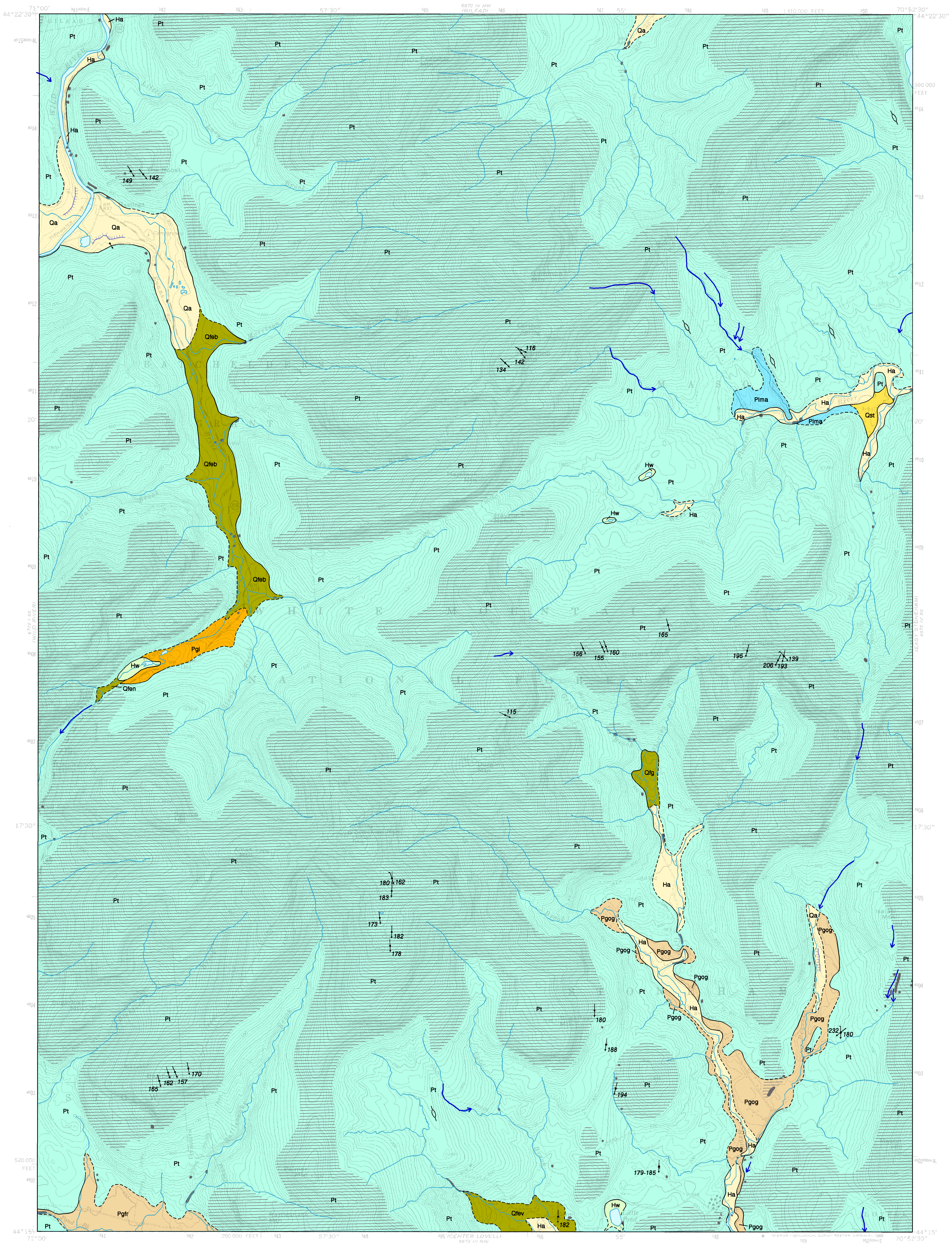
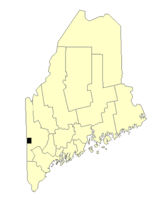
Surficial Geology



SOURCES OF INFORMATION

Surficial geologic mapping of the Speckled Mountain quadrangle was conducted by Woodrow B. Thompson in 2001 for the Maine Geological Survey mapping program. This map was funded from the MGS/USGS STATEMAP cooperative (award no. 01HQAG0090).



Quadrangle Location

SCALE 1 : 24,000

CONTOUR INTERVAL 20 FEET

TRUE NORTH

Topographic base from U.S. Geological Survey Speckled Mountain 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.

Ha — **Stream alluvium** - Sand, gravel, silt, and organic sediment. Deposited on flood plains of modern streams. Unit includes some wetland areas.

Hw — **Wetland deposits** - Peat, muck, silt, and clay. Deposited in poorly drained areas.

Qst — **Stream terrace** - Sand and gravel terrace at confluence of Miles Brook and West Branch Pleasant River. May have resulted from erosion of an originally higher glacial deposit as ice recession caused lowering of stream base-level farther down the West Branch valley (in East Stoneham quad).

