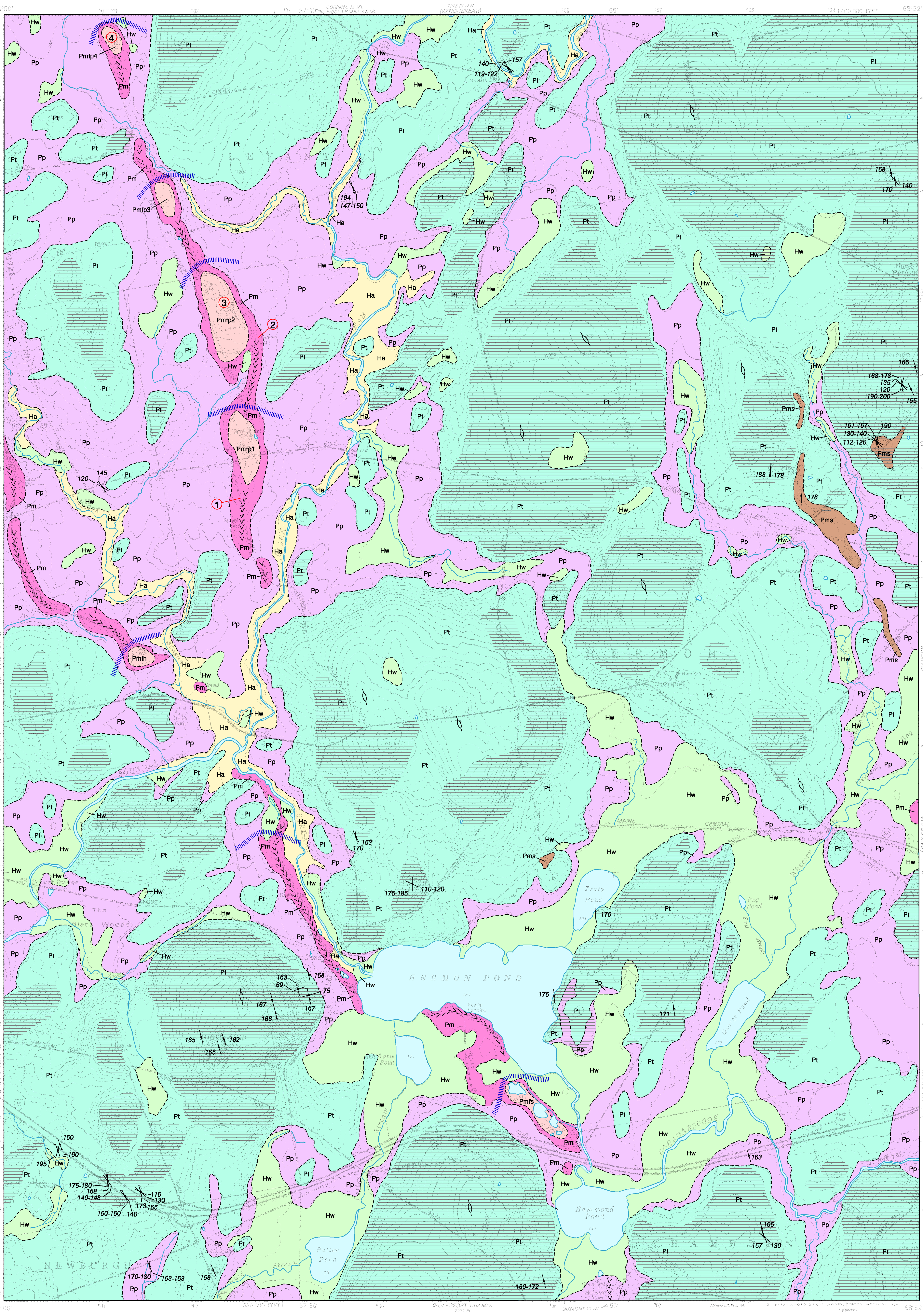
# Surficial Geology



## SOURCES OF INFORMATION

Modified in 2013 based on field work by Alice R. Kelley and Lynn Caron. Surficial geologic mapping by Thomas K. Weddle completed during the 2007 field season; funding for this work provided by the U.S. Geological Survey STATEMAP program.

