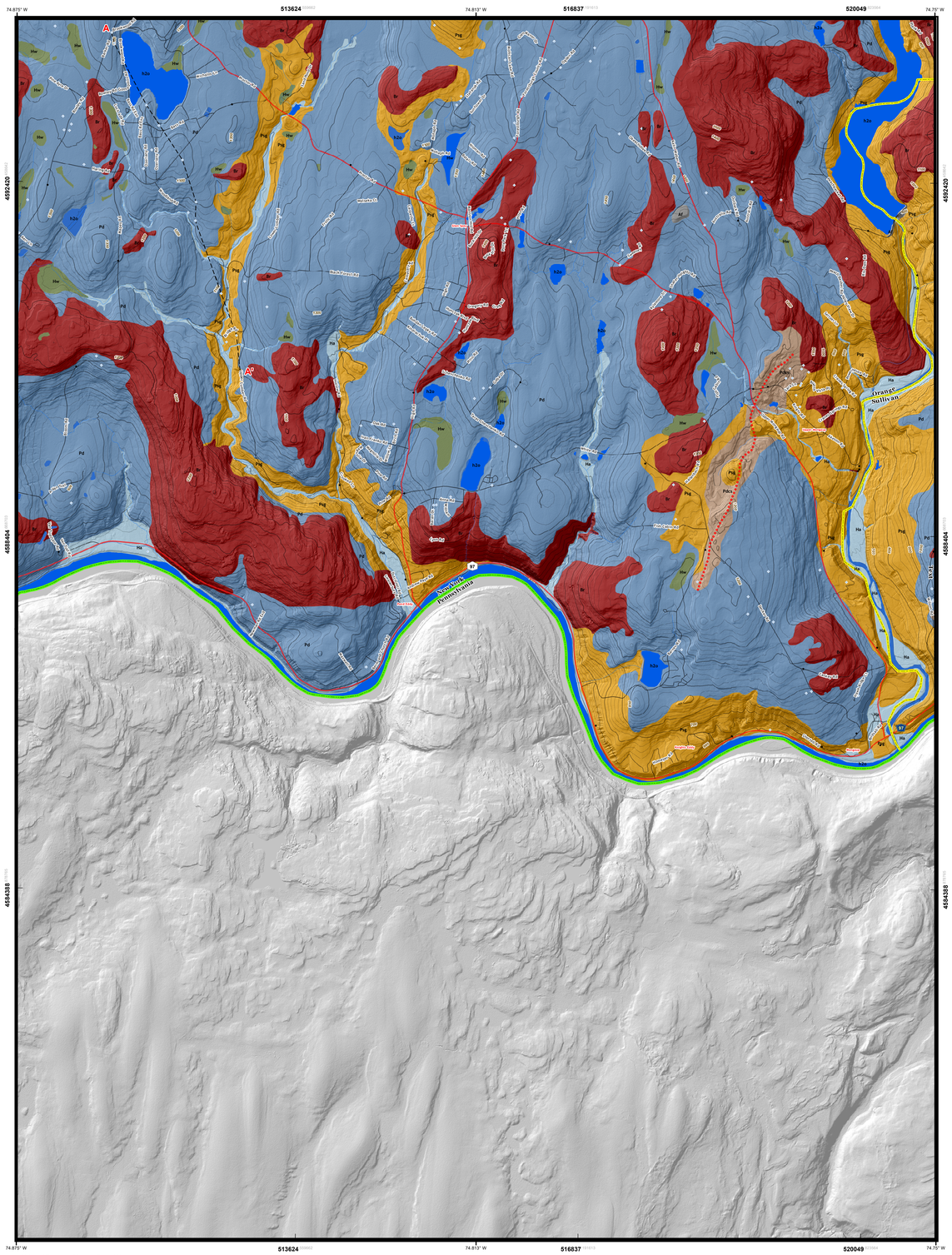
New York State Museum
Mark Schaming, Director

New York State Geological Survey



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 Orange and Sullivan Counties (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 2007 FEMA Delaware-Sullivan 1-meter and the NYS 10-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 J.Leone, 2019
Digital data and cartography, J. Leone & K. Backhaus, 2019.

MN
GN
12° 42'
226 MILS
0° 7'
2 MILS

UTM GRID AND 2016 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SURFICIAL GEOLOGY OF THE POND EDDY 7.5-MINUTE QUADRANGLE, ORANGE AND SULLIVAN COUNTIES, NEW YORK

James R. Leone and Karl J. Backhaus
2019

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prepared by
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Supported in part by the National Park Service Task Agreement Number P17AC01044 in the year 2017.

