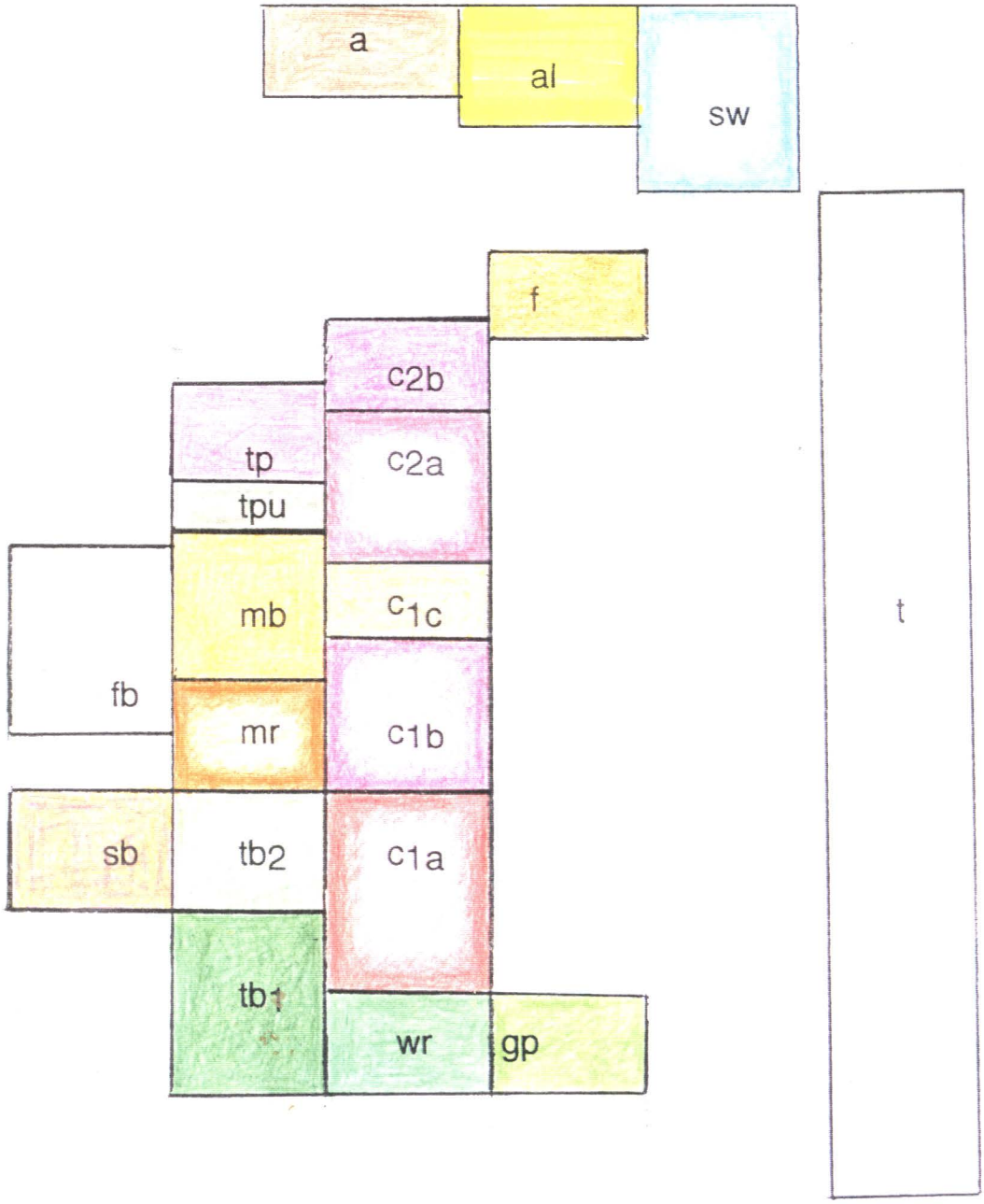
SURFICIAL GEOLOGY OF THE EAST HALF OF THE MOUNT MONADNOCK QUADRANGLE, CHESHIRE COUNTY, NEW HAMPSHIRE

BY

CAROL. T. HILDRETH

1995

CORRELATION OF MAP UNITS



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DESCRIPTION OF MAP UNITS

By

Carol T. Hildreth

(NOTE: ALL UNITS ARE QUARTERNARY IN AGE AND SYMBOLS NORMALLY WOULD BE PRECEDED BY A "Q")

(Mapped in 1994 at 1:25,000 Scale and plotted on a 1:24,000 blowup of that base map)

A layer of windblown sand and silt, generally mixed with underlying glacial deposits, is present over much of the map area but is not shown.

NOTE: Correlation between isolated deposits and between map units is tentative.

a ARTIFICIAL CUT AND FILL--Manmade. Material of fill varies from natural sand and gravel to quarry wastes to sanitary landfill. Depth of cuts and thickness of fill variable.

al ALLUVIUM (HOLOCENE)--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 (sw).

sw SWAMP DEPOSITS (HOLOCENE)---Muck, peat, silt, and sand. Generally 1/2 meter to 3 meters (1 foot to 10 feet) thick. In places indistinguishable from alluvium (al).

f GLACIAL-LAKE AND GLACIAL-STREAM DEPOSITS NEAR FROST POND (PLEISTOCENE)--Sand, gravel and minor silt and clay deposited in contact with or beyond adjacent ice as kame-terrace and kame-delta deposits graded to a threshold at 333-336 meters (1090-1120 feet) elevation at the southeast end of Frost Pond. Meltwaters draining this area contributed sediment to unit c_{2b} deposits immediately downstream of the threshold. As much as 6 meters (20 feet) thick.

GLACIAL-LAKE AND GLACIAL-STREAM DEPOSITS OF GLACIAL LAKE CONTOOCOOK (PLEISTOCENE)--Sand, gravel, silt and clay deposited in contact with or beyond adjacent ice, representing different stages of a glacial lake within the Contoocook River valley. Units c_{1+2} are correlated with those previously mapped in the Peterborough South quadrangle to the east (Hildreth, 1992). Nearly all deposits in these units have surface elevations of roughly between roughly 300 and 336 meters (1000-1100 feet). It should be noted that gradients in outlet channels are very low (nearly level) for long distances downstream. The oldest, unit c_{1a}, is associated with an outlet at 318+ elevation northwest of Pool Pond, which drained west into various channels east of Pearly Lake, thence southward through swamps and streams that eventually drain into Tarbell Brook. While meltwaters utilized this outlet Pool Pond was occupied by a stagnant ice block and sand and gravel was deposited around its margins (unit c_{1a} surrounding Pool Pond). Drainage southwest of Pool Pond was blocked by an ice block occupying the large swamp there. Unit c_{1b} is associated with the 306-312 meter (1000-1023 foot)

1 elevation outlet channel carved through the south end of the c_{1a} deposits southwest of

Pool Pond after the ice block to the southwest melted out of the swamp. Later, the stagnant ice front receded a bit farther north and uncovered another outlet south of Carter Hill through a swamp along Route 202 at the same 306-312 meter elevation today. However, during glacial retreat, this same outlet would have been about 1.5 meter (almost 5 feet) lower than the first outlet due to post-glacial uplift (Koteff and others, 1987). Meltwaters there flowed westward through a series of swamps and finally southward into Pearly Lake and its associated drainage. Deposits in the Mountain Brook valley are associated with this outlet. Unit c_{1c} had the same outlet but by this time the stagnant ice front had moved farther north up the valley of Tyler Brook Later, the ice front moved farther north to whereTyler Brook crossed Bryant Road (head of outwash), and meltwaters deposited unit c_{2a} in the valley of Tyler Brook and in an unnamed valley at the east edge of the map. Unit c_{2b} was deposited by south-flowing streams into Glacial Lake Contoocook and is partly contemporaneous with deposits (f) in the valley of Stanley Brook and Frost Pond area. Both c_2 units are associated with the same outlet as unit c_{1b+c}. As the glacial front receded northward, Glacial Lake Contoocook was controlled by this outlet until the front reached a 386.5-292.6 meter (940-960 foot) elevation divide in the Wapack Range at the east edge of the Peterborough North quadrangle. It was perhaps at the time that the lake level dropped to this new elevation that the meltwater channels in unit c_{1a} were carved by the rapidly draining lake waters.

