# Surficial Geology of Mount Desert Island


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This map supersedes the B-38 Surficial Geology map.


**Note:** The first letter of each map unit indicates the general age of the unit:
**H** = Holocene (postglacial deposit; formed during the last 11,700 years).
**Q** = Quaternary (deposit of uncertain age; usually late-glacial and/or postglacial).
**P** = Pleistocene (deposit formed during glacial to late-glacial time, prior to 11,700 yr B.P. [years before present]).

af — **Artificial fill** - This unit occurs along roadways and at building sites. Considerable areas of fill occur at each of the villages.

Ha — **Stream alluvium** - Stratified sand and gravel with minor amounts of silt deposited on flood plains of present day streams; typically 1-2 m (3-6 ft) thick.

Haf — **Alluvial fan** - Stratified gravel and sand deposited in a fan-shaped landform where streams in steep, narrow valleys enter more gently sloped and wider areas. Typically 2 m (6 ft) or more thick.

Hat — **Alluvial terrace** - Stratified sand and gravel forming benches running parallel to and 1-3 m (3-10 ft) above the present floodplain, usually 1-2 m (3-6 ft) thick.

Hw — **Freshwater wetland** - Muck, peat, silt, and sand in poorly drained areas, often with standing water, typically 0.3-2 m (1-6 ft) thick.

Hwsm — **Salt marsh** - Grass, reed, and sedge wetland, inundated at high tide, organic-rich material has a variable thickness of 0.3-2 m (1-6 ft). It is typically underlain by clayey-silt glaciomarine sediment.

Hms — **Marine shoreline deposit** - Present-day beach ridges composed of sand to boulder sized material 2-5 m (6-15 ft) thick.

Qts — **Talus** - Angular to subangular rock blocks deposited at the base of bedrock cliffs. Individual block size is typically around 0.6-1 m (2-3 ft) and range in size from 0.3-10 m (1-33 ft). Deposit thickness is typically 1-5 m (3-15 ft), with some deposits more than 10 m (33 ft) thick. Much of material was deposited during late Pleistocene periglacial climate conditions with lesser amounts of material deposited during the Holocene.

Pms — **Marine shoreline deposit** - Stratified pebble to boulder gravel and sand that has layering dipping downslope. This deposit was mapped where abandoned gravel and sand pits show the material to be 2-5 m (6-15 ft) thick or where there are distinct strandline features. In some strandline areas the deposit is less than 2 m (6 ft) thick. Well-defined shoreline deposits and strandlines often occur at elevations up to 67-73 m (220-240 ft).

Pmn — **Marine nearshore deposits** - Gravel and sand deposited as a result of wave activity reworking other glacial deposits; not associated with beach morphology. Usually 0.3-1.5 m (1-5 ft) thick.

Pmd — **Marine delta** - Stratified sand and gravel with near horizontal top strata (topsets) underlain by seaward dipping strata (foresets). Top surface graded to sea level at time of deposition. Deposit thickness is generally 5-10 m (15-33 ft).

Pp — **Presumpscot Formation** - Fine-grained marine mud (silt and clay with sandy lenses) commonly containing gravel dropstones and, more rarely, marine shell fossils. The mud was deposited in deeper, quieter water in front of the retreating glacier during the marine submergence of the coast. Usually 2-10 m (6-33 ft) thick.

Pms/Pgl — **Marine shoreline deposit over ice-contact gravel** - Stratified pebble to boulder gravel and sand, with layering dipping downslope, overlies and truncates ice-contact gravel and sand. Thickness typically 1.5-3 m (5-10 ft) on top of the ice-contact gravel and sand.

Pms/Pt — **Marine shoreline deposit over till** - Stratified pebble to boulder gravel and sand, with layering dipping downslope, overlies and truncates till. Thickness typically 1.5-3 m (5-10 ft) on top of the till.

Pgl — **Ice-contact gravel** - Stratified boulder to pebble gravel and sand deposited in contact with the melting glacial ice. Stratification in places may be horizontal or dipping consistently while in other places stratification may be chaotic with abrupt bedding and grain size changes. Typically 5-15 m (15-45 ft) thick.

