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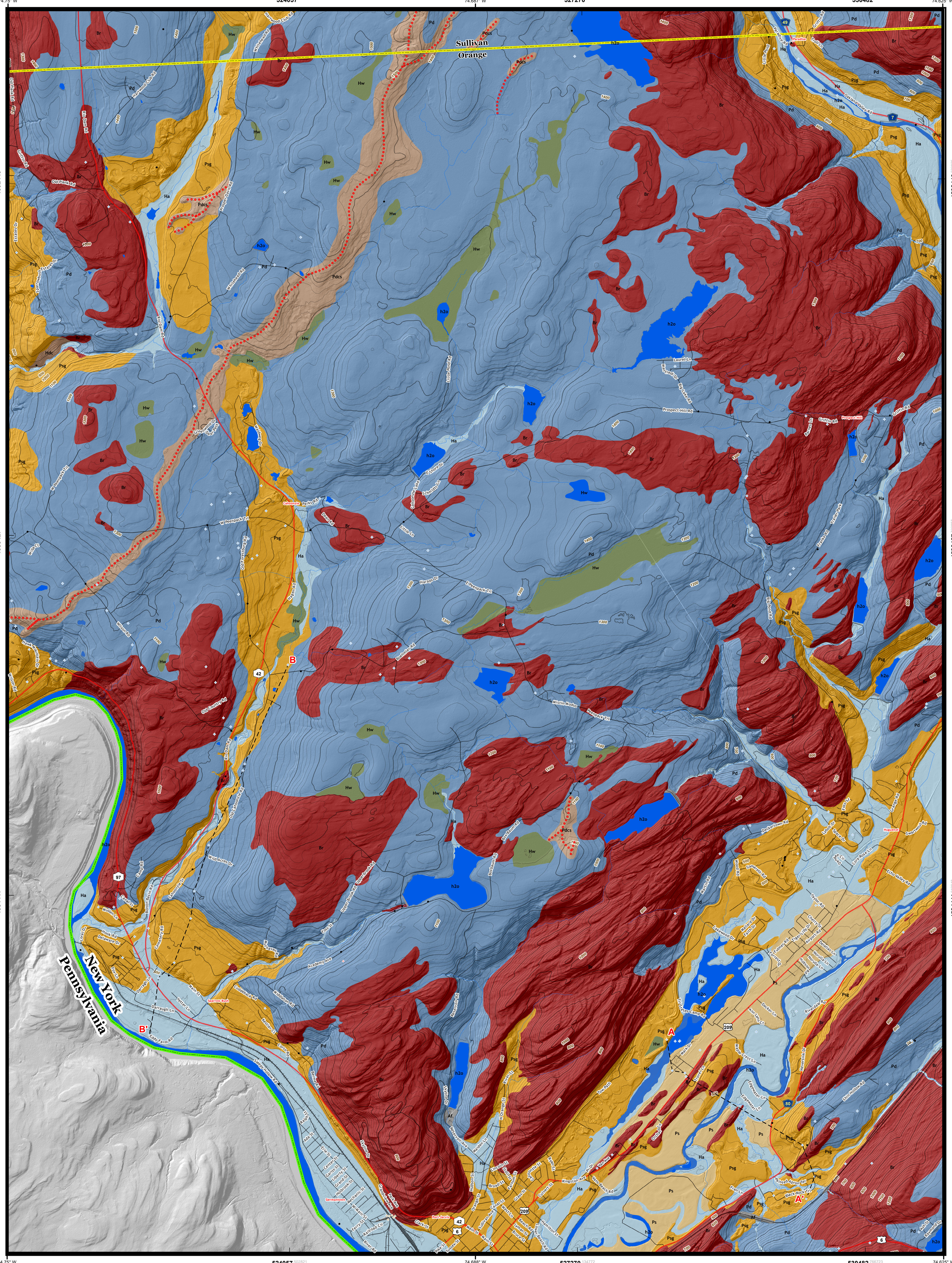
SURFICIAL GEOLOGY OF THE PORT JERVIS NORTH 7.5-MINUTE QUADRANGLE, ORANGE AND SULLIVAN COUNTIES, NEW YORK

prepared by

James R. Leone and Karl J. Backhaus

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



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 hydrograpghy (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

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, 2019
Digital data and cartography, J. Leone & K. Backhaus, 2019.