Quadrangle Location

SCALE 1 : 24,000

1 MILE

7000 FEET

1 KILOMETER

CONTOUR INTERVAL 10 FEET

TRUE NORTH

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



**Ha** — **Stream alluvium** - Sand, gravel, and silt deposited on flood plains of Souadabscook Stream and other streams. May include some wetland deposits.

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

**Pms** — **Marine shoreline deposits** - Small area of gravelly sediments inferred to have formed when marine processes reworked older glacial deposits during regression of the sea.

**Pp** — **Presumpscot Formation** - Glaciomarine silt, clay, and sand deposited on the late-glacial sea floor.

**Pmf** — **Glaciomarine fans** - Sand and gravel deposited as submarine fans at the glacier margin during recession of the late Wisconsinan ice sheet.

- Pmfpx - Pine Tree Road fans
- Pmfh - Horseback Road fan
- Pmfs - Souadabscook fan

**Pm** — **Pleistocene glaciomarine deposit** - undifferentiated; may consist of gravel, sand, silt, or clay or any combination, deposited during marine regression.

**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. Boulders commonly present on ground surface.

**Bedrock outcrops/thin-drift areas** - Ruled pattern indicates areas where bedrock outcrops are common and/or surficial sediments are generally less than 10 ft thick. Mapped from air photos and ground observations. Actual thin-drift areas probably are more extensive than shown.

**Contact** - Boundary between map units, dashed where approximate.

**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.

**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.

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

>>>>> **Crest of esker** - Alignment of symbols shows trend of esker ridge. Chevrons point in direction of meltwater flow.

(4) **Photo location.**

## HISTORICAL NOTE

In the inset map below, the location of a dug stream-diversion canal connecting Black Stream and Souadabscook Stream is shown. The headwaters of Black Stream are about seven miles north of the diversion. Before the streams were joined, Black Stream looped north and joined Kenduskeag Stream in Glenburn (found on the adjacent Kenduskeag quadrangle). The canal was dug in the mid-1800's by lumbermen so that they could float logs from one stream to the other in the spring when the water was high, and on to the sawmills. This location was locally known as "the cross" or "the crossing" where the two streams crossed over (Gaudreau and others, 2005). Interestingly, in her book *Indian Place-Names of the Penobscot Valley and the Maine Coast*, Eckstorm (1941) noted that prior to the canal, the location was called by the Indians "Chebatigosuk," meaning "across," and that the root "chebaht" was often used for narrows or short-cuts when travelling by canoe. At this site, the portage between the streams was short, about 660 feet. It was an important location where within several miles one could cross over from Penobscot to Kennebec drainage from Souadabscook Stream to the Sebasticook River, a tributary that joins the Kennebec at Winslow (Cook, 2007). From there, travel via what eventually became known as the Arnold Trail, up the Kennebec and down the Chaudiere River in Canada to the St. Lawrence, brought them to trade at Quebec City, or to visit family at the French Missions at Odanak and Wolinak.

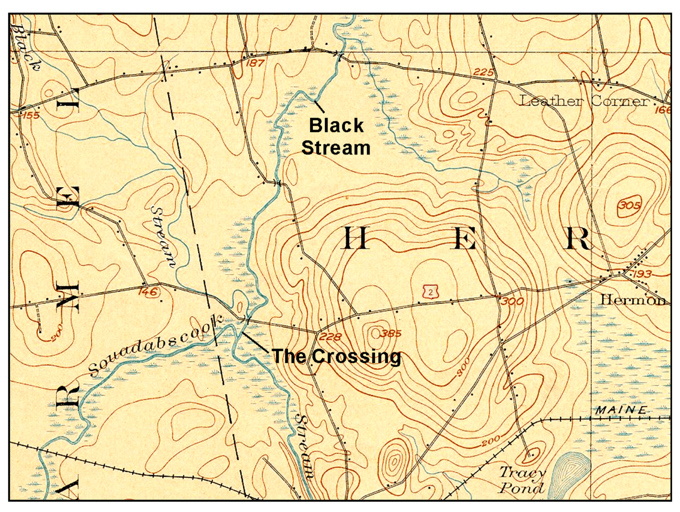
## REFERENCES


Cook, D. S., 2007, Above the gravel bar; The native canoe routes of Maine: Polar Bear and Company, Solon, Maine, 149 p.

Eