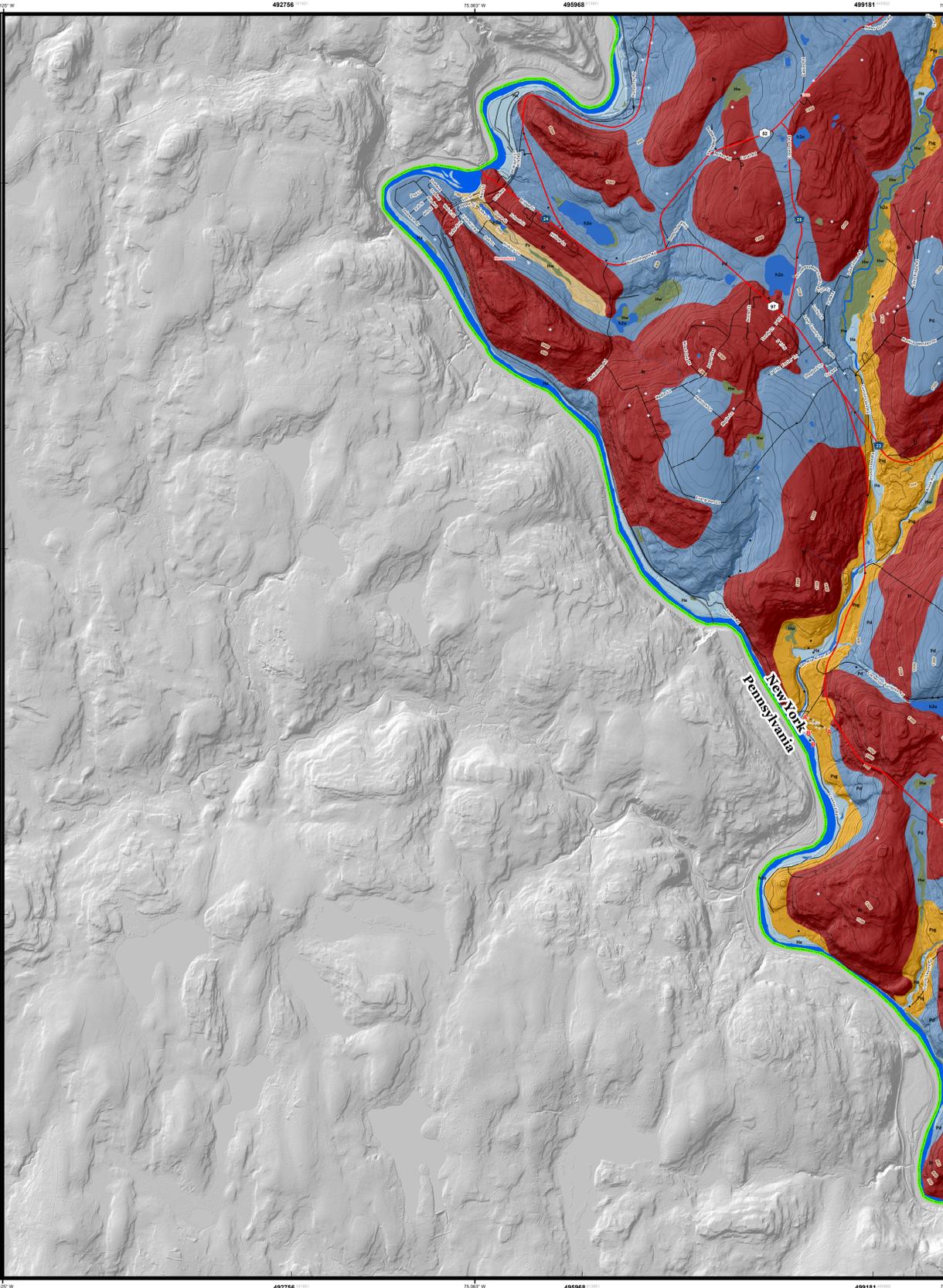


SURFICIAL GEOLOGY OF THE NARROWSBURG 7.5-MINUTE QUADRANGLE, SULLIVAN COUNTY, NEW YORK

prepared by
Jamers R. Leone and Karl J. Backhaus

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Introduction

The geology of the Narrowsburg 7.5-minute Quadrangle was mapped during 2015, 2016 and 2017 as part of the National Parks Service Task Agreement P15AC01482 for Geologic Mapping of the Upper Delaware Scenic and Recreational River (UDSRR). This map is part of Phase I of the mapping project in Delaware and Sullivan Counties, New York. The purpose of this map was to identify and delineate various geologic formations in the Narrowsburg Quadrangle with the intent that this information can guide the National Parks Service and municipalities in land use, environmental, and natural resource decisions. The Narrowsburg Quadrangle is within the Catskill Region of New York near the state border with Pennsylvania. The quadrangle is within the Town of Tusten, Sullivan County. The Hamlet of Narrowsburg is the main community in the quadrangle. The quadrangle is mainly wooded with large tracts of land for lumber and recreation. Bluestone mining is another major land uses in the quadrangle and surrounding area.

