

Orland Quadrangle, Maine

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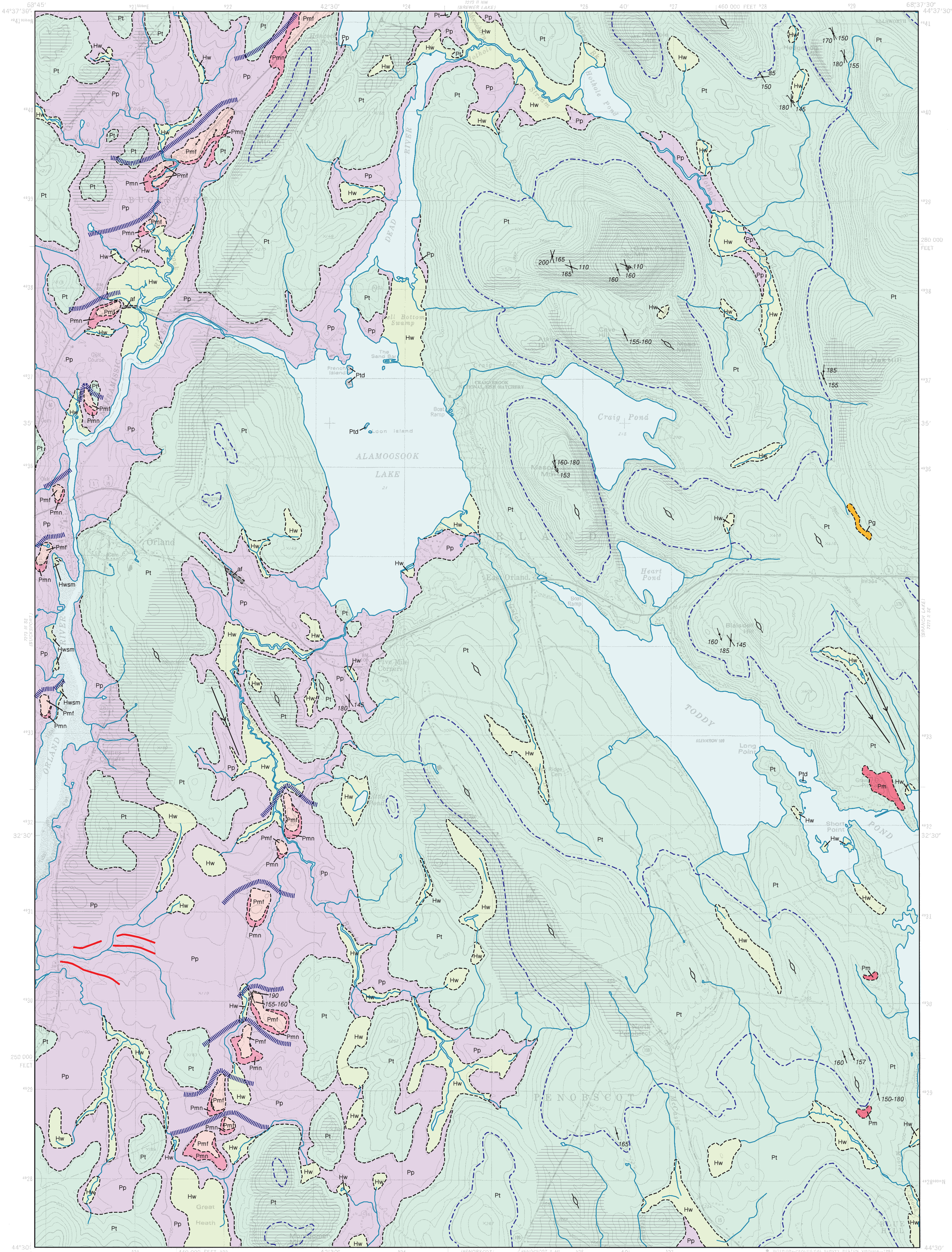


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Surficial Geology



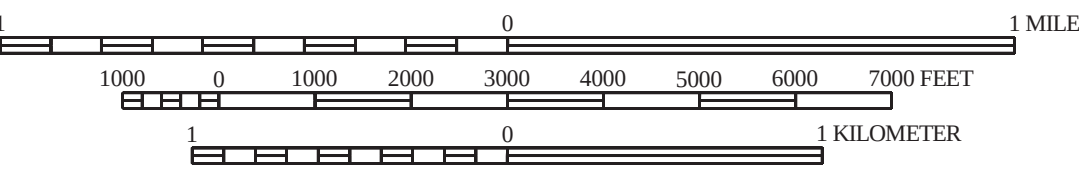
SOURCES OF INFORMATION

Surficial geologic mapping by Thomas K. Weddle completed during the 2010 field season; funding for this work provided by the U.S. Geological Survey STATEMAP program.