MN GN
12' 46' 227 MILS
0' 12' 4 MILS

UTM GRID AND 2016 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

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James R. Leone and Karl J. Backhaus
2019

Introduction

The geology of the Port Jervis North 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 Port Jervis North quadrangle with the intent that this information can guide the National Parks Service and municipalities in land use, environmental, and natural resource decisions. The Port Jervis North quadrangle is located in southeastern New York along the Pennsylvania border and about one kilometer north of the New Jersey border. Included within the quadrangle are the Towns of Forestburgh, Mamakating, and Deerpark, which includes the City of Port Jervis. The City of Port Jervis is situated in the south eastern portion on the quadrangle. The remaining portions of the quadrangle have a few small communities, but it is mainly wooded with large tracts of land for lumber and recreation.

Situated at the southern edge of the Catskill Mountain and Mohawk-Hudson Lowlands physiographic provinces the landscape varies from floodplains in the river valleys to mountainous topography. The highest elevation on an upland moraine is at 1,558 feet or 475 meters above mean sea level (amsl) in the north central portion of the quadrangle with the lowest elevation being 590 feet, or 475 meters, where the Delaware River exits the southern portion of the map. The sediments found throughout the quadrangle includes silt, sand, gravel, diamicton (till) and bedrock.

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 80 observation points were made during the mapping process, with 61 samples collected for grain size analysis.

Water wells (179 in total) from the Department of Environmental Conservation and engineering borings (6 in total) from the Department of Transportation were also used to evaluate the subsurface geology of the Port Jervis North 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.

Field Mapping

Port Jervis North was the eastern most quadrangle mapped in Phase II. The UDSRR ends in the western portion of the quadrangle in Sparrow Bush, NY but the quadrangle contains about five more kilometers of the Upper Delaware River Valley and ends about one kilometer north of the confluence of the Upper Delaware and the Neversink River in the Minisink Valley. Hawk's Nest, possibly the most recognizable geologic feature of the Upper Delaware River Valley, resides at the western edge of this quadrangle. The near shear face of this continuous outcrop of Devonian aged sandstone features a roadway built along a middle ledge.

Adjacent to the north and west of Hawk's Nest are large sand and gravel deposits that are the predominate unconsolidated sediments of the Mongaup River Valley. On the eastern edge of the quadrangle is a sand quarry off Wilson Road that contains sand with some gravel beds dipping to the south southwest. This feature maybe a deltaic deposit containing foresets and topsets (Figure 1) from glacial meltwater emptying into a proto-Delaware River or a proglacial lake. The topset – foreset contact occurs at 273 meters in elevation and the top of the outcrop is around 275 meters. Despite limited exposures of silt and sand while mapping, the sedimentary structures displaying foreset-topset architecture suggests a stable lake existed at an elevation of 273 meters. Thick packages of silts and clays were found in test borings below the present-day river sediments as reported in Phase I and the Barryville Borings of Fluhr (1950) in the Shohola Quadrangle (Leone, 2019). Sediment was likely being deposited as an ice contact delta while a glacier was building the moraine. OSL samples were collected from the base of the topsets and about 20 meters lower in elevation within the foresets.

Moving to the uplands out of the Delaware River Valley there is a broad ridge that starts out somewhat subdued and only perceivable with the help of LiDAR and becomes more pronounced as it continues northeast into the Hartwood Quadrangle. The more subdued southern end appears to be made up of a sandy diamicton in most places, but the northern more pronounced end the ridge is mostly made up of large boulders with little to no fine-grained sediments present below the thin modern soils (Figure 2).

The north end of the ridge is also the highest elevation in the mapping area of Phase II. Given the way this feature extends continuously through the quadrangle and into adjacent areas it is probable that this is a large moraine. The abundance of boulders with little fine-grain material at the north end may suggest that this portion of the moraine could have been an interlobate zone where two lobes of glacial ice merged.