Situated at the western edge of the Catskill Mountain physiographic province the landscape varies from floodplain in the Delaware River Valleys to mountainous topography. The highest elevation is at 1,312 feet, or 400 meters, above mean sea level (amsl) in the northeastern portion of the quadrangle with the lowest elevation being 610 feet, or 186 meters, where the Delaware River exits the quadrangle to east. The sediments found in the quadrangle includes sand, gravel, diamicton (till) and bedrock exposed throughout the quadrangle.

The portions of the Narrowsburg Quadrangle within the boundaries of the UDSRR, consist primarily of exposed bedrock, deposits of stratified sand and gravel, till over rock and alluvium on the floor of the Delaware River Valley. The New York portion of the quadrangle is located west of the Delaware River. While much of the area mapped was bedrock ledges and cliffs the Ten Mile River Valley contained hummocky deposits of sand and gravel suggesting stagnant ice left behind by glaciers was the source of these deposits. Hillslopes and slopes were mainly bedrock ledges with some lower hills covered with thin till. In some instances, bedrock exposed through the till was had striations recorded on them. The valley floor itself was made up mostly of alluvium sediments.

Clastic Upper Devonian rocks make up virtually all bedrock in this region. These shales, mudstones, fine to coarse sandstone were observed in the area. There is some quartz pebbleconglomerate beds and there is a possibility to have localized lacustrine carbonate beds (Ver Straeten, 2013). Multiple cycles and similar facies, that cover 25 million years, make this area difficult to correlate without spending great amounts of time exclusively mapping the bedrock. Extensive geophysical, geochemical, and fossil identification would need to be carried out to create a comprehensive bedrock map of the region. The age of the rocks spans the Frasnian stage, ~385 million year ago (Ma) to ~360 Ma. In that time, this region was an expansive coastline with a complex river system, transporting massive amounts of sediment coming from the ancestral Acadian Mountains, which occupied present day eastern New England

Methods

Field mapping for this quadrangle was completed in 2016 and 2017. Mapping efforts included traversing the quadrangles primarily by vehicle along roadways, with some mapping taking place on private land. Sample collection was taken by pick and shovel from outcrops in drainage ditches, road and stream 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 40 observation points were made during the mapping process, with 21 samples collected for grain size analysis. Twenty-six Geoprobe samples were collected on the Ten Mile River Boy Scout camp along the Delaware River and three along Hickory Lane.

Water wells (41 in total) from the Department of Environmental Conservation and exploratory boreholes (29 in total) by the New York State Geological Survey were also used to decipher the subsurface geology of the Narrowsburg Quadrangle. The subsurface data from this well was simplified using the drillers descriptions to more standard and uniform descriptions.

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.

Surficial Map Units

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 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 can be found several meters in elevation higher than the present-day river valley floors. Psg is found in gravel pits, tributary valleys. The Ten Mile River valley is predominately sand and gravel. This trend continues into the Eldred Quadrangle (Leone, 2019).

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. This material is found throughout the mapped portion of the quadrangle covering most valley walls on the west side of the Delaware River. It is generally matrix supported, sand-dominant, and tan and reddish brown in color.

Summary and Discussion

The Narrowsburg quadrangle located on the southwestern edge of the Catskill Mountains. The region, like the surrounding Catskill Mountains, has 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. The nature of the sand and gravel in the tributary valleys are interpreted as related to stagnant ice left behind by retreating glaciers. Striations on exposed bedrock in two locations along Maple Lane southeast of Narrowsburg have a north northeast to south southwest orientation indicated ice movement at one point through the area.

Radiocarbon dates from cross-section B-B', along the Delaware River flood plain were dated to younger than 9,500 years bp and interpreted to be Holocene alluvium. The Geoprobe sample TMR1704 was collected within 20 meters of the shoreline, with TMR1705 being located 30 more meters inland. Cross-section A-A' is higher in elevation north of the B-B' samples. These Geoprobe samples were out of the floodplain of the Delaware River and likely associated with the stratified sand and gravel deposits of the Ten Mile River Valley. While this gave insight to be able to differentiated timing between the Holocene alluvium samples and the Pleistocene Sand and gravel samples it did not give any information about the timing of ice melt out from the region.