c_{2b} Kame-terrace, kame-delta and lake-bottom deposits; as much as 6 meters (20 feet thick).

c_{2a} Ice-cannel fillings, kame-terrace and kame-delta deposits; as much as 6 meters (20 feet) thick.

c_{1c} Ice-channel fillings and kame-terrace deposits; as much as 12 meters (40 feet) thick.

c_{1b} Ice-channel fillings and kame-terrace deposit; as much as 21 meters (70 feet) thick.

c_{1a} Kame-terrace, kame-delta and lake-bottom deposits; as much as 23 meters (75 feet) thick.

GLACIAL-STREAM AND GLACIAL-LAKE DEPOSITS NEAR THORNDIKE POND (PLEISTOCENE)--Sand, gravel and minor silt deposited in contact with or beyond adjacent ice as ice-channel fillings, kame-terrace, kame-delta and lake-bottom deposits laid down by south-flowing meltwaters graded to a low divide (354-360 meters or 1160-1180 feet elevation) at the south end of Thorndike Pond. These meltwaters then followed the valley of Stony Brook south to Glacial Lake Contoocook. Unit tpu is a small solated kame terrace uphill to the west of tp deposits.

tp Ice-channel fillings, kame-terrace, kame-delta and probable lake-bottom deposits; as much as 9 meters (30 feet) thick.

tpu Kame-terrace deposit; as much as 2 meters (6 feet) thick.

fb GLACIAL-LAKE AND GLACIAL-STREAM DEPOSITS OF THE FASSET BROOK AREA (PLEISTOCENE)-- Sand, gravel, silt and clad deposited in contact with or beyond adjacent ice as kame-terrace and kame-delta deposits graded eastward to the divide (456-462 meters [1496-1516 feet] elevation) on Route 124 near the intersection with the Halfway House Road. Meltwaters crossing this divide flowed east and may have contributed sediment to unit mr and/or unit mb; unit fb deposits are as much as 9 meters 30 feet) thick.

mb GLACIAL-LAKE AND GLACIAL-STREAM DEPOSITS IN THE VALLEY OF MEAD AND STONY BROOK (PLEISTOCENE)--Sand, gravel, and minor sit and clay deposited in contact with or beyond adjacent ice as kam- terrace, kame-delta and outwash deposits. Deposits are graded eastward to outlets over ice or local till or bedrock threshold within the stream valleys ; as much as 5 meters (15 feet) thick.

mr GLACIAL-LAKE AND GLACIAL-STREAM DEPOSITS OF THE MILLIKEN ROAD AREA (PLEISTOCENE)--Sand and gravel deposited in contact with or beyond adjacent ice. primarily as kame-terrace deposits along the south flank of Mt. Monadnock. May have received some of its sediment from meltwaters that deposited Unit fb on the west side of the gap, immediately to the west. Apparently graded to a threshold of ice. As much as 18 meters (60 feet thick, but generally less than than 6 meters (20 feet) thick.

sb GLACIAL-STREAM DEPOSITS OF THE SCOTT BROOK AREA (PLEISTOCENE)--Sand and gravel deposited in contact with or beyond adjacent ice in the valley of Scoot Brook, immediately south of Scott Pond, as outwash deposits graded to the glacially swollen stream course; as much as 3 meters (10 feet) thick.

GLACIAL-STREAM AND GLACIAL-LAKE DEPOSITS OF TARBELL BROOK VALLEY (PLEISTOCENE)--Sand, gravel and minor silt and clay deposited in contact with or beyond adjacent ice by meltwaters flowing southward along Tarbell Brook and its tributaries into the Millers Rivers, thence westward to the Connecticut River. Someof the original tb_1 deposit is in places eroded away by later meltwaters draining Glacial Lake Contoocook.

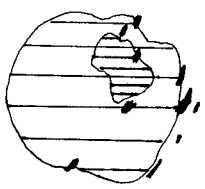
tb_2 Kame-delta and outwash deposits; as much as 6 meters (20 feet) thick.

tb_1 Kame-terrace, kame-delta, and outwash deposits; as much as 9 meters (30 feet) thick.