There are smaller ridges that may represent recessional moraines east of this moraine that were formed after the two lobes of ice detached during retreat. Toward the west is another moraine that extends across the Mongaup River Valley into the Pond Eddy Quadrangle. Stratified sand and gravel deposits comprise the surface of the landscape between the two moraines suggesting this area was infilled with a considerable amount of glacial outwash.

A quarry in Rio, NY contained a zone of faulted beds of sand, gravel and boulders at the very base of the pit exposure (Figure 3). The observed deformation are small normal faults produced by extensional forces. Further up section within the quarry, beds of well sorted fine to medium sands with few interbeds of gravel and less deformation are present. The fine to medium sand was likely deposited onto the older sediments after it had undergone deformation, this is attributed to a lack of observed faulting in the younger beds. Below the faulted beds were two large boulders within beds of fine to medium sand and beds of coarse sand and gravel. An OSL sample was collected in a fine sand bed at the base of one of the boulders still in situ.

A portion of the Neversink Valley occupies the northeastern edge of this Port Jervis North Quadrangle. The valley walls have sand and gravel terraces up above 250 meters above sea level, which is over 50 meters above the valley floor. Bedrock is exposed on the tops of the valley walls. These bedrock exposures continue down into the southern portion of the quadrangle into the Minisink Valley. The bedrock here has been scoured off by large amounts of glacial meltwater draining along the walls of the valley as the ice retreated. The valley floor which the Neversink River meanders through contains mainly stratified sand, some gravel deposits, and thin silt beds are present. The valley features elongated fluted bedrock outcrops mainly oriented northeast to southwest consistent with the orientation of the valley.

The very southeast edge of the quadrangle is on west side of the Shawangunk/Kittatinny Ridge. Bedrock is well exposed on the ridge with some thin till deposits, and sand and gravel deposits on the sides of the valley. While this ridgeline is minimal in the Port Jervis North Quadrangle and well east of the UDSRR, it forms the eastern edge of the Delaware Valley through the Delaware Water Gap National Recreational Area.

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.

Holocene Diamicton 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. A steep valley in the along a tributary of the Mongaup River Valley has deposits of Hdc.

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 in Minisink Valley that the present-day Neversink River flows through. These deposits consisted of mainly tan to brown sediments ranging between very fine sand to coarse sand.

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 to dominated by large boulders.

Figure 1: Sand quarry showing foresets of sand. Beds do contain some small rounded gravel clasts. Beds are dipping south southwest. Photo showing foresets and topset beds on the highwall of quarry at 273 meters above sea level.

Figure 2: Large boulder deposits on northern part of suspected moraine

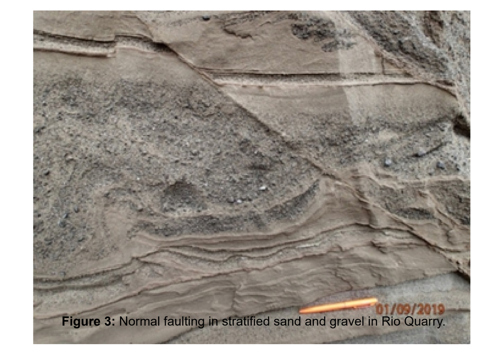

Figure 3: Normal faulting in stratified sand and gravel in Rio Quarry.

Summary and Discussion

The Port Jervis North Quadrangles is located southern edge of the Catskill Mountains, where the Delaware River forms the border between New York and Pennsylvania. The area, managed by the National Parks Service ends just north of the Hamlet of Sparrow Bush, New York. The mapping effort for Phase II included the remaining area of the quadrangle outside of the National Park Service managed area within New York State. 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 Minisink Valley contains Middle Devonian Hamilton Group and some Onondaga Limestone exposed on the valley floor. In the extreme southeast corner of the Port Jervis North Quadrangle Lower Devonian Helderberg Group limestone and Silurian aged bedrock.