References

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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-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

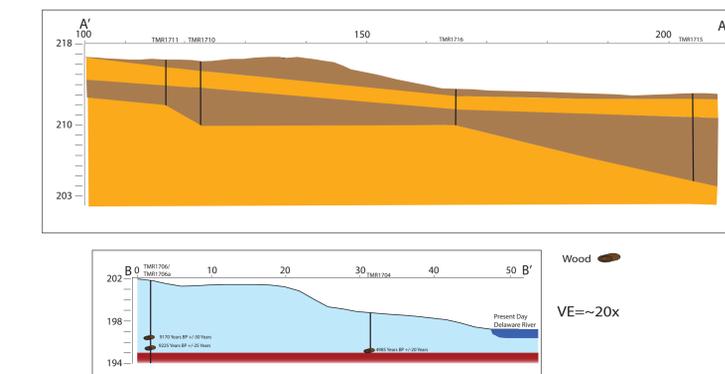
Pleistocene

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

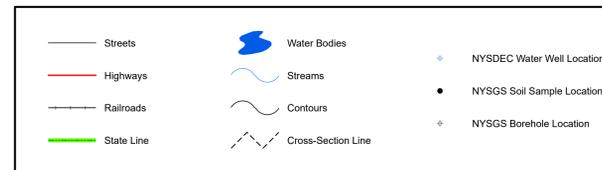
Pre-Pleistocene

- 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.

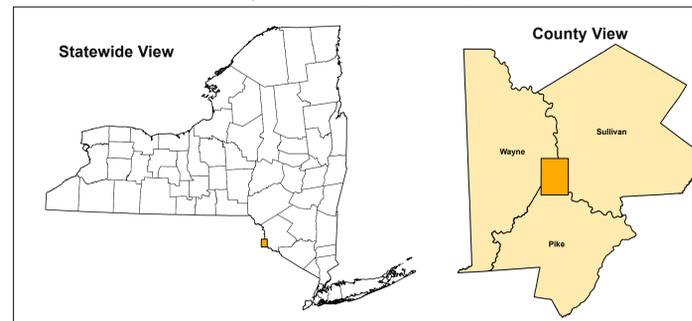
CROSS-SECTIONS A-A' & B-B'



SYMBOLS



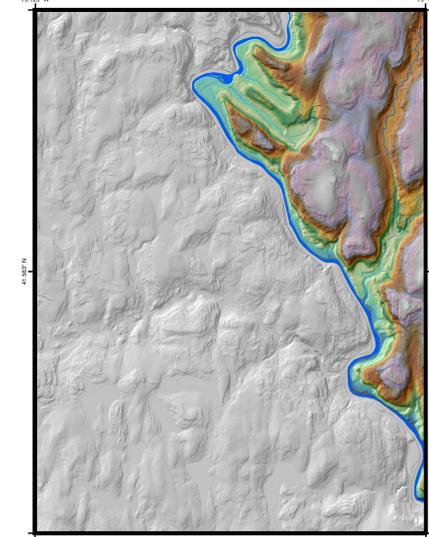
QUADRANGLE LOCATION



ADJOINING QUADRANGLES



QUADRANGLE ELEVATION



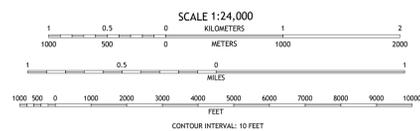
Universal Transverse Mercator, Zone 18 N
North American Datum of 1983

Hydrology, and planimetry layers from the New York State DOT Raster Quadrangle separates for Sullivan County
(https://gis.ny.gov/pdata/investor/investor/member.cfm?OrganizationID=108)

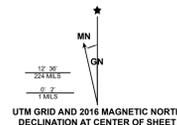
Geographic data layers from 2018: NYSDEC Line shapes for transportation and hydrography (https://www.census.gov/ipeds/data/geospatial/index.php)

Shaded relief from 2007 FEMA Delaware-Sullivan 1-meter and the NYS 10-meter lidar data sets
(https://gis.ny.gov/elevation/index.cfm)

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



Geologic mapping by J. Leone, K. Backhaus and C. Porreca, 2016
Digital data and cartography, K. Backhaus, 2019.



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NOTICE
This geologic map was funded in part by the National Park Service Task Agreement Number P15AC01482 for the Geologic Mapping in Upper Delaware Scenic and Recreational River Phase 1 in the year 2015.
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