Bowdoinham Quadrangle, Maine

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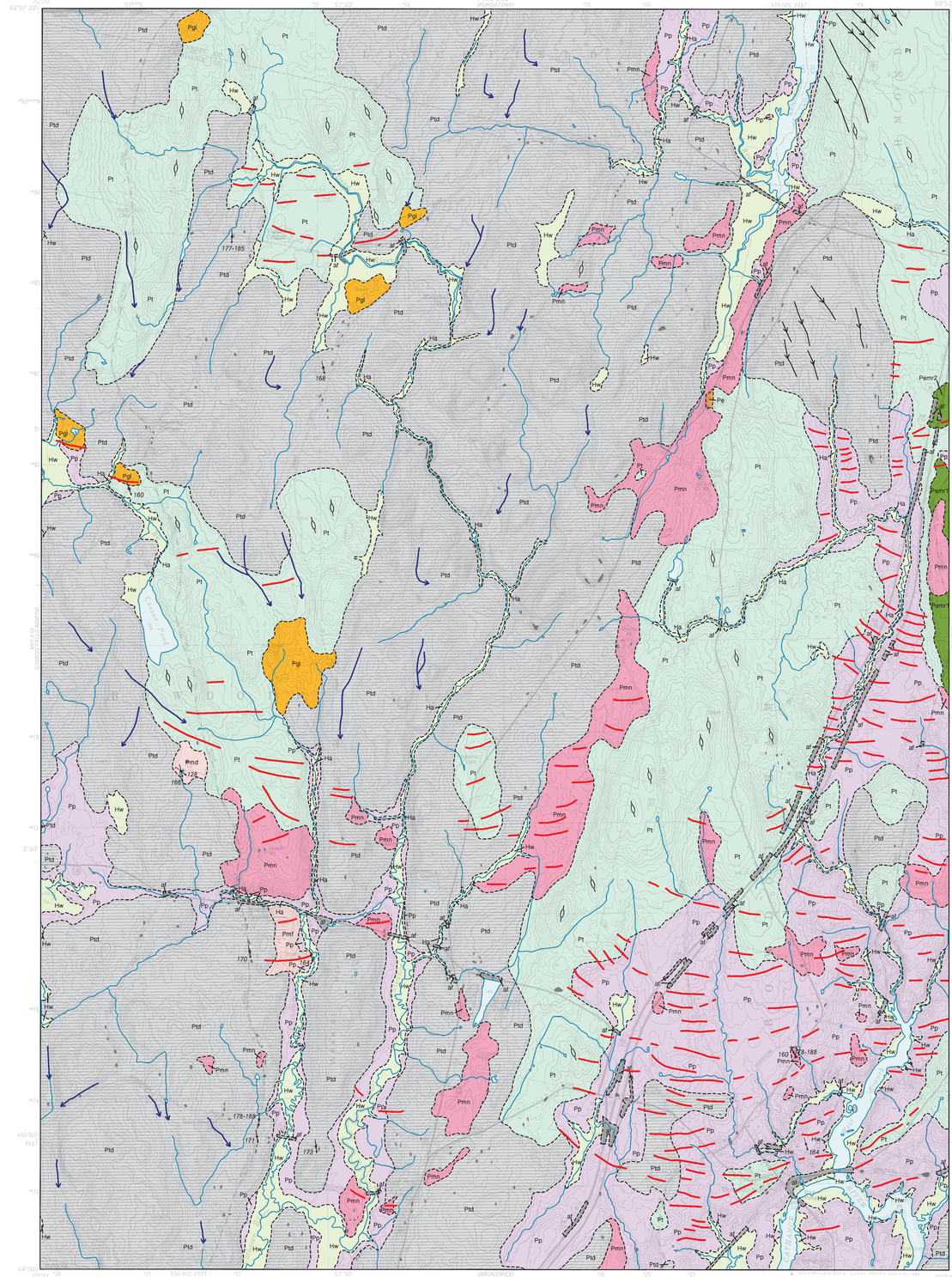
For additional information,
see Open-File Report 03-54.

Surficial Geology



SOURCES OF INFORMATION

Surficial geologic mapping of the Bowdoinham quadrangle was conducted by Carol T. Hildreth during the 2002 field season. Funding for this work was provided by the U. S. Geological Survey STATEMAP program and the Maine Geological Survey, Department of Conservation.

