

Surficial Geology of the Mt Grace Quadrangle in NH

Introduction

The surficial geology of the Mt. Grace quadrangle in New Hampshire is mapped as consisting of five major groups of deposits. In order of increasing age, the deposit groups are: wetland deposits (Qw), alluvial deposits (Qal), fine-grained deposits (Qlb), fine to coarse-grained stratified deposits (Qcp, Qjbd, Qsbd, Qsvd), and glacial till (Qt, Qtt). The wetland and alluvial deposits date to the Holocene. Stratified and till deposits were derived principally from the last fluctuation of the southward-flowing Laurentide Ice Sheet over the field area during the Wisconsinan Age of the Pleistocene. Many ice sheet fluctuations over the field area during the Pleistocene are likely reflected by deposits below the surface (Dyke and Prest, 1987). The surficial deposits overlie Late and Middle Ordovician granites, granodiorites, and tonalites of the Oliverian Plutonic Suite, the metasedimentary and metavolcanics rocks of the Ammonoosuc Volcanics, and Lower Devonian metasedimentary and metavolcanics rocks of the Littleton Formation (Lyons, 1997).

The eastern two-thirds of the quadrangle is in the town of Richmond, N.H. The western third is in Winchester, NH. There are three major zones of stratified glacial deposits. the Cass Pond zone in the Falls Brook watershed in the east; the upper Roaring Brook and Sprague Brook zone in the central quadrangle, and the valley-filling deposits of the Sunny Valley in the west.

Stratified deposits east and south of Cass Pond, Qcp, head at spillways carved in bedrock. The spillways were carved both by active glacial ice, as demonstrated by their morphology and the presence of an esker, and also meltwater impounded in a glacial lake to the north in the West Swanzey quadrangle (Hildreth, 1997; Pendleton, 1998). The deposits form a proglacial, glaciofluvial sediment-landform suite (Benn and Evans, 2010). Stratified deposits along Jesse Brook (Qjbd) and Sprague Brook (Qsbd) exhibit a distribution and morphology that are diagnostic of deposition meltwater at an ice margin. Hence, these deposits are considered to be a marginal-morainic sediment suite marking the position of a former ice-margin. The interfluvial area between the Cass Pond and Upper Roaring Brook zones exhibits drumlinized basal till diagnostic of a subglacial sediment-landform suite.

Deposits in the Sunny Valley are mostly glaciolacustrine (Qlb) bordered upslope by glaciofluvial sediments (Qsvd). Some colluvium is likely present. The glacial lake represented by Qlb was valley-filling and associated with Glacial Lake Ashuelot (Pendleton, 1997). A limited amount of water well data indicates that stratified sediment thicknesses average ~ 75 ft.

Methods

Information about the lithology and geomorphology of sediments in the map area was obtained from the following sources: 1) Web Soil Survey (Staff, 2019), 2) field work by the author, 3) water-well records from the water-well database, and 4) LIDAR data downloaded from the NH Granit, New Hampshire's Statewide GIS Clearinghouse web site.

References

Benn, D. I., and Evans, D. J. A., 2010, *Glaciers and Glaciation*, London, Hodder Education, 802p
Dyke, A. S., and Prest, V. K., 1987, Late Wisconsinan and Holocene history of the Laurentide Ice Sheet: *Géographie Physique et Quaternaire*, v. 41, p. 237-263.

- Hildreth, C. T., 1997, Surficial Geology of the West Half of the Monadnock Quadrangle (Troy), Cheshire County, New Hampshire: New Hampshire Dept. Resources and Economic Development, scale 1:24,000.
- Lyons, J. B., Bothner, W. A., Moench, R. H., and Thompson, J. B., Jr., 1997, Bedrock geologic Map of New Hampshire: U.S. Department of Interior, scale 1:250,000.
- Pendleton, R., 1998, Surficial Geologic Map of the West Swanzey 7.5 x 7.5 Minute Quadrangle (East Half of the Winchester 7.5 x 15 Minute Metric Quadrangle), Cheshire County, New Hampshire New Hampshire Department of Resources and Economic Development.
- Staff, S. S., 2019, Web Soil Survey, Natural Resources Conservation Service, United States Department of Agriculture.

Deposit Description

Unit Code	Name	Description
af	Artificial Fill/Disturbed Area	Areas where surficial sediments may have been disturbed or removed and /or material transported from another location.
Qal	Alluvium (Holocene and Pleistocene)	Sand, silt, gravel and minor muck in flood plains along present rivers and streams. As much as 3 meters (10 feet) thick. Extent of alluvium indicates most areas flooded in the past which may be subject to future flooding. In places, indistinguishable from swamp deposits (w).
Qcp	Cass Pond Outwash (Pleistocene)	Sand and gravel with minor mud deposited either close to or down-valley from glacier ice as outwash. The deposit is graded southward to a divide at 324+ meters elevation and partly to a 306+meter elevation gap in the hills east of Buffum Hill. As much as 9 meters (30 feet) thick.
Qjbd	Jesse Brook Deposit (Pleistocene)	Sand, gravel (pebbles to boulders) deposited along Jesse Brook proximal to and down-valley from the front of the ice-sheet at a stillstand in the Roaring Brook drainage
Qlb	Lake Bottom Deposits (Pleistocene)	Mostly sand and mud deposited into a glacial lake.
Qsbd	Sprague Brook Deposit (Pleistocene)	Sand and gravel deposited proximal to and down-valley from the front of the ice-sheet at a stillstand in the Roaring Brook drainage
Qsvd	Sunny Valley Outwash Deposit (Pleistocene)	Sand, silt, gravel, cobble and boulders likely deposited as outwash proximal to ice as the glacier front retreated northward within Sunny Valley. The deposits likely graded to meltwater spillways to the south (Grace Brook) and southwest (Lovers Retreat Brook).
Qt	Till (Pleistocene)	Light- to dark-gray, non-sorted to poorly-sorted mixture of clay, silt, and pebbles, cobbles and boulders. Thickness varies but generally is less than 20 feet, but is commonly more than 80 feet under the crest of most drumlins.
Qtt	Thin Till Deposits (Pleistocene)	Light- to dark-gray, non-sorted to poorly-sorted mixture of clay, silt, and pebbles, cobbles and boulders. Thickness less than 10 feet.
Qw	Wetland	Organic rich waterlaid sediments.
water		