The quadrangle and the adjacent areas have large amounts of sand and gravel deposits along with bedrock exposures and till, mostly at higher elevations. The sand and gravel deposits in the deltas was likely in contact with stagnant ice deposits in the valleys as evidenced by the extensional faulting in the lower portions of the Rio Quarry. Glacial meltwater may have been exploiting and actively eroding out a pre-existing river valley where the Ontario Lobe and Hudson-Champlain Lobe were converging. Large amounts of bedrock are exposed predominantly along the western edge of the Mongaup Valley. Water may have begun eroding off these valley walls while the ice from the Ontario Lobe stagnated and the ice from the Hudson-Champlain Lobes retreated down into the Neversink and Minisink Valleys then into the larger extent of the Hudson Lowlands.

The Port Jervis North quadrangle has landforms that indicate the effects of glacial advances, glacial outwash, and glacial meltwater drainage. The delta found in the Wilson Road Quarry in relation to the well pronounced easternmost moraine indicates there being a glacial lake impounded by ice that would flood much of the Upper Delaware Valley. We propose the tentative name Lake Sparrow Bush for this glacial lake. The elevation where the foresets and topsets meet in the delta is 273 meters or 896 feet above sea level, which indicates the proglacial lake level of Lake Sparrow Bush. Extending this elevation northwestward upstream, indicates the valley floor does not reach the same elevation as the top of the delta until you are just south of Hancock, NY. A distance of about 90 kilometers or 56 miles. Suggesting the possibility of a substantial glacially dammed lake. Further work will define the full extent of this lake and possible outlets. The water in the lake could have also been contained by stagnant ice, left behind in the western portions of the Upper Delaware River Valley. Past drilling in Phase I and boreholes near Barryville, NY (Fluhr, 1950) record beds of silt and clay that may have been part of this lake. The Minisink Sub-Lobe of the Hudson-Champlain Lobe as mapped by Conally and Epstien (1969 and 1973), Cotter et al. (1986) occupied the area prior to 18,500 Cal BP. As the ice lobe retreated out of the Upper Delaware River Valley and to the north and east into the Minisink Valley the water from a younger phase of Lake Sparrow Bush, would have expanded eastward following the contraction of the Minisink Sub-Lobe. A potential spillway at 262 meters, occupied by present day Cummins Creek, may have become exposed five kilometers south of the Wilson Road Quarry delta and initiated draining Lake Sparrow Bush from Milrift, PA down to Milford, PA to a lower elevation. This was probably used as a pathway for water to drain until the retreating ice blocking the present-day channel of the Delaware River was clear enough for water to exploit new drainage pathways.

The sediments along the now exposed bedrock along the walls of the Neversink and Minisink Valleys likely were stripped away by meltwater moving along the western edge of the retreating glacier. When ice cleared out of the Minisink Valley meltwater from further north may have flowed down the valley for quite some time while ice was occupying the remainder of the valley all the way up into Ulster County. Future work the Minisink/Neversink Valleys and the Shawangunk Ridge may help understand the timing that glacial ice left the valley.

The moraine in the Porth Jervis North Quadrangle has yet to have an age determined. Previous models of deglaciation through the area assign the Phillipsport Moraine north of this region with and age of 18,100 Cal yr BP (Ridge, 2003). It is of note based on observations that both moraines continue into Pennsylvania on the uplands south of the Upper Delaware River Valley. Continuing southeast these moraines run into the area where the Ogdensburg-Culver Gap Moraine that Sirkin and Connally have estimated to be a terminal moraine somewhere between the LGM and 18,500 Cal yr BP, Cotter (1986) Ridge, (2003). OSL samples have been collected in locations along the moraine. The dates that will be obtained by the OSL samples may help further resolve one of the greatest gaps in the glacial record of eastern New York State.

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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

Hdc — **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.

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.

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.