Introduction
The geology of the Pond Eddy 7.5-minute Quadrangle was mapped during the Fall of 2018 through the Winter of 2019 as part of the National Parks Service Task Agreement P17AC01044 for Geologic Mapping of the Upper Delaware Scenic and Recreational River (UDSRR). This map is part of Phase II of the mapping project in Sullivan and Orange Counties, New York. The purpose of this map was to identify and delineate various geologic formations in the Pond Eddy Quadrangle with the intent that this information can guide the National Parks Service and municipalities in land use, environmental, and natural resource decisions. The Pond Eddy Quadrangle is in southeastern New York along the state border with Pennsylvania. Portion of the towns of Highland, Lumberland, and Forestburg, Sullivan County and a small portion of the Town of Deerpark, Orange County are within the quadrangle. The quadrangle is mainly wooded with large tracts of land for lumber and recreation. In the eastern side of the quadrangle was the Mongaup River Valley.

Situated at the southern edge of the Catskill Mountain physiographic province the landscape varies from near flood plain in the Upper Delaware River Valley to mountainous topography. The highest elevation is at 1,525 feet or 465 meters above mean sea level (amsl) in the north central portion of the quadrangle with the lowest elevation being 469 feet or 143 meters where the Delaware River exits the map to the east. The sediments found in the quadrangle includes sand, gravel, diamicton (till) and bedrock exposed throughout the quadrangle.

Methods
Field mapping for this quadrangle was completed during the Fall of 2018 to 2019. Mapping efforts included traversing the quadrangles primarily by vehicle along roadways, with some mapping taking place on state land parcels and private land. Sample collection was taken by pick and shovel from outcrops in drainage ditches, road and streams cuts or within quarry/sand and gravel pits. Sample collection was also taken with a two-meter long hand auger to collect samples below the soil layer where possible. A total of 44 observation points were made during the mapping process, with 40 samples collected for grain size analysis.

Water wells (122 in total) from the Department of Environmental Conservation and Engineering Borings (one in total) from the Department of Transportation were also used to evaluate the subsurface geology of the Pond Eddy quadrangle. The subsurface data from these wells were interpreted, and then translated from the well driller's description into a standardized lithologic (materials based) description. The location, thickness and depths of all lithologies were also recorded and used to create cross-sections and 3D borings logs within the quadrangle.

Field data were digitized in ArcMap 10.6. Polygons were created based upon the lithology of the surface material and the sample and boring locations were plotted. The boring logs and map data were created using the Adobe Illustrator CS6 using the data created in the ArcMap program.

Map Units
Pond Eddy's west side shares similarities with the neighboring Shohola quadrangle. Light brown to reddish brown diamicton (till) and bedrock makes up much of the uplands in the quadrangle with continuous sand and gravel deposits throughout the Mill Brook's branched valleys. Bedrock can be found exposed along the creeks in the base of these valleys, underlying sand and gravel deposits. These sand and gravel deposits are continuous throughout the valleys and Mill Brook has incised through these deposits. The sand and gravel deposits appear as hummocks in the valley and may indicate the presence of stagnant ice during deposition.

Moving eastward towards the Mongaup River Valley the sand and gravel sediments are more widespread across the elevations from the base of the valley up along the valley walls. Hummocky topography depicted on the geologic map and samples collected along what might be a moraine were sandy diamicton at the southwest end. Moving northeast along the moraine two samples on Knight Road (PE-JL-19, PE-JL-20) had sandy diamicton, interpreted as till, in the western sample, about 150 meters east there was only sand and gravel in the sample, minimal silt and clay was present in the latter sample. South of the Knight Road by about 400 meters samples from an old quarry pit had stratified sand beds with some silt beds and some beds with coarse sand (PEJL-37a/b). This may reflect a possible deltaic feature on top of the moraine.

Signs of the moraine within the Mongaup Valley appeared absent but the valley was filled with stratified sections of sand and gravel likely from glacial outwash associated with a glacial margin. Most of the observed sediments in the north-south oriented valley were sand beds with varying amounts of gravel present. The outwash likely post-dates the formation of the delta and moraine. Sample PEJL-28 collected in a small stream along the side the valley had well-sorted fine sand in a small stream cut. The deeper portions of the valley contained sand and gravel draped over bedrock exposures. The deposits oriented in a southwest to northeast trend and may be indicative a moraine. Moraines are continuous ridges of glacially deposited sediment usually made up of till, but sometimes granular materials from meltout of ice also are deposited at moraines. Moraines represent the edge of a former ice margin where sediment had been deposited.

Surficial Map Units
Artificial Fill (Af)
This material is found throughout as artificial dams built to retain water and a large landfill in the upper part of quadrangle. This lithology is generally composed of coarse/fine, large cement mounds and/or crushed rock anthropogenically transported and used for construction purposes.

