MAP GQ-485

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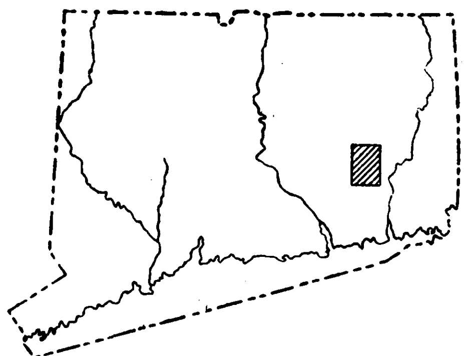
GEOLOGIC QUADRANGLE MAPS OF THE UNITED STATES

SURFICIAL GEOLOGIC MAP OF THE FITCHVILLE QUADRANGLE NEW LONDON COUNTY, CONNECTICUT

By
Fred Pessl, Jr.



QUADRANGLE LOCATION

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SURFICIAL GEOLOGIC MAP OF THE FITCHVILLE QUADRANGLE, NEW LONDON COUNTY, CONNECTICUT

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INTRODUCTION

The surficial geology of the Fitchville quadrangle was mapped in 1964 as part of the cooperative mapping project with the State of Connecticut Geological and Natural History Survey. The bedrock geology was mapped in 1957 by George Snyder (1964).

The area has been tectonically inactive since Triassic time, and until the initial surges of Pleistocene glaciers across southern New England, the rocks were subjected primarily to the erosional effects of wind and water. The resulting preglacial landscape was probably quite similar to that of today, with perhaps slightly greater relief and somewhat less streamline topography. Preglacial streams, although better integrated than present drainage systems, generally followed the same courses now occupied by modern streams. A thick residual soil, the result of a long period of chemical and biological weathering probably was widespread prior to the advance of the first Pleistocene glaciers.

No distinct evidence of early Pleistocene glaciation is recognized in the quadrangle. All the glacial deposits mapped are believed to be of Wisconsin age.

GLACIAL EROSION

Striations have been observed at four localities, and associated with the striae at two localities are crescentic fractures arranged in nested series along lines parallel to the striae. These fractures are concave to the southeast and vary from ½ inch to 1 inch in width, measured between the ends of each fracture. The striae trend from S.8°E. to S.39°E.; the average bearing is S.32°E., indicating that the glacier advanced across the quadrangle from the northwest to the southeast.

Streamline hills whose shapes are in part the result of glacial erosion and in part the result of the molding action of ice as it flowed around and over topographic highs are recognized in the eastern, southern, and west-central parts of the map area. The long axes of these hills are approximately parallel to the direction of ice movement. The extent to which bedrock structure controls the orientation of the hills is unknown. It probably varies greatly depending on the attitude, lithology, and jointing of the bedrock. In order to emphasize the effects of glacial action on the orientation of the topography, only those hills in which the bedrock structure does not parallel the long axis of the hill are designated on the map as ice-molded, streamline hills.

GLACIAL DEPOSITS

Till

Till, the most extensive glacial deposit in the quadrangle, varies in color from light gray to light olive brown (Munsell Color Company, Inc., 1954). The till matrix ranges from silty sand to sandy silt. The sandier till is loose, friable, and structureless; the siltier till has fewer stones and is so compact that digging with a hand shovel is difficult. In some exposures the compact till has a poorly developed fissility approximately parallel to the topographic surface. The difference in the two types of till may reflect differences in mode of deposition. The compact till may be composed of particles carried primarily in the basal portion of the ice which were plastered against the subglacial surface. The sandy, loose till may have been deposited during deglaciation, as particles carried within and upon the melting glacier were released. Small, discontinuous lenses of stratified material within the till indicate a minor amount of fluvial action during deposition. The stratigraphic relationship between the two till types and the precise mechanism of deposition for each remains unclear. The till types are not differentiated on the map.