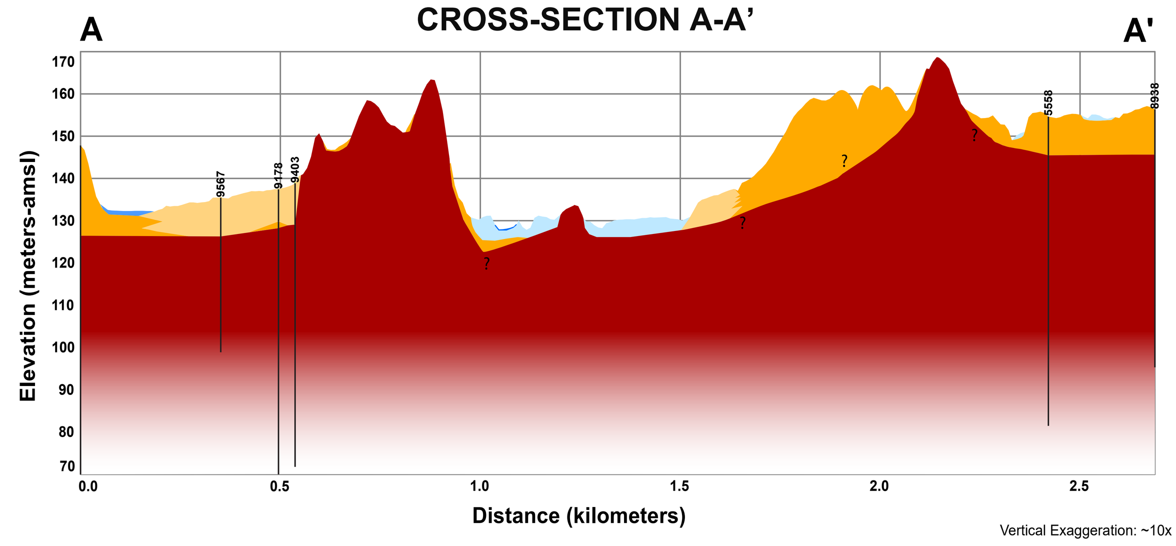
Pd — **Diamicton (Pd)**
An admixture of unsorted sediment ranging from clay to boulders. Generally matrix supported, massive, clast-rich and interpreted to be glacial till.

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

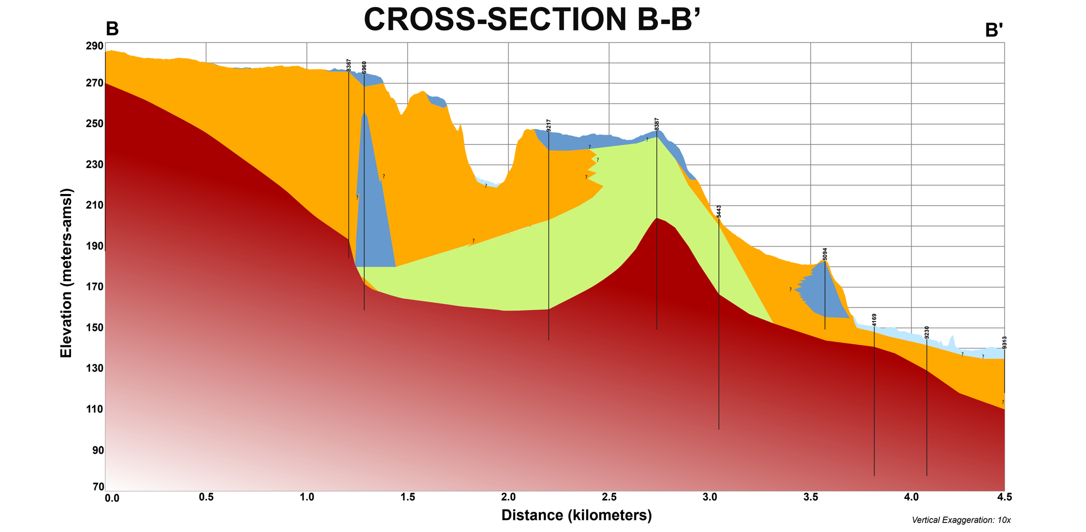
Pre-Pleistocene

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.

