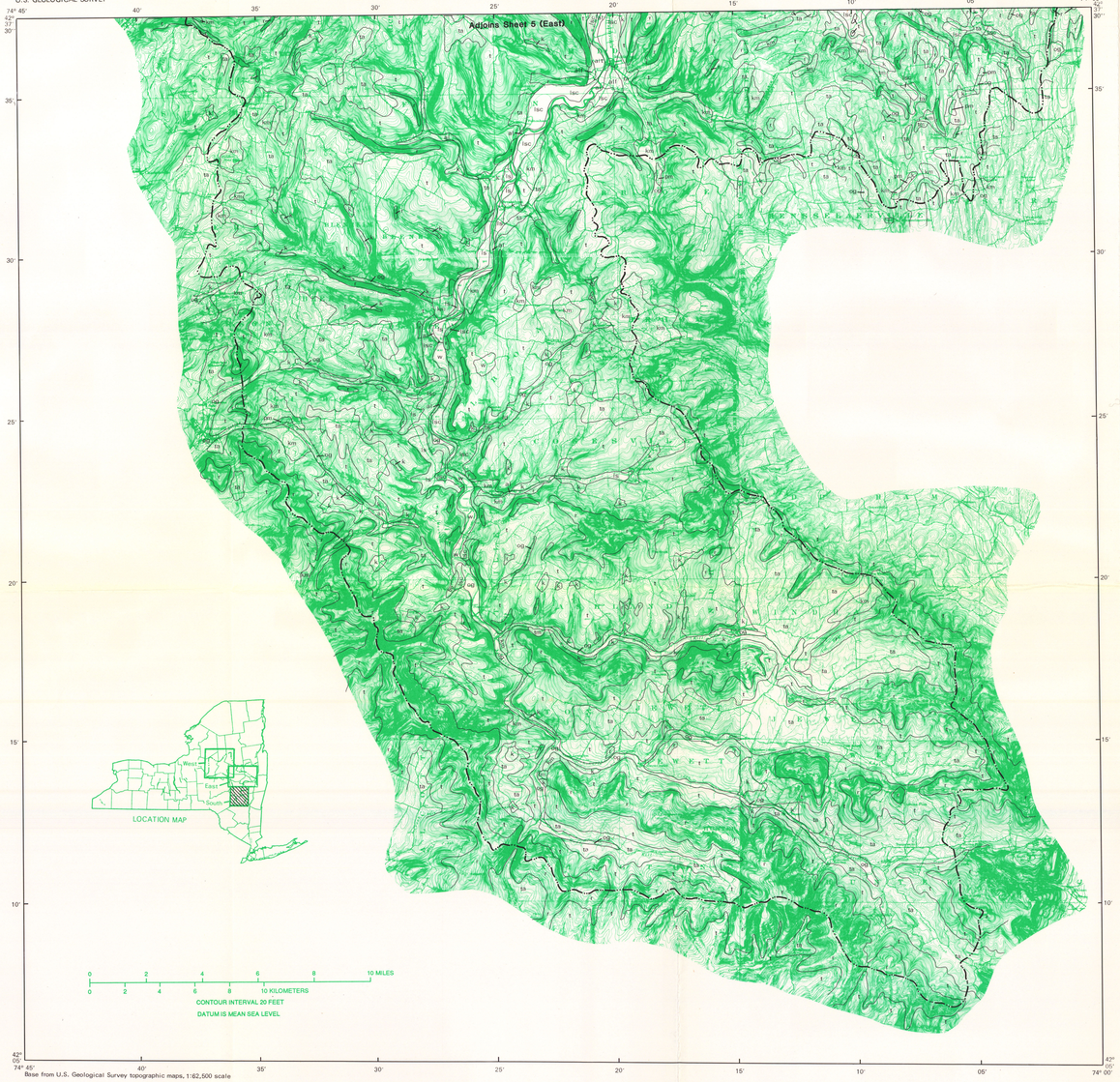
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH THE
HERKIMER-ONEIDA COUNTIES PLANNING COMMISSION
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

WATER-RESOURCES INVESTIGATIONS REPORT 88-4091
SHEET 6 (SOUTH)--SURFICIAL GEOLOGY



AVAILABILITY OF GROUND WATER FROM UNCONSOLIDATED DEPOSITS IN THE MOHAWK RIVER BASIN, NEW YORK

By
Richard J. Reynolds

Sheet 6.--Surficial geology, South

SURFICIAL GEOLOGY

This map (sheets 4, 5, 6) depicts the generalized surficial geology of the Mohawk River basin. The location and distribution of surficial materials were determined primarily from reconnaissance mapping on 1:24,000 scale (7.5-minute) topographic maps by the New York State Geological Survey and other geologists working independently within New York State. The level of detail on the original maps varies significantly from quadrangle to quadrangle as well as among investigators. As a result, some areas of the Mohawk basin, primarily the eastern part, have been mapped in detail, whereas others have received only cursory reconnaissance. In general, the mapping in the valleys has been more detailed than mapping in the uplands.

The primary source of data is unpublished field maps, at scales of 1:24,000 (7.5 minute) and 1:62,500 (15-minute) that are on file with the New York State Geological Survey. Other sources include published reports containing surficial geologic maps of one or more quadrangles, unpublished Master's and Doctoral theses, and unpublished or published surficial maps by independent workers. The major contributors to mapping of surficial geology in various parts of the Mohawk basin have been:

Western part - D. A. Franzi, J. C. Ridge, E. H. Muller, and F. M. Wright III (Syracuse University), and Marshall Kay (Columbia University).

Central Mohawk - J. M. Whipple, (U.S. Geological Survey) and E. H. Muller (Syracuse University).

Lower Mohawk - D. H. Cadwell and R. J. Dineen (New York State Geological Survey), R. G. LaFleur (Rensselaer Polytechnic Institute), and A. P. Brigham (New York State Geological Survey).

Schoharie basin - D. H. Cadwell and J. L. Rich (New York State Geological Survey) and R. G. LaFleur (Rensselaer Polytechnic Institute).

Other contributors are listed in the "References" section. Compilation of data from these sources and the resolution of discrepancies in the mapping of units in adjacent areas was done by D. H. Cadwell of the New York State Geological Survey.

Southern Mohawk River Basin (Schoharie Creek Basin)

The Schoharie Creek basin is part of the Appalachian Plateau physiographic province that has been deeply dissected by predominantly northward-flowing streams. During glaciation, these northward stream gradients restricted free drainage of meltwater away from the ice margin and resulted in the development of proglacial lakes during both the advance and retreat of the glacier. Most glacial geologists who have studied the deposits in this part of the Mohawk basin agree that high glacial-lake levels (up to 1,600 feet above sea level) had been maintained in the Schoharie valley as the ice front receded (Cadwell, 1986, p. 77). They differ, however, in their interpretations of the sequence of lake drainage and deglaciation in the Schoharie Creek basin. Rich (1935) postulated a continuous ice retreat to the north with six temporary "stages" or ice-margin positions. LaFleur (1969) hypothesized four glacial readvance positions in the Schoharie valley during the retreat of the last ice sheet. Cadwell (1986) proposed a deglaciation model similar to that of Rich (1935) but recognized only three recessional ice margins and no evidence of ice readvance into the valley. Randall (U.S. Geological Survey, written commun., 1986) believes that at least the lower Schoharie valley was subjected to multiple readvances of ice, during which oscillations of the ice front formed, traversed and reformed proglacial lakes, thus producing till layers interbedded with localized deposits of deltaic and fluvial gravel.

Most of the apparently productive sand and gravel aquifers in this area consist of thin surficial outwash and alluvium deposits in the Schoharie Creek valley proper, although four major east-side tributaries contain valley-train outwash and(or) kame deltas and terraces of sand and gravel. The steep valleys of the Plattekill, the Batavia Kill, and the Manor Kill are floored with valley-train outwash and alluvium that form significant surficial water-table aquifers. Shallow unscreened domestic wells that tap these units have reported yields as high as 30 gal/min. Kame sand and gravel deposits also flank the steep walls of these valleys, but their high elevation suggests that they probably are largely unsaturated (A. D. Randall, U.S. Geological Survey, written commun., 1986), although they may be saturated and hydraulically connected with adjacent outwash at depth.

The upper (southern) Schoharie Creek valley is floored as far north as Prattsville with valley-train outwash that forms a surficial aquifer that is tapped by several domestic wells. Records of wells in some places within the upper Schoharie Creek valley, however, also suggest the presence of a deeper sand and gravel aquifer that is possibly confined by lacustrine silt and clay and(or) till. Here, too, yields of 6-inch-diameter unscreened domestic wells are commonly 20 to 30 gal/min.

The lower (northern) Schoharie Creek valley contains deposits of lake silt and clay emplaced high on the valley walls as a result of deposition in one or more stages of proglacial Lake Schoharie. The valley floor is covered with a veneer of alluvium over glaciofluvial sand and gravel. This upper sand and gravel unit forms a surficial aquifer that is hydraulically connected to Schoharie Creek and to tributaries to the Schoharie where these deposits are present. Deep wells drilled on the valley floors commonly penetrate from 100 feet to more than 200 feet of stratified drift before tapping sand and gravel. The materials penetrated are generally logged as hardpan (till) with lesser amounts of clay, quicksand (silt or very fine sand), and coarse sand and gravel (A. D. Randall, U.S. Geological Survey, written commun., 1986). Sand and gravel aquifers are present at several depths in this area. Wells that tap these deeper, confined aquifers in the lower Schoharie valley range from 100 to more that 200 ft deep and commonly have yields that exceed 20 gal/min.

Valley-train outwash also floors the Cobleskill Creek valley, but most wells that tap sand and gravel in this valley do so only at considerable depths. Most domestic wells in this valley that are completed in sand and gravel are from 100 to more than 300 ft deep and penetrate till and(or) large thicknesses of lacustrine fine sand, silt, and clay before terminating in gravel. Yields from deep domestic wells in this valley range from 10 to 60 gal/min.

Elsewhere in the Schoharie basin, localized deposits of ablation till and kame moraine can provide adequate supplies of ground water to dug wells if the saturated thickness is sufficient to provide usable amounts of water.

SELECTED REFERENCES

Antonetti, M. D., 1982, The Pleistocene geology of the South Trenton, New York 7.5-minute quadrangle: Syracuse University, unpublished Master's thesis, 100 p.

Brigham, A. P., 1898, Topography and deposits of the Mohawk Valley: Geological Society of America Bulletin, v. 9, p. 183-210.

____1929, Glacial geology and geographic conditions of the lower Mohawk valley: New York State Museum Bulletin, v. 280, 133 p.

Brown, G. A., and others, 1981, Geohydrology of the valley-fill aquifer in the Schenectady area, Schenectady County, New York: U.S. Geological Survey Open-File Report 82-84, 6 sheets, 1:24,000 scale.

Cadwell, D. H., 1979-86, Reconnaissance surficial geologic maps of the Mohawk River basin: Unpublished field maps on file with the New York State Geological Survey, Albany, N.Y., scales 1:24,000 and 1:62,500.

____1986, Late Wisconsinan stratigraphy of the Catskill Mountains, *in* Cadwell, D. H., ed., The Wisconsinan stage of the first geological district, eastern New York: New York State Museum Bulletin 455, p. 73-88.

Caggiano, J. A., Jr., 1966, Glacial drainage history and drift petrography of the Vernon, New York, quadrangle: Syracuse University, unpublished Master's thesis, 104 p.

Caprio, R. C., Jr., 1979, Quantitative appraisal of till in south-central New York: State University of New York at Binghamton, unpublished Doctoral dissertation, 201 p.

Cook, J. H., 1930, The glacial geology of the Capital District, *in* Ruedemann, Rudolf, Geology of the Capital District: New York State Museum Bulletin 285, p. 181-199.

____1935, The glacial geology of the Berne Quadrangle, *in* Goldring, Winifred, Geology of the Berne Quadrangle: New York State Museum Bulletin 303, p. 222-230.

Cushing, H. P., 1905, Geology of the vicinity of Little Falls, Herkimer County, New York: New York State Museum Bulletin v. 77, 95 p.

DeSimone, D. J., 1980-85, Reconnaissance surficial geologic mapping: Unpublished field maps on file at the New York State Geological Survey, Albany, N.Y., 1:24,000 scale.

Dineen, R. J., 1970-86, Reconnaissance surficial geologic mapping: Unpublished field maps on file at the New York State Geological Survey, Albany, N.Y., scales 1:24,000 and 1:62,500.

Dineen, R. J. and Hanson, E. L., 1983, Bedrock topography and glacial deposits of the Colonie Channel between Saratoga Lake and Coeymans, New York: New York State Museum Map and Chart Series no. 37, 55 p.

____1985, Deglaciation of the middle Mohawk and Sacandaga valleys, or a tale of two tongues, *in* Lindemann, R. H., ed., 1985, Field trip guidebook, New York State Geological Association, 57th annual meeting: New York State Geological Association, p. 250-268.

Fairchild, H. L., 1912, Glacial waters in the Black and Mohawk valleys: New York State Museum Bulletin, v. 160, 47 p.

Foresti, R. J., 1984, Macrofabrics, microfabrics, and microstructures of till and Pleistocene geology of the Ilion quadrangle, Mohawk Valley, New York: Syracuse University, unpublished Masters' thesis, 100 p.

Franzi, D. A., 1984, The glacial geology of the Remsen-Ohio region, east-central New York: Syracuse University, Doctoral dissertation, 172 p.

Fullerton, D. S., 1971, The Indian Castle glacial readvance in the Mohawk lowland, New York and its regional implications--parts 1 and 2: Princeton University, Doctoral dissertation, 270 p.

Halberg, H. N., and others, 1962, Water resources of the Utica-Rome area, New York: U.S. Geological Survey Water Supply Paper 1499C, 46 p.

Hanson, E. L., 1977, Late Woodfordian drainage history in the Lower Mohawk Valley: Troy, N.Y., Rensselaer Polytechic Institute, unpublished Masters' thesis, 62 p.

Kay, Marshall, 1953, Geology of the Utica Quadrangle, New York: New York State Museum Bulletin 347, 126 p.

Krall, D. B., 1972, Till stratigraphy and Olcan ice retreat in east-central New York: New Brunswick, N.J., Rutgers University, Doctoral dissertation 96 p.

____1977, Late Wisconsinan ice recession in east-central New York: Geological Society of America Bulletin, v. 88, p. 1679-1710.

LaFleur, R. G., 1969, Glacial geology of the Schoharie valley, *in* Bird, J. M., ed., Guidebook for field trips in New York, Massachusetts, and Vermont: New England Intercollegiate Geological Conference, 61st annual meeting, State University of New York at Albany, p. 5-1 to 5-20.

____1975-79, Reconnaissance surficial geologic mapping of the lower Mohawk valley: Unpublished field maps on file at New York State Geological Survey, Albany, N.Y., 1:24,000 scale.

____1979, Deglacial events in the eastern Mohawk-northern Hudson lowland, *in* Friedman, G. M., ed., Guidebook - Joint annual meeting New York State Geological Association (51st) and New England Intercollegiate Geological Conference (71st): Troy, N.Y., p. 326-350.

Lewis, H. G., and others, 1929, Soil survey of Herkimer County area, New York: U.S. Department of Agriculture, 45 p.

Lowey, J. M., 1983, The Pleistocene geology of the Oriskany, New York, 7.5-minute quadrangle: Syracuse University, unpublished Masters' thesis, 67 p.

Lykens, C. A., 1983, The maximum extent of Oneida lobe ice within the western Mohawk valley, within the Port Bruce stadial--a reevaluation: Syracuse University, unpublished Masters' thesis, 84 p.

MacClintock, Paul, and Apfel, E. T., 1944, Correlation of the drifts of the Salamanca reentrant, New York: Geological Society of America Bulletin, v. 55, pp. 1143-1164.

Maxon, E. T., and others, 1915, Soil survey of Oneida County, New York: U.S. Department of Agriculture, 59 p.

Miller, W. J., 1909, Geology of the Remsen Quadrangle: New York State Museum Bulletin 126, 51 p.

____1916, Geology of the Lake Pleasant Quadrangle, Hamilton County, New York: New York State Museum Bulletin 182, 75 p.

Muller, E. H., and Cadwell, D. H., 1986, Surficial geologic map of New York, Finger Lakes Sheet, *in* Cadwell, D. H., and others, Surficial geologic map of New York: New York State Museum Map and Chart Series no. 40, scale 1:250,000

Muller, E. H., Franzi, D. A., and Ridge, J. C., 1986, Pleistocene geology of the western Mohawk Valley, New York *in* Cadwell, D. H., ed., The Wisconsinan stage of the first geological district, eastern New York: New York State Museum Bulletin 455, p. 143-157.

Reynolds, R. J., 1985, Hydrogeology of the Clifton Park area, Saratoga County, New York: U.S. Geological Survey Water Resources Investigations Report 84-4031, 6 sheets, scale 1:24,000.

Rich, J. L., 1935, Glacial geology of the Catskills: New York State Museum Bulletin 199, 180 p.

Ridge, J. C., 1985, The Quaternary glacial and paleomagnetic record of the West Canada Creek and western Mohawk valleys of central New York: Syracuse University, unpublished Doctoral dissertation, 471 p.

Ridge, J. C., Franzi, D. A., and Muller, E. H., 1984, The Lake Wisconsinan glaciation of the West Canada Creek valley, *in* Potter, D. B., ed., Field trip guidebook: New York State Geological Association, 56th annual meeting, Hamilton College, Clinton, N.Y., p. 237-277.

Simpson, E.S., 1952, The ground-water resources of Schenectady County, New York: New York State Department of Conservation Bulletin GW-30, 110 p.

Stoller, J. H., 1911, Glacial geology of the Schenectady Quadrangle: New York State Museum Bulletin 154, 43 p.

Waller, R. M., 1983, Ground-water potential of the Capital District buried-valley deposits, in Dineen, R. J., and Hanson, E. L., Bedrock topography and glacial deposits of the Colonie Channel between Saratoga Lake and Coeymans, New York: New York State Museum Map and Chart Series no. 37, p. 25-31.

Whipple, J. M., 1969, Glacial geology of the area from Little Falls to Richfield Springs, New York: Troy, N.Y., Rensselaer Polytechnic Institute, Doctoral dissertation, 158 p.

Winslow, J. D., and others, 1965, Ground-water resources of eastern Schenectady County, New York with emphasis on infiltration from the Mohawk River: New York State Water Resources Commission Bulletin 57, 148 p.

Wright, F. M., III, 1972, The Pleistocene and recent geology of the Oneida-Rome District, New York: Syracuse University, Doctoral dissertation, 191 p.

Yatsevich, Yuri, 1968, Surficial geology of the Gloversville area, New York: Troy, N.Y., Rensselaer Polytechnic Institute, unpublished Master's thesis.

EXPLANATION

HOLOCENE

- **al** ALLUVIUM--Postglacial alluvial deposits of silt, sand, and some gravel generally confined to flood plains within a valley. Locally overlain by silt of variable thickness in larger valleys that are subject to frequent flooding. Relatively low permeability. Thickness variable but generally less than 30 feet.
- **alf** ALLUVIAL FAN--Fan shaped, fluvially deposited accumulations of poorly stratified silt, sand, and gravel deposited by tributary streams at the foot of steep slopes. Relatively high permeability.
- **alt** ALLUVIAL TERRACE--Postglacial stream terraces composed of stratified silt, sand, and gravel produced by continued or renewed downcutting of the flood plain or valley floor by a stream. Moderately permeable but thinly saturated.
- **pm** SWAMP DEPOSITS--Postglacial to recent deposits of peat, muck, organic silt, and sand that accumulated in poorly drained areas and localized depressions. Locally overlies marl and lake silts. Thickness generally less than 60 feet.

PLEISTOCENE

- **ld** LACUSTRINE DELTA--Fluvially deposited stratified, coarse to fine gravel and sand. Generally well sorted. Relative permeability moderate. Deposited by meltwater streams that entered a proglacial lake. Variable thickness.
- **lsc** LACUSTRINE SILT AND CLAY--Silt and clay deposited as bottom sediment in proglacial lakes. Generally composed of calcareous, thinly bedded laminated beds of silt but can be massive. Variable thickness, ranging up to 300 feet. Relative permeability very low.
- **ls** LACUSTRINE SAND--Sand, well sorted, stratified, deposited into pro-glacial lakes in a nearshore, shallow-water environment. Variable thickness. Relative permeability moderate.
- **og** OUTWASH SAND AND GRAVEL--Glaciofluvial stratified sand and gravel deposited by meltwater streams as valley train or as outwash plains and terraces. Well-sorted coarse to fine gravel with sand. Grain-size generally becomes finer with distance from ice front. Variable thickness. Relative permeability high to very high.
- **k** KAME DEPOSITS--Includes kames, eskers, kame terraces, and kame deltas. Ice-contact sand and gravel deposits consisting of fluvially sorted coarse to fine gravel and(or) sand. Extreme variability in sorting, grain size, and thickness of individual beds. May be locally cemented with calcium carbonate. Variable thickness and permeability. Relative permeability high in coarse, well-sorted beds.
- **km** KAME MORAINES--Ice-contact, poorly sorted to moderately well-sorted deposits of sand and gravel that may also contain considerable amounts of silt, clay, and boulders. Generally composed of the slumped remnants of a formerly continuous outwash plain built up over the foot of rapidly wasting or stagnant ice. Indicative of a temporary location of the ice during deglaciation. Thickness and grain size variable; is locally cemented with calcium carbonate. Relative permeability low to moderate but generally high in coarse, well-sorted beds.
- **t** TILL (GROUND MORAINE)--Ice-contact, unsorted, unstratified mixture of clay, silt, sand, gravel, and boulders deposited beneath advancing glacial ice. Relatively impermeable with moderate to large clay content. Tends to be sandy and, thus, more permeable in areas underlain by igneous and metamorphic rock. Thickness variable (up to 150 ft) but generally less than 20 feet on upland hills. Generally yields adequate amounts of water for domestic use to large-diameter dug wells.
- **tm** TILL MORAINE--Ice-contact deposits of till that mark a stillstand or retreat in the ice front at the terminus of an ice lobe (end moraine), flanking an ice lobe (lateral moraine), or between two ice lobes (interlobate moraine). Much like ground moraine but more variable in sorting. Relative permeability low. May show ice-shove deformation features. Grain size ranges from boulder to clay.
- **ta** ABLATION TILL--A morainal or sheet deposit of nonstratified till that was deposited from a rapidly wasting ice margin. Ablation till is composed of rock debris that were formerly imbedded in or atop glacial ice and were rapidly deposited as the ice melted. Ablation till typically is loose and uncompacted and, therefore, much more permeable than till moraine or ground moraine. Permeability is also enhanced by the general absence of the silt and clay fraction, which was carried off by meltwater. Yields of wells that terminate in saturated ablation till in this region may approach those of wells screened in stratified material such as kame sand and gravel.
- **r** BEDROCK--Areas where bedrock is exposed or close to land surface. Bedrock ranges from igneous and metamorphic rock of Precambrian age to shale and siltstone of Devonian age and includes carbonate rocks of Devonian to Silurian age.
- **w** OPEN WATER--Areas of open water such as lakes, large ponds, and reservoirs.

GEOLOGIC CONTACT--Denotes contact between adjacent surficial geologic units. Approximately located.

BASIN BOUNDARY--Indicates approximate location of the surface-water divide that separates the Mohawk River basin from adjacent river basins.