Pge — **Esker** - A ridge of stratified boulder to pebble gravel and sand deposited in a subglacial tunnel. The bedding is often chaotic with abrupt bedding and grain size changes. Thickness generally 3-10 m (10-33 ft).

Pt — **Thin Till** - Poorly sorted mixture of gravel, sand, silt, and clay (diamict) deposited directly by the glacier ice. Land surface is often more bouldery than the underlying till due to removal of smaller surface material by running water or waves. Till deposits are generally less than 3 m (10 ft) thick and bedrock outcrops often project through the till.

Pt — **Thick Till** - Poorly sorted mixture of gravel, sand, silt, and clay (diamict) deposited directly by glacial ice, with a thickness of 3-10 m (10-33 ft). Land surface is often more bouldery than the underlying till due to removal of smaller surface material by running water or waves. From well data, the thickest till (18-21 m [60-70 ft]) is along the northern crest of Beech Hill.

**Boulder surface mantle** - Area of boulders covering the ground surface on top of other material such as till or bedrock. Boulders typically cover 50 to 100 percent of the ground surface. Average boulder size is 0.6 to 1 m (2-3 ft) and ranges from 0.3 to 5 m (1 to 15 ft).

rk — **Bedrock** - Areas shown as solid gray are where 25% or more of the land surface is knobs of bare or vegetation-covered bedrock ledge. Thin (0.3-1 m [1-3 ft]) glacial, colluvial, and/or residual materials overlie the bedrock between knobs. On higher, more steeply sloped areas 75-100% of the surface is bare or vegetation-covered ledge. Where gray spots lie within other colored areas of glacial deposits, the gray spots are bedrock ledges projecting through the glacial deposits.

**Disturbed earth** - Original topography of the area has been disturbed by gravel pit excavation.

**Contact** - Indicates approximate boundary between adjacent map units. Expectable line location error is 3-6 m (10-20 ft) to locally as much as 10-15 m (30-50 ft) where the materials are obscured by dense surface vegetation and lack diagnostic landforms.

**Upper limit of marine submergence** - Shows highest elevation of sea level immediately following recession of the glacier from the area. This elevation is approximate, based on glacial-marine delta elevations in the region (~67-73 m [~220-240 ft] above sea level; Thompson and others, 1989, figure 2 contours). Everywhere below this elevation wave erosion has cut into the glacial deposits. Where such deposits were thin, only lags of large boulders have been left on bedrock ledges. Where such deposits were thicker, a thin 0.3-1 m (1-3 ft) deposit of gravel and sand, often with a boulder surface, overlies other glacial deposits. This thin "wave wash veneer" is not shown on the map, only the underlying material.

**Small moraine ridge** - Ridge of till and/or sand and gravel deposited and/or deformed by glacier ice. About 300 small moraine ridges, 1-5 m (3-15 ft) high and 5-30 m (15-100 ft) wide have been identified, from south to north on the map. Such ridges probably represent annual "push moraines".

**Large moraine ridge** - A pair of much larger moraines lies at the southern ends of Long Pond and Echo Lake and to either side of the Somes Sound Narrows. Large till knobs south of Upper Hadlock Pond and Jordon Pond and thick till south of Bubble Pond and The Tarn are probably equivalent to those moraines. The large moraines represent stabilization of the receding ice front for a few decades or more.

**Marine beach ridge or strandline** - Subtle ridge or bench feature with an abrupt steepening of slope in the downslope direction in an area of Pleistocene Marine shoreline deposits. A strandline marks a temporary stillstand in sea level lowering or an especially stormy period during sea level lowering.

**Marine terrace scarp** - Marks the top edge of a marine wave-cut scarp; hachures point downslope.

**Head scarp of a rock block slide** - Failure surface at the head of a rock block slide. Tick marks point in the down slide motion direction.

**Meltwater channel** - Arrow shows trace of former meltwater channel; arrowhead shows direction of water flow.

**Buried valley** - Arrow shows trend of preglacial stream valley floor now partly to completely filled in by glacial deposits.

**Esker ridge** - Shows trend of sand and gravel ridge deposited in a meltwater tunnel within or beneath glacial ice. Chevrons indicate direction of meltwater flow.

**Glacially grooved or fluted till** - Formed beneath the glacier by erosion of till surfaces or by development of elongate till ridges parallel to ice-flow direction.

**Quadrangle map outline grid** - The widely spaced blue line grid of north-south and east-west lines outlines the borders of the individual 1:24,000 scale Surficial Geology maps that cover the island (see location map below).

125 / 165 — **Glacial striation locality** - Where present, arrow heads on striation lines show a unique direction of ice-flow. Dot marks point of observation. A flagged arrow shows an older striation that is crossed by a younger striation. (Sh) next to striation line indicates data from Shaler, 1889.

**Other glacial erosion marks on bedrock** - Includes crescentic marks and stoss-and-lee topography. Arrow shows direction of ice-flow. Dot indicates point of observation.

**Glacially streamlined hill** - Glacially streamlined hill. Symbol shows long axis of hill or ridge shaped by flow of glacial ice, and which is parallel to former ice-flow direction.

▲231 — **Glaciomarine delta** - Number indicates elevation (in feet) of contact between topset and foreset beds, or of meltwater channel on delta surface, which marks position of corresponding sea level.

© — **Core sample locality** - Location of core sample from Sargent Mountain Pond; radiocarbon-age analysis yielded a date of 16,600 calendar years B.P. (Norton and others, 2010). Lowell (1980) obtained a date of 13,230 ± 360 radiocarbon years B.P. from the same site.

## REFERENCES


Borns, H. W., 2007, Maine's Ice Age Trail: Down East – A Map and Guide: Climate Change Institute, University of Maine, Orono.

Braun, D. D. and Braun, R. E., 2016, Guidebook to the Geology of Mount Desert Island and Acadia National Park: North Atlantic Books, Berkeley, CA, 206 p.

Lowell, T. V., 1980, Late Wisconsin ice extent in Maine: evidence from Mount Desert Island and the Saint John River area: unpublished M.S. thesis, University of Maine, Orono, 180 p.

Norten, S. A. and others, 2010, Early post-glacial and Holocene history of the Sargent Mountain pond watershed, as seen from the bottom of Sargent Mountain pond, Acadia National Park, Maine: in Gerbi, C., Yates, M., Kelley, A., and Lux, D., eds., Guidebook for field trips in coastal and interior Maine: 102nd NEIGC meeting, p. 45-60.

Shaler, N.S., 1889, The Geology of the Island of Mount Desert, Maine: U.S. Geologic Survey, 8th Annual Report 1886-1887, Part 2, p. 987-1061.


## SOURCES OF RELATED INFORMATION


Thompson, Woodrow B., 2015, Surficial geology handbook for southern Maine: Maine Geological Survey, Bulletin 44, 97 p.

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


Individual Surficial Geology and Surficial Materials maps for each 1:24,000 scale quadrangle can be found on the Maine Geological Survey web site.

## SOURCES OF MAP INFORMATION

Surficial geologic mapping of Mount Desert Island was conducted by Duane D. Braun during the 2012, 2013, and 2014 field seasons. Mapping was also conducted in the Southwest Harbor quadrangle by Thomas V. Lowell during the 1988 field season and modified using 2011 field data by Thomas K. Weddle. Mapping was also conducted in the Newbury Neck and Salsbury Cove quadrangles by Thomas K. Weddle during the 2011 field season.

Base map features from Maine Office of GIS - 1:24,000 USGS contour lines, E911 roads, 1:24,000 National Hydrography Dataset, USGS GNIS placenames and 1:24,000 political boundaries. Map projection Universal Transverse Mercator, North American Datum, 1927.

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.



SCALE 1:30,000

1 0.5 0 1 Mile
1000 0 1000 2000 3000 4000 5000 6000 7000 Feet
0.5 0 1 Kilometer

CONTOUR INTERVAL VARIES

Approximate Mean Declination, 2016
16.7° W (not to scale)