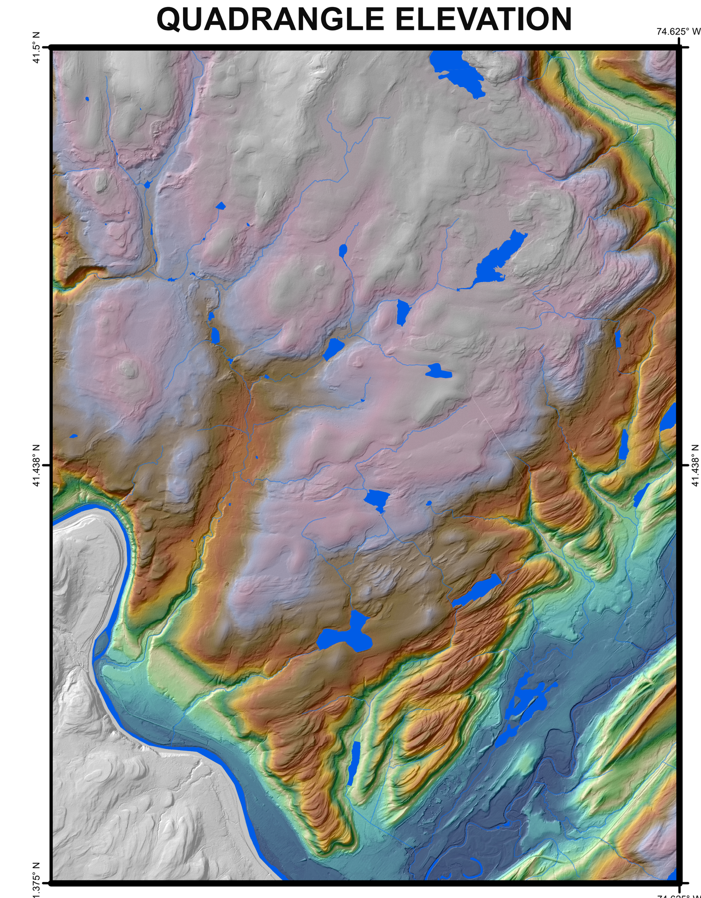
CROSS-SECTION A-A'



CROSS-SECTION B-B'



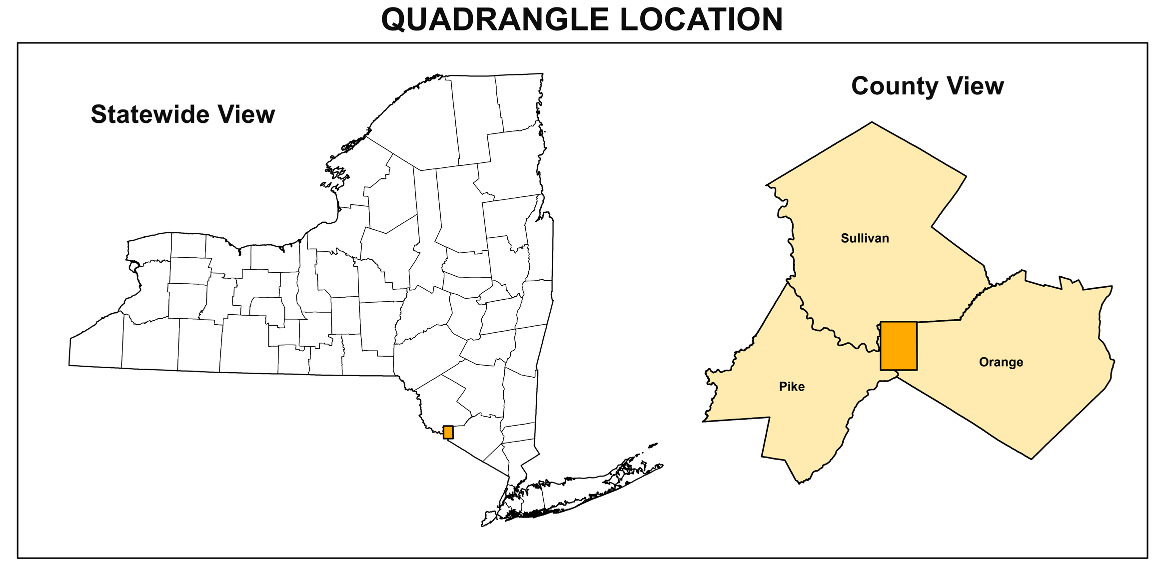
QUADRANGLE ELEVATION



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.

QUADRANGLE LOCATION



SYMBOLS

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

ADJOINING QUADRANGLES

Highland Lake	Hartwood	Yankee Lake
Pond Eddy	Port Jervis North	Otisville
Milford	Port Jervis South	Unionville

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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