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 areas along the Delaware River and its tributaries. 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 Sand and Gravel (Psg)
Characterized as well-sorted and stratified sand and gravel this unit is interpreted to be deposited by glacial meltwater at or very near the glacier and is upwards of 130ft thick in the valleys. Psg is found within the north-south valleys containing the modern-day tributaries for the Delaware River.

Pleistocene Diamicton (Pd)
This unit is a mixture of sediment grains that range from clay to boulders in size. In this quadrangle, all diamicton in interpreted to be glacial till, sediment deposited directly beneath the glacier and can be upwards of 265 feet thick. This material is found throughout and is the most abundant lithology within the quadrangle. It is generally matrix supported, sand-dominant, and tan and reddish brown in color.

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. In this quadrangle identified moraines are comprised of clast supported till ranging from gravel rich in some cases showing hummocky topography along the morainal boundary.

Summary and Discussion
The Pond Eddy quadrangle is located at the southern edge of the Catskill Mountains forming the New York/Pennsylvania border. The region is like the surrounding Catskill Mountains with greenish blue to dark grey sandstones with zones of crossbedding, and red shales of the Devonian Period Catskill Delta making up the bedrock of the mountains. The light brown to reddish brown diamicton, till, is deposited along the slopes of the mountain sides, shorter hilltops may be till covered as well. Valleys tended to be filled with sand and gravel that has been cut through by present day drainage. Outwash deposits and deltas in the eastern portion of the quadrangle are likely related to meltwater coming from up glacier into the Mongaup River Valley. The western portion has a more hummocked appearance in the valleys suggesting stagnant glacial ice may have filled the valleys after glacial retreat.

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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

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.

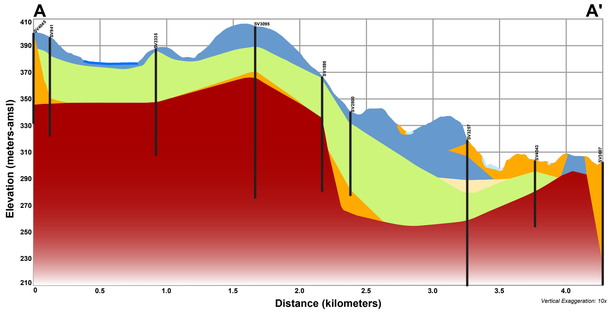
Pd — **Diamicton (Pd)**
An admixture of unsorted sediment ranging from clay to boulders. Generally matrix supported, massive, clast-rich and interpreted as glacial till.

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.

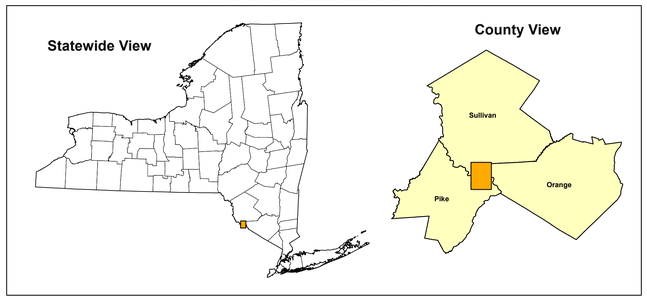
CROSS-SECTION A-A'



SYMBOLS

- Streets
- Highways
- Railroads
- State Line
- County Line
- Water Bodies
- Streams
- Contours
- Cross-Section Line
- NYSGS Soil Sample Location
- NYSDEC Water Well Location
- Ice Margin

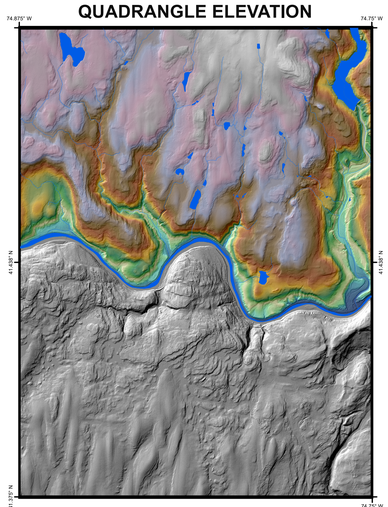
QUADRANGLE LOCATION



ADJOINING QUADRANGLES

Eldred	Highland Lake	Hartwood
Shohola	Pond Eddy	Port Jervis North
Edgemere	Milford	Port Jervis South

QUADRANGLE ELEVATION



Feet-amsl
460 1525

1:75,000 scale; 2x vertical exaggeration

Shaded relief generated from 2007 Delaware & Sullivan Counties 1-meter lidar data set by the Federal Emergency Management Agency and the 2014 3-County lidar data set by the United States Geological Survey.

NOTICE

This geologic map was funded in part by the National Park Service Task Agreement Number P17AC01044 for the Geologic Mapping in Upper Delaware Scenic and Recreational River Phase 2 in the year 2017.

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