Qa — **Stream alluvium** - Gravel and sand deposited by Evans Brook, Wild River, and Bog Brook. Ages probably range from early postglacial (higher deposits) to recent on modern flood plains adjacent to the streams.

Qfeb — **Evans Brook fan complex** - Series of coalescent alluvial fan deposits formed at the mouths of tributary streams entering the Evans Brook valley. Composed mostly of coarse gravel.

Qfen — **Evans Notch fan** - Bouldery debris fan, formed by slope wash or avalanching on the west side of Evans Notch.

Qfg — **Great Brook fan** - Coarse stream gravel deposited in early postglacial to recent time along the steep headward part of the Great Brook valley.

Qfev — **Evergreen Valley fan** - Gravel and sand deposited in fan by glacial and/or postglacial stream discharge from Cold Brook valley and the unnamed valley west of Cold Brook.

Plma — **Glacial Lake Mason deposits** - Gravel and sand deposited in or graded to an ice-dammed glacial lake in the West Branch Pleasant River valley. Lake level probably was controlled by a spillway at ~ 990 ft elevation, northeast of Bad Mountain in East Stoneham quad.

Pgog — **Great Brook deposits** - Sand and gravel. Outwash deposited by glacial streams in Great Brook valley.

Pgfr — **Rattlesnake Brook fan** - Gravel and sand deposited in outwash fan. Formed mainly by glacial meltwater discharge from the Rattlesnake Brook valley and smaller valleys on south side of Blueberry Mountain. May have been enlarged by postglacial stream activity.

Pgi — **Ice-contact deposits** - Sand and gravel deposited by glacial meltwater flowing southward through Evans Notch. May include glaciofluvial (kame/esker) deposits and/or deltaic sediments deposited in a small glacial lake ponded between the ice margin and the spillway at the notch.

Pt — **Till** - Loose to very compact, poorly sorted, massive to weakly stratified mixture of sand, silt, and gravel-size rock debris deposited by glacial ice. Locally includes lenses of water-laid sand and gravel.

Bedrock outcrops/thin-drift areas - Ruled pattern indicates areas where outcrops are common and/or surficial sediments are generally less than 10 ft thick (mapped partly from air photos). Dots show individual outcrops.

Contact - Boundary between map units. Dashed where inferred.

Scarp - Hachured line shows scarp between adjacent levels of alluvial deposits. Hachures on downslope side.

Glacially streamlined hill - Symbol shows trend of long axis, which is parallel to former glacial ice-flow direction.

135 **Glacial striation locality** - Arrow shows ice-flow direction inferred from striations on bedrock. Dot marks point of observation. Number is azimuth (in degrees) of flow direction. Where relative ages could be determined, flagged direction is older.

Dip of cross-bedding - Arrow shows average dip direction of cross-bedding in fluvial deposits, which indicates direction of current flow. Dot marks point of observation.

Meltwater channel - Channel eroded by glacial meltwater stream. Arrow shows inferred direction of former stream flow.

Area of many large boulders, where observed. May be more extensive than shown.

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. Thompson, W. B., 2003, Surficial geology of the Speckled Mountain 7.5-minute quadrangle, Oxford County, Maine: Maine Geological Survey, Open-File Report 03-5, 9 p.

2. Thompson, W. B., and Locke, D. B., 2002, Surficial materials of the Speckled Mountain quadrangle, Maine: Maine Geological Survey, Open-File Map 02-103.

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4. Neil, C. D., 2002, Significant sand and gravel aquifers of the Speckled Mountain quadrangle, Maine: Maine Geological Survey, Open-File Map 02-147.

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

Speckled Mountain Quadrangle, Maine

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For additional information, see Open-File Report 03-5.

SURFICIAL GEOLOGY OF MAINE

Continental glaciers like the ice sheet now covering Antarctica probably extended across Maine several times during the Pleistocene Epoch, between about 1.5 million and 10,000 years ago. The slow-moving ice superficially changed the landscape as it scraped over mountains and valleys, eroding and transporting boulders and other rock debris for miles. The sediments that cover much of Maine are largely the product of glaciation. Glacial ice deposited some of these materials, while others washed into the sea or accumulated in meltwater streams and lakes as the ice receded. Earlier stream patterns were disrupted, creating hundreds of ponds and lakes across the state. The map at left shows the pattern of glacial sediments in the Speckled Mountain quadrangle.

The most recent "Ice Age" in Maine began about 25,000 years ago, when an ice sheet spread southward over New England (Stone and Borns, 1986). During its peak, the ice was several thousand feet thick and covered the highest mountains in the state. The weight of this huge glacier actually caused the land surface to sink hundreds of feet. Rock debris frozen into the base of the glacier abraded the bedrock surface over which the ice flowed. The grooves and fine scratches (striations) resulting from this scraping process are often seen on freshly exposed bedrock, and they are important indicators of the direction of ice movement. Erosion and sediment deposition by the ice sheet combined to give a streamlined shape to many hills, with their long dimension parallel to the direction of ice flow. Some of these hills (drumlins) are composed of dense glacial sediment (till) plastered under great pressure beneath the ice.