Quadrangle Location

SCALE 1 : 24,000



CONTOUR INTERVAL 20 FEET



Topographic base from U.S. Geological Survey Orland 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 implicate responsibility for any present or potential effects on the natural resources.

af

Artificial fill - Includes landfills, highway and railroad embankments, and dredge spoil areas. These units are mapped only where they are resolvable using the contour lines on the map, or where they define the limits of wetland units. Minor artificial fill is present in virtually all developed areas of the quadrangle.

Hw

Wetlands - Peat, muck, silt, clay, and sand. Includes areas of stream and river alluvium.

Hwsm

Saltmarsh wetlands - Peat, muck, silt, and clay. Coastal marsh, subject to tidal flooding. Thin, non-commercial peat layers are present atop a mineral substrate consisting of estuarine sands and muds.

Pmn

Marine nearshore deposits - Sand, gravel, and silt deposited by wave and current action in shoreline and shallow nearshore environments. Formed mostly during the regressive phase of late-glacial marine submergence. May be very thin in areas of bedrock-controlled topography.

Pp

Presumpscot Formation - Massive to laminated silty clays with rare dropstones and occasional shelly horizons, which overlie rock and till, and are interbedded with and overlie marine fan deposits; includes sand deposited as a distal unit of submarine fans.

Pm

Marine deposits, undifferentiated - Sand and gravel of uncertain origin, but thought to have been deposited in the sea.

Pmf

Submarine outwash fans - Thick sand and gravel accumulations formed at the mouth of subglacial tunnels along the retreating late Pleistocene ice margin. The sand and gravel is interbedded with and overlain by Presumpscot Formation clays at the distal edges of the fans, and interlayered with and overlain by tills at their ice-contact faces.

Pg

Glacial stream deposits - Sand and gravel deposited by glacial meltwater streams at or near the ice margin. Map unit includes ice-contact and outwash sediments.

Pt

Till - Light- to dark-gray nonsorted to poorly sorted mixture of clay, silt, sand, pebbles, cobbles, and boulders, a predominantly sandy to silty diamict containing some gravel. Generally found under most other deposits.

Ptd

Thin drift, undifferentiated - Areas of thin patchy sediment cover on bedrock, which are unmapped or have few exposures of surficial materials. The sediments may include till, Presumpscot Formation, and/or marine nearshore deposits.

Thin drift - Ruled pattern indicates areas of abundant exposures and areas where surficial deposits are generally less than 3 m (10 ft) thick.

----- **Contact** - Approximate boundary between map units.

— **Moraine ridge** - Line shows inferred crest of moraine ridge deposited along the retreating margin of the most recent glacial ice sheet. These moraines are composed mostly of till but may also include sand and gravel.

||||| **Ice-margin position** - Shows an approximate position of the glacier margin during ice retreat, based on meltwater deposits, moraines, and/or positions of meltwater channels.

- - - - **Glacial marine limit** - Approximate elevation of late-glacial sea (here approximately 300 feet above modern sea level).

↗ **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.

↗ **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 two or more directions are observed in the same outcrop, flags indicate older trends where discerned. Symbol with no arrow indicates unknown flow direction.

↗ **Glacially grooved or fluted till** - formed beneath the glacier by erosion of till surfaces by boulders in the base of the ice scouring the till, or by obstructions on the till surface that allow for development of elongate till ridges parallel to ice-flow direction.

↗ **Paleocurrent direction** - Average dip direction of cross bedding (including foreset beds in deltas) in sand or gravel. Indicates direction of flow of glacial meltwater. Dot marks point of observation.

↗ **Crescentic mark locality** - Dot marks point of observation. Crescent symbol is convex towards direction of inferred ice flow.

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

- Weddle, T. K., and Locke, D. B., 2011, Surficial materials of the Orland quadrangle, Maine: Maine Geological Survey, Open-File Map 11-21.
- Foster, L. E., and Smith, T. T. (compilers), 2011, Significant sand and gravel aquifers in the Orland quadrangle, Maine: Maine Geological Survey, Open-File Map 11-51.
- Thompson, W. B., and Borns, H. W., Jr., 1985, Surficial geologic map of Maine: Maine Geological Survey, scale 1:500,000.
- Thompson, W.B., Crosson, K.J., Borns, H.W., Jr., and Anderson, B.G., 1989, Glaciomarine deltas of Maine and their relation to Late Pleistocene-Holocene crustal movements, in Anderson, W. A., and Borns, H. W., Jr., eds., Neotectonics of Maine, Neotectonics of Maine: studies in seismicity, crustal warping, and sea-level change, Maine Geological Survey, Bulletin 40, p. 43-67.