Quadrangle Location

SCALE 1 : 24,000

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET

TRUE NORTH

Topographic base from U.S. Geological Survey Bowdoinham quadrangle, scale 1:24,000 using standard U.S. Geological Survey topographic map symbols.

The use of industry, firm, or local government names on this map is for location purposes only and does not impute responsibility for any present or potential effects on the natural resources.

NOTE: A thin, discontinuous layer of windblown sand and silt, generally mixed with underlying glacial deposits by frost action and bioturbation, is present near the ground surface over much of the map area but is not shown.

af **Artificial fill** - Man-made. Material may vary from natural sand and gravel to quarry waste or sanitary landfill, including highway and railroad embankments. This material is mapped only where it can be identified using the topographic contour lines or where actually observed. Minor artificial fill is present in virtually all developed areas of the quadrangle. Thickness of fill varies.

Ha **Stream alluvium** (Holocene) - Sand, silt, gravel, and muck in flood plains along present rivers and streams. As much as 3 m (10 ft) thick. Extent of alluvium indicates most areas flooded in the past that may be subject to future flooding. In places, this unit is indistinguishable from, grades into, or is interbedded with wetlands deposits (Hw).

Hw **Wetland deposit** (Holocene) - Muck, peat, silt, and sand deposited in poorly drained areas. Generally 0.5 to 3 m (1 to 10 ft) thick, but may be thicker in bogs. In places, this unit is indistinguishable from, grades into, or is interbedded with stream alluvium (Ha).

Pe **Eolian deposit** (Late Pleistocene) - Fine- to medium-grained, well-sorted sand. Deposited after late-glacial sea level regressed from the area and left fine-grained marine sediments exposed to wind erosion and transport before vegetation established itself and anchored the deposits. Thickness varies from 0.5 to 2 m (1 to 6 ft).

Pp **Presumpscot Formation: Glaciomarine bottom deposits** (Pleistocene) - Silt and clay with local sandy beds. Consists of late-glacial fine-grained sea-floor deposits. Commonly lies beneath surface deposits of unit Pmn; in places, may be overlain by unmapped thin dune deposits. As much as 21 m (70 ft) thick.

Pmn **Marine nearshore deposits** (Pleistocene) - Sand, silt, mud, and minor gravel. Consists of reworked till and glaciomarine sediments redistributed by marine currents and wave action as sea level fell during late-glacial time. May include shoreline, beach, and dune deposits in places. As much as 3 meters (10 ft) thick.

Pmd **Glaciomarine delta** (Pleistocene) - Sand and gravel deposited into the sea at the glacier margin and locally built up to the ocean surface. Includes sediments reworked by marine nearshore processes during regression of the sea. May overlie unit Pp in some places.

Pmf **Glaciomarine fan** (Pleistocene) - Sand and gravel deposited as submarine fan at the glacier margin. Locally includes sediments reworked by marine nearshore processes during regression of the sea. May overlie or be overlain by unit Pp in some places.

Pgi **Undifferentiated ice-contact deposits** (Pleistocene) - Sand, gravel, and silt. Consists of thin glaciofluvial outwash and/or ice-contact deposits. May include esker or glaciomarine fan deposits. Thickness varies from 0 to 15 m (0 to 50 ft).

Pem **End moraines** - Linear ridges consisting of bedded sand and gravel interbedded with Presumpscot Formation silty clay and occasionally interlayered with till on the ice-proximal faces of the moraines. Some moraines, or groups of moraines, have been assigned a unique geographic name listed below:

Pemr$_x$ - Ridge Road moraines 1-2

Pt **Till** (Pleistocene) - Light- to dark-gray, nonsorted to poorly sorted mixture of clay, silt, sand, pebbles, cobbles, and boulders; a predominantly sandy diamicton containing some gravel. Generally older than other glacial deposits and may underlie them. Thickness varies and generally is less than 6 m (20 ft), but may be more than 30 m (100 ft) in areas of streamlined topography. Many streamlined hills in this area are bedrock-cored.

Ptd **Thin glacial drift** (Pleistocene) - Areas with generally less than 3 m (10 ft) of drift covering bedrock. Till overlies bedrock on hillslopes and ridge crests; Presumpscot Formation silty clay is present in depressions; and nearshore deposits overlie till, Presumpscot Formation, and bedrock on hillslopes and at the base of these slopes.

Bedrock exposures - Not all individual outcrops are shown on the map. Gray dots indicate observed outcrops; ruled pattern indicates areas of abundant exposures and areas where surficial deposits are generally less than 3 m (10 ft) thick. Mapped in part from aerial photography, soil surveys (McEwen, 1970; Faust and LaFlamme, 1978), and previous geologic (Thompson and Smith, 1977; Thompson and Borns, 1985) and materials maps (Locke, 1999).

Contact - Boundary between map units, approximately located.

Meltwater channel - Channel eroded by glacial meltwater or later meteoric runoff.

135 **Glacial striation** - Point of observation is at dot. Arrow shows ice-flow direction inferred from striations on bedrock. Number is azimuth (in degrees) of flow direction. Arrow with flag shows older ice-flow direction.

Drumlin or other glacially streamlined hill. Symbol is parallel to glacial ice movement.

Grooved till surface - Symbols show lengths and directions of narrow ridges inferred to have been carved in till by flow of glacial ice.

Moraine ridge - Ridge of till, sand, and gravel deposited and/or deformed by glacial ice. Most moraines shown here have been inferred from surface topography and air photo interpretation. May be mantled by Presumpscot Formation.

REFERENCES

Faust, A. P., and LaFlamme, K. J., 1978, Soil survey of Kennebec County, Maine: U. S. Department of Agriculture, Soil Conservation Service, 87 p., scale 1:20,000.

Locke, D. B., 1999, Surficial materials of the Bowdoinham quadrangle, Maine: Maine Geological Survey, Open-File Map 99-51.

McEwen, B. W., 1970, Soil survey of Androscoggin and Sagadahoc Counties, Maine: U. S. Department of Agriculture, Soil Conservation Service, 83 p., scale 1:15,840.

Thompson, W. B., and Borns, H. W., Jr., 1985, Surficial geologic map of Maine: Maine Geological Survey, scale 1:500,000.

Thompson, W. B., and Smith, G. W., 1977, Reconnaissance surficial geology of the Gardiner 15' quadrangle, Maine: Maine Geological Survey, Open-File Map 77-43.

USES OF SURFICIAL GEOLOGY MAPS

A surficial geology map shows all the loose materials such as till (commonly called hardpan), sand and gravel, or clay, which overlie solid ledge (bedrock). Bedrock outcrops and areas of abundant bedrock outcrops are shown on the map, but varieties of the bedrock are not distinguished (refer to bedrock geology map). Most of the surficial materials are deposits formed by glacial and deglacial processes during the last stage of continental glaciation, which began about 25,000 years ago. The remainder of the surficial deposits are the products of postglacial geologic processes, such as river floodplains, or are attributed to human activity, such as fill or other land-modifying features.

The map shows the areal distribution of the different types of glacial features, deposits, and landforms as described in the map explanation. Features such as striations and moraines can be used to reconstruct the movement and position of the glacier and its margin, especially as the ice sheet melted. Other ancient features include shorelines and deposits of glacial lakes or the glacial sea, now long gone from the state. This glacial geologic history of the quadrangle is useful to the larger understanding of past earth climate, and how our region of the world underwent recent geologically significant climatic and environmental changes. We may then be able to use this knowledge in anticipation of future similar changes for long-term planning efforts, such as coastal development or waste disposal.

Surficial geology maps are often best used in conjunction with related maps such as surficial materials maps or significant sand and gravel aquifer maps for anyone wanting to know what lies beneath the land surface. For example, these maps may aid in the search for water supplies, or economically important deposits such as sand and gravel for aggregate or clay for bricks or pottery. Environmental issues such as the location of a suitable landfill site or the possible spread of contaminants are directly related to surficial geology. Construction projects such as locating new roads, excavating foundations, or siting new homes may be better planned with a good knowledge of the surficial geology of the site. Refer to the list of related publications below.

OTHER SOURCES OF INFORMATION

1. Hildreth, C. T., 2003, Surficial geology of the Bowdoinham 7.5-minute quadrangle, Kennebec and Sagadahoc Counties, Maine: Maine Geological Survey, Open-File Report 03-54, 5 p.
2. Locke, D. B., and Hildreth, C. T., 2004, Surficial materials of the Bowdoinham quadrangle, Maine: Maine Geological Survey, Open-File Map 04-44.
3. Neil, C. D. and Weddle, T.K., 2004, Significant sand and gravel aquifers of the Bowdoinham quadrangle, Maine: Maine Geological Survey, Open-File Map 04-80.
4. Thompson, W. B., 1979, Surficial geology handbook for coastal Maine: Maine Geological Survey, 68 p. (out of print).