Ice-contact Deposits

In general, ice-contact deposits are irregularly stratified and exhibit a wide range of textures, from boulders greater than 6 feet in diameter to medium to fine sand and silt. Topographic expression is commonly hummocky, with numerous closed depressions and irregular ridges reflecting collapse of the original surface after melting of the buried or supporting ice masses. In fresh exposures, collapse structures such as tilted, contorted, and faulted strata are common.

The best examples of collapse topography on ice-contact deposits are units Qc_1 at the southeast shore of Gardner Lake, Qc_2 east of Deep River Reservoir, and Qc_3 at the head of Mineral Spring Brook. Local relief on these deposits exceeds 50 feet in some places. Numerous ridges and irregular hillocks with steep ice-contact slopes are present. Good examples of ice-contact structures and textures are exposed in units Qc north of Fitchville Pond, Qc southeast of Red Cedar Pond, and Qc_4 near the intersection of Plains Road and Under The Mountain Road in the northeast corner of the quadrangle.

Because ice-contact deposits were, by definition, in contact with, or in close proximity to, dead glacier ice, the distribution of these deposits is an indication of the distribution of stagnant ice and the mode of deglaciation. Large areas in the quadrangle covered by ice-contact deposits attest to the importance of stagnation as a means of deglaciation. At different times during deglaciation, tongues and isolated blocks of dead ice occupied most of the prominent valleys in the quadrangle.

Valley-train Deposits

The distinction between ice-contact deposits (Qc) and valley-train deposits (Qv) is sometimes difficult and ultimately arbitrary, for two contemporaneous deposits may be part of the same depositional sequence and are differentiated only by the presumed presence or absence of stagnant ice during deposition.

In general the materials in a valley-train deposit are medium to well sorted, horizontally stratified, commonly crossbedded, and range from pebble-cobble gravel to medium sand. Good examples of valley-train sediments are exposed at the large pits in the lower Gardner Brook area, north of Bear Hill, and in a small pit at the west margin of West Plain Cemetery in the southeast corner of the quadrangle. Pits along the west side of lower Susquetonscut Brook offer additional good exposures of valley-train sediments.

The topographic surface of valley trains is usually smooth where not modified by later erosion. When sufficiently large segments of the original surface are preserved, a gentle topographic profile reflecting the gradient of the stream in which the valley train was deposited can be reconstructed (see diagram). The most extensive valley train in the quadrangle (Qv_4) is located along the Yantic River and the lower reaches of its major tributaries. The gradient on this deposit along the Yantic River is 8 feet per mile, and although the tributary terraces have steeper gradients, they appear to have been graded to the main Yantic terrace. That part of valley train Qv_5 which lies within the quadrangle has a gradient of 6½ feet per mile, but it is more than 100 feet higher than the highest Qv_4 terrace along the Yantic River (fig. 1) and is related to a later period of deposition. The head of unit Qv_5 is northwest of the quadrangle.

DEGLACIATION

Sometime after the maximum southward extension of the Wisconsin ice sheet, deglaciation began with gradual thinning of the ice sheet and the northward migration of the active ice front. As wastage of the ice continued, first the highest hills and then progressively lower hills and ridges protruded above the ice. Thinning of the ice sheet along the margin eventually resulted in the isolation of large masses of inert ice from the main body of diminishing, but still active ice. Glacial streams, issuing from the wasting ice, transported and reworked materials released from the ice and subsequently deposited these glaciofluvial materials as ice-contact or valley-train deposits.

The oldest glaciofluvial deposit recognized in the quadrangle is the ice-contact deposit Qc_1, located in the southwest corner of the map area. Active ice covered most of the quadrangle during deposition of this unit, but a zone of stagnant ice occupied at least the southern part of the depression in which Gardner Lake now lies. Qc_1 is continuous with unit Qgo_3 in the Montville quadrangle (Goldsmith, 1962). Melt water issuing from the ice at this time drained southeastward along the course of the present Oxoboxo Brook in the Montville quadrangle, and south and southwestward across the present drainage divide at the head of Frazer Brook in the northwest corner of the Montville quadrangle.

After deposition of unit Qc_1, the main ice front retreated northward along the Gardner Lake-Deep River lowland to a position near the junction of Sherman Brook and Deep River. A narrow tongue of dead ice extended southward into the area now occupied by the Deep River Reservoir, and a large ice block may have persisted in the Gardner Lake basin. The highest deposits of unit Qc_2 occur at an altitude of 420 feet. Other deposits of this unit occur at progressively lower altitudes southward toward the northern shore of Gardner Lake where they occur at an altitude of 400 feet. No outlets at or below 400 feet are present around Gardner Lake except a 380-foot outlet at its northeastern end where the lake now spills over a small dam into Gardner Brook. Deposits at 390 and 350 feet along Gardner Brook mark the northeastward drainage of melt water from the wasting ice at this time. Near the junction of Gardner Brook and Austin Brook this drainage appears to have bifurcated, part flowing southeastward and part continuing its northeasterly course until diverted to the south by ice occupying the lowland northwest of Bear Hill. These two streams probably coalesced west of Bishop Pond and flowed south and then southeast down Trading Cove Brook valley.

An ice-contact deposit (Qc_3) at 270 feet near the head of Mineral Spring Brook in the south-central part of the quadrangle indicates that the dead ice margin receded northward sometime after the deposition of unit Qc_2. Recession was probably limited to less than a mile at this time, for the northward drainage of melt water was still prevented by ice in the valley north of Bear Hill. Isolated patches of unit Qc_3 can be traced southward to the prominent bedrock ridge north of Trading Cove Brook. Channels cut in this ridge at altitudes of 240 and 280 feet mark spillways over which melt water descended into the valley of Trading Cove Brook which was ice-free by this time except for small ice blocks in the valley west of Bishop Road.

Downstream from the melting ice masses a valley train (Qv_3) was deposited. In the southeast corner of the quadrangle, north of Leffingwell School, an area of sand and gravel extends northward from its contact with the valley-train deposit (Qv_3). Although exposures are poor, this deposit (Qc) is considered an ice-contact deposit because of the collapse topography which it exhibits. The age relation of Qc to Qv_3 is not clear. Unit Qv_3 is continuous with unit Qv_3 in the Norwich quadrangle (Hanshaw and Snyder, 1962) and can be traced southward into the Uncasville quadrangle where it is designated Qvt (Goldsmith, 1960).

During deposition of units Qc_4 and Qv_4 the dead ice margin extended northeastward from the Savin Lake lowland in the west-central map area to a position 2½ miles northeast of Mason Hill. Blue Hill and Mason

Hill probably were nunataks at this time with at least their summit areas free of ice. Bashon Hill may also have been ice-free, although ice may still have existed on the northwest slope. Tongues of stagnant ice extended down Pease Brook on the west side of Blue Hill to an altitude of 200 feet and down Kahn Brook east of Blue Hill to an altitude of 250 feet. It is likely that residual blocks of stagnant ice occupied part of the swampy area northeast of Mason Hill at this time. However, active ice may have been present there, in which case the ice-contact deposits at the north end of the swamp would be younger than Qc_4 deposits. Ice-contact deposits (Qc_4) along successive valleys from Austin Brook to the northeast corner of the quadrangle mark the zones of stagnant ice that formed the head of the extensive valley-train deposit (Qv_4) which was being deposited in the Yantic River valley and its tributaries at this time. This unit (Qv_4) forms the major terraces along the Yantic River and indicates a major melt-water drainage system which flowed southeastward and joined the Thames River drainage near Norwich, Conn. Qv_4 is continuous with unit Qv_3 in the Norwich quadrangle (Hanshaw and Snyder, 1962).

The age relation between units Qv_3 and Qv_4 in the Fitchville quadrangle and unit Qv_3 in the Norwich quadrangle is not clear. Evidence from the Fitchville quadrangle indicates that Qv_3 is older than Qv_4, but both appear continuous with Qv_3 as mapped in the Norwich quadrangle, and therefore could be contemporaneous. It is possible that the difference in age is slight and that the Fitchville units (Qv_3 and Qv_4) merge with Qv_3 in the Norwich quadrangle in such a manner that they are unrecognizable as separate units.

The valley train (Qv_4) of the lower Gardner Brook area is 10 feet lower than the main Yantic River terrace (Qv_4) at the junction of the two surfaces on the west side of Fitchville Pond (see diagram). This difference in altitude suggests a slight difference in age of the two deposits, the main Yantic terrace being older. However, the difference in age is probably slight, and both deposits are considered products of the same depositional period.

The youngest correlated glaciofluvial deposit in the quadrangle is the valley train (Qv_5) in the west-central map area. The topographic position of unit Qv_5, the lack of valley-train deposits along the Yantic River between unit Qv_5 and Kahn Brook, and the presence of ice-contact deposits (Qc_4) in the Yantic River valley between Kahn Brook and Pease Brook indicate that Qv_5 is not a continuation of Qv_4 and was deposited sometime after the deposition of Qv_4.

While melt-water streams were still active in the area, fine sand and silt derived from glaciofluvial materials were picked up by winds and spread as a thin, discontinuous blanket over most of the previously glaciated landscape. This deposit is not shown on the map.

POSTGLACIAL HISTORY

Soil formation, the development of swamps, and the return of forest vegetation mark the change to postglacial time. With the disappearance of the wasting ice and the resulting decrease in the source of sediment, streams began to dissect the glacial deposits, leaving terraces on the valley sides as remnants of the valley trains that formerly filled the major river valleys. During this period of dissection, tributary streams eroded headward into the uplands. Where tributary streams joined major valleys they deposited coarse material in fan-shaped forms, such as the alluvial fans located along the north slope of the Yantic River valley. The precise time of deposition of the alluvial fans is unknown and probably extended over a long period of time beginning after the disappearance of ice from the Yantic River valley. The process of alluvial-fan development continues at a reduced rate today, expecially during flood times. Narrow bodies of alluvium now occupy the broader reaches of most present streams.

During winter months, ice on Gardner Lake is occasionally broken up by strong winds and blown against the northwest shore. As the ice advances on to the beach it scoops and pushes the beach sands shoreward, constructing a ridge (Qip) composed of beach debris and disrupted root masses along a line marking the inland limit of ice advance. The force of the wind-driven ice is sufficient to dislodge trees as much as 4 inches in diameter and to have caused shoreline recession of 6 to 10 feet. Gaps in the ridges owing to irregular deposition and wave erosion now form channels through which storm waves pass, flooding the swamp to the northwest.

ECONOMIC GEOLOGY

The most valuable natural resource in the quadrangle, as in most of eastern Connecticut, is sand and gravel derived from stratified drift. Valley-train deposits provide the best source of sand and gravel for concrete. The most extensive valley-train deposits suitable for economic exploitation in the quadrangle are located in lower Gardner Brook valley and southeast of Savin Lake. A minimum volume of pebble gravel in the lower Gardner Brook valley train (Qv_4) is estimated to be 3 million cubic yards, assuming a uniform thickness of 8 feet as exposed in the pit east of the intersection of Route 163 and Bozrah Street. Sand and gravel in valley-train deposits along the Yantic River have been used extensively in new highway construction and are considerably depleted. Ice-contact deposits in the quadrangle are generally too poorly sorted and too coarse to be used without considerable screening, except for coarse aggregate and fill. Small quantities of sand and gravel suitable for use in concrete are only locally available in these deposits. Detailed descriptions and enlarged photographs of materials exposed in ice-contact and valley-train deposits are available in open file (Pessl, 1965).

Swamps have traditionally served as sources of peat; however, the modern utilization of peat here is limited and of minor economic importance. If the swamps were drained and tilled, they would provide small areas of rich soil for specialized agricultural uses.

Glaciofluvial deposits are commonly valuable local sources of ground water and are utilized as such in many areas within the quadrangle. However, the extreme variability in thickness and texture of these deposits necessitates local investigations for their development as dependable sources of water.

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