A warming climate forced the ice sheet to start receding as early as 21,000 years ago, soon after it reached its southernmost position on Long Island (Sirkin, 1986). The edge of the glacier withdrew from the continental shelf east of Long Island and reached the present position of the Maine coast by 13,800 years ago (Dorion, 1993). Even though the weight of the ice was removed from the land surface, the Earth's crust did not immediately spring back to its normal level. As a result, the sea flooded much of southern Maine as the glacier retreated to the northwest. Ocean waters extended far up the Kennebec and Penobscot valleys, reaching present elevations of up to 420 feet in the central part of the state.

Great quantities of sediment washed out of the melting ice and into the sea, which was in contact with the receding glacier margin. Sand and gravel accumulated as deltas and submarine fans where streams discharged along the ice front, while the finer silt and clay dispersed across the ocean floor. The shells of clams, mussels, and other invertebrates are found in the glacial-marine clay that blankets lowland areas of southern Maine. Age dates on these fossils tell us that ocean waters covered parts of Maine until about 11,000 years ago, when the land surface rebounded as the weight of the ice sheet was removed.

Meltwater streams deposited sand and gravel in tunnels within the ice. These deposits remained as ridges (eskers) when the surrounding ice disappeared. Maine's esker systems can be traced for up to 100 miles, and are among the longest in the country.

Other sand and gravel deposits formed as mounds (kames) and terraces adjacent to melting ice, or as outwash in valleys in front of the glacier. Many of these water-laid deposits are well layered, in contrast to the chaotic mixture of boulders and sediment of all sizes (till) that was released from dirty ice without subsequent reworking. Ridges consisting of till or washed sediments (moraines) were constructed along the ice margin in places where the glacier was still actively flowing and conveying rock debris to its terminus. Moraine ridges are abundant in the zone of former marine submergence, where they are useful indicators of the pattern of ice retreat.

The last remnants of glacial ice probably were gone from Maine by 10,000 years ago. Large sand dunes accumulated in late-glacial time as winds picked up outwash sand and blew it onto the east sides of river valleys, such as the Androscoggin and Saco valleys. The modern stream network became established soon after deglaciation, and organic deposits began to form in peat bogs, marshes, and swamps. Tundra vegetation bordering the ice sheet was replaced by changing forest communities as the climate warmed (Davis and Jacobson, 1985). Geologic processes are by no means dormant today, however, since rivers and wave action modify the land, and worldwide sea level is gradually rising against Maine's coast.

References Cited

Davis, R. B., and Jacobson, G. L., Jr., 1985, Late-glacial and early Holocene landscapes in northern New England and adjacent areas of Canada: Quaternary Research, v. 23, p. 341-368.

Dorion, C. C., 1993, A chronology of deglaciation and accompanying marine transgression in Maine: Geological Society of America, Abstracts with Programs, v. 25, no. 2, p. 12.

Sirkin, L., 1986, Pleistocene stratigraphy of Long Island, New York, *in* Caldwell, D. W. (editor), The Wisconsinan stage of the first geological district, eastern New York: New York State Museum, Bull. 455, p. 6-21.

Stone, B. D., and Borns, H. W., Jr., 1986, Pleistocene glacial and interglacial stratigraphy of New England, Long Island, and adjacent Georges Bank and Gulf of Maine, *in* Sibrava, V., Bowen, D. Q., and Richmond, G. M. (editors), Quaternary glaciations in the northern hemisphere: Quaternary Science Reviews, v. 5, p. 39-52.

Figure 1: View southwest from Speckled Mountain, showing Evans Notch (upper left).

Figure 2: Weathered granite pegmatite ledge near summit of Blueberry Mountain. Glacial striations trending 162° (parallel to pen) were revealed by rubbing a pencil across the milky quartz pod.

Figure 3: Trout Pond, in the northeast corner of the quadrangle, occupies a valley shaped by glacial ice. Steep cliffs (center) border the west side of the valley.

Figure 4: Till with inclusions of deformed silt-sand lenses, possibly deposited in ponded glacial meltwater. Site is located adjacent to woods road near junction of Miles Brook with West Branch Pleasant River.

Figure 5: View along crest of very narrow esker(?) ridge in unit Plma, north side of West Branch Pleasant River.

Figure 6: Poorly-sorted sand and gravel in postglacial alluvial terrace (unit Qfeb) near junction of Morrison Brook with Evans Brook.

Figure 7: Waterfall and pool on Great Brook in Stoneham. This part of the brook flows across a nearly horizontal joint surface on granite bedrock. Note vertical joint cutting the ledge in foreground.

Figure 8 : Potholes in bed of Great Brook, just downstream from site shown in Figure 7.