Maine Geological Survey
DEPARTMENT OF CONSERVATION
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Title: Reconnaissance Surficial Geology of the Bridgewater, Houlton, Howe Brook, and Smyrna Mills Quadrangles, Maine

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Contents: 7 page report

GENERAL

This report covers reconnaissance field mapping carried out during the summer of 1981 within the gravel aquifer program of the Maine Geological Survey. The quadrangles which have been mapped in this study are

Map	Author(s)
Bridgewater Quadrangle	Brewer
Houlton Quadrangle	Brewer
Howe Brook Quadrangle	Brewer (SE¼), Newman(SW¼, NE¼) Genes (NW¼)
Smyrna Mills Quadrangle	Brewer (E½), Newman (W½)

Discription of Area

This area can be divided into two distinct parts with different bedrock and topographic characteristics. The eastern part which comprises approximately the eastern 2/3 of the Houlton and Bridgewater quadrangles is gently rolling terrain with elevations between 400 and 600 feet. A few hills have elevations above 800 feet. Bedrock in this area is predominantly limestone and dolostone of the Carys Mills Formation (E2/3 of the Bridgewater quadrangle and NE¼ of the Houlton quadrangle) and siltstone of the Smyrna Mills Formation (Pavilides, 1965, 1971, 1972). The Carys Mills Formation exhibits especially low relief, the hills around 800 feet are developed on the Smyrna Mills Formation. The land use in this area is primarily agricultural and many outcrops and gravel pits are exposed.

The western part of the area (Howe Brook quadrangle, Smyrna Mills quadrangle, and the western 1/3 of the Houlton and Bridgewater quadrangles) exhibit much higher elevations and higher relief. The highest hills are higher than 1600 feet and relief is about 1000 feet. This section is underlain by plutonic and volcanic rocks as well as siltstone, slate and phyllite of the Carys Mills Formation. Some of the high relief is due to contact metamorphism of pelitic rocks adjacent to plutons. The land is primarily forest land and outcrop is not well exposed. Recent road building has exposed a number of gravel deposits.

The time of deglaciation of the areas encompassed by these quadrangles is bracketed by events on the Maine Coast and in the St. Lawrence River valley. It appears that deglaciation is more recent than about 12,000 YBP. Moraines and sequences which represent ice frontal positions are rare and those which do exist are unspectacular. An interesting transition takes place in this region, however. The Bridgewater quadrangle is characterized by thin drift cover and a few patchy gravel deposits. The southernmost part of the Bridgewater quadrangle contains a few small esker fragments. These lead directly to a large, extremely well developed esker system on the Houlton quadrangle which is directly south. This system continues through the Amity and Danforth quadrangles where strongly lineated terrain also becomes apparent. This transition can be well explained by assuming different sub-glacial thermal regimes during the glacial maximum. It appears that frozen-based ice became wet-based ice to the south. The till which blankets this area is what we (Brewer, Newman, Genes) have called the Mars Hill till. Its is characterized by clasts derived from local outcrops. Canadian Shield rocks have not been observed in till deposits in this area, although they have been found in gravel deposits as far south as Danforth.

BRIDGEWATER QUADRANGLE

The Bridgewater quadrangle is characterized by gently rolling agricultural terrain in the east and higher relief woodland terrain in the west. The two areas correspond to the limits of the Carys Mills Formation (limestone and dolomite) which underlies the lower elevations (Pavlides, 1965)

The glacial drift is thin where well exposed in the agricultural area and is probably thin in the upland areas as well. Outcrop is readily observed on aerial photography where it is seen as unplowed areas in fields. Well developed limestone (Karst?) topography exists in the NE¼ of the quadrangle. This was mapped by Pavlides as a pitted outwash plain. Aside from lack of gravel in this section, several lines of evidence suggest limestone solution or weathering as the origin of this terrain.

1. Much outcrop is exposed and little drift
2. Virtually no swamps are present in this section
3. Numerous depressions, some of which are closed, have a structural alignment. This is clearly seen on aerial photography. Fortunately (for interpretation) the structure is perpendicular to glacial movement.
4. Field inspection of several depressions reveals that they are clearly rimmed with limestone outcrop

The presence of this topography yields different interesting conjectures depending on when it was formed. If the topography is pre-glacial, then very little glacial erosion has occured here which in turn suggests that the ice was frozen based. If the topography was sculptured during glaciation, some interesting sub-glacial hydraulics must have been involved. If the topography is post-glacial, the development of it was extremely fast.

The gravel deposits on this quadrangle are of three types.

1. thin poorly sorted deposits with little or no relief usually less than ten feet thick with little internal structure. The gravel in the town of Bridgewater is of this sort.
2. Ordinary ice contact deposits such as eskers, kames etc.

These are found only in the southern part of the quadrangle

3. Post glacial alluvial deposits on the Meduxnekeag River.

The origin of the first of these is unclear. It is possible to develop arguments that they are either deposits due to subglacial melting, or poorly developed kames, or else possibly poorly washed deposits associated with glacial lakes or even a marine environment.

The eskers which appear on the south part of this map are the northern extremity of an esker system which can be followed all the way to the coast. Although the topography around Ross Lake appears on the topographic map to be typical outwash/ice contact topography, most of the material there is actually till and is so mapped. The esker here leads into a well displayed incised channel at the southern margin of the map.

HOULTON QUADRANGLE

The Houlton quadrangle is characterized by a thin drift cover over bedrock, a well developed and well displayed esker system and a probable glacial lake or perhaps even marine deposit.

The topography of this quadrangle is controlled by bedrock in a manner similar to the topography of the Bridgewater quadrangle. The lowest areas with the least relief correspond to the Carys Mills Formation which trends northeasterly across the center of the quadrangle. Higher relief corresponds to siltstone and coarser clastic rocks of the Smyrna Mills Formation. (Pavlides, 1971)

The esker system in Houlton is well displayed on the topographic map and many active gravel cuts exist into it. The gravel is primarily of local origin. Sorting is variable from cut to cut but is generally good. Several gravel pits contain large calcareous concretions. One huge concretion at the Houlton town pit forms a natural bridge which is quite picturesque.

A glacial lake or possible glacial marine deposit has been identified in the section west of Houlton. This probably existed within and east of Houlton as well but lack of suitable exposures for interpretation and generally low relief do not permit tracing it out on a reconnaissance basis. A provisional boundary for the western portion of this lake appears on my field map in blue.

The evidence for this lake is as follows:

1. A delta complex in northern New Limerick

2. Shoreline features in Ludlow and Littleton (near B school); Carys Mills (flanking the esker); Hodgdon (flanking the esker) and Linneus

3. Many silt exposures within the lake basin.

The esker which passes through Linneus rises to the south. Where it is above glacial lake elevation, it occupies a well developed pitted outwash plain. Below lake elevation, it is flanked by swamp and silt deposits. This suggests that the flanking material was modified by lake action.

The "spillway" for this lake is actually a broad area about 2 miles wide on the Amity quadrangle at about 460 feet elevation which leads to Monument Stream. The appearance of this wide, south-draining spillway suggest the possiblity that this is actually a marine embayment rather than a glacial lake.

Two possible ice frontal positions have been identified on ths quadrangle, neither of which is terribly spectacular. The one in Hammond is indicated by a deposit of large boulders which are otherwise unusual on these quadrangles. In Hodgdon, it appears possible to trace an actual morainal land form.

SMYRNA MILLS QUADRANGLE

This quadrangle is largly upland forested terrain with poor access and little exposure. The eastern 1/2 of the quadrangle contains virtually no gravel deposits. A probable ice frontal position has been identifed in Smyrna and is indicated by several good till exposures. This might be correlated with the possible ice frontal position identified northwest of Smyrna Mills. The esker system which occupies a north-south position through the quadrangle has largly been removed and graded off during the construction of rte. 95. A few hills with apparent glacial elongation are found on the southern part of the quadrangle. These land forms become more common on the map sheets to the south.

HOWE BROOK QUADRANGLE

Although this quadrangle is predominantly forested upland terrain, it is similar to the Bridgewater quadrangle to the east in that the northernmost extent of the regional esker system occurs in the center of the map sheet. The drift here occurs as a thin cover over bedrock, especially at higher elevations. The outwash deposit (Qgo) in T8 R3, WELS is thin, patchy and ill defined, and may in fact be much smaller than indicated.

References Cited

Pavlides, Louis (1965) Geology of the Bridgewater Quadrangle, Aroostook County, Maine; USGS Bull. 1206

_____(1971) Geologic Map of the Houlton Quadrangle, Aroostook County, Maine; USGS; GQ 920

_____(1972) Geologic Map of the Smyrna Mills Quadrangle, Aroostook County, Maine; USGS; GQ1024