GLACIAL-STREAM DEPOSITS IN WEST RINDGE AREA (PLEISTOCENE)--Sand and gravel deposited in contact with or beyond adjacent ice as kame terrace deposits graded to a 330-336 meter (1080-1100 foot) elevation gap in the hills along Route 202 near the south edge of the map. Meltwaters that flowed through this gap flowed west into Tarbell Brook, thence south; as much as 5 meters, 915 feet) thick.

gp GLACIAL-STREAM AND GLACIAL-LAKE DEPOSITS NEAR GRASSY POND (PLEISTOCENE)--Sand and gravel deposited in contact with or beyond adjacent ice as ice-channel fillings kame-terrace, kame-delta, and outwash deposits laid down by meltwaters that flowed south to a 360-366 meter (1180-1200 foot divide in the hills southeast of Grassy Pond. This unit is equivalent to unit h_4 of the Peterborough South quadrangle (Hildreth, 1992).

t TILL (PLEISTOCENE)--Light- to dark-gray, nonsorted to poorly sorted mixture of clay, silt, and, pebbles,cobbles and boulders; contains some gravel. Thickness varies but generally is less than 20 feet, but is commonly more than 80 feet under the crest of most drumlins.



BEDROCK EXPOSURES--Individual outcrops not shown completely. Solid is individual outcrop; closely ruled pattern covers large areas of outcrop (most notable is the summit of Mt. Monadnock); and widely ruled pattern indicates areas of abundant exposures and areas where surficial deposits are generally less than 10 feet thick. Mapped in part from aerial photos, Soil Surveys (Simmons and others, 1949, and Rosenberg, 1985), and data from bedrock geologic maps (Fowler-Billings, 1949, and Thompson, 1985).

MATERIALS OBSERVATIONS--Surficial materials in exposures, well holes and test holes. Letters indicate texture in decreasing order of abundance. Number indicates thickness in feet.

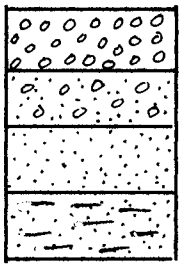
g gravel
b boulder
c cobble
p pebble
s sand (as separate beds; not including sand in matrix of gravel)
F fine sand
s silt
c clay
t till

WELL-HOLE AND TEST-HOLE DATA--Materials for some holes described. Approximately ocated from Harte and Johnson (1995) and Moore and others (1994).

● 37 Well or test hole that reached bedrock or refusal at depth indicated (in feet below surface).

O 6t Well or test hole that did not reach bedrock or refusal. Depth reached indicated (in feet).

TEXTURE OF STRATIFIED DEPOSITS--Indicated to a depth of at least I meter (3 feet)



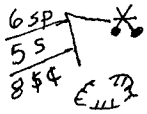
Pebble to boulder gravel

Mixed sand and gravel

Sand

Sand, fine sand and silt

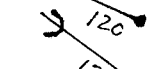
Borrow pit, small



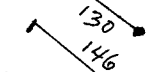
Borrow pit, small-abandoned

Borrow pit, large, or cut bank

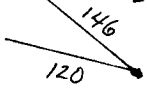
Direction of glacial meltwater flow over outwash deposits



Glacial striations. Point of observation is at southern end of line.



Glacial groove. Point of observation is at south end of line



Two directions of glacial striations and /or grooves on same outcrop, Tick on northern end of symbol indicates the earlier of the two, where that can be determined. A fascinating field study would be to map as many striations and grooves on Mt. Monadnock as possible to determine the direction and extent of the second direction of glacial movementover and around Mt. Monadnock.

Drumlin form. Indicates general direction of glacial ice movement This part of the Monadnock area has an unusually large number of drumlins and they partly occur in peculiar formation. Arcuate eat-west rows of drumlins alternate with swamps and lakes,suggesting some type of end moraine formation, and some of them do line up with mapped heads of outwash (See attached tentative ice-frontal position sketch map Any ideas on how these drumlin rows formed will be welcomed.

306-312
Clb+c

Threshold (outlet) to which designated glacial deposits are graded. Number gives approximate elevation in meters. Symbol(s) is (are) unit(s) graded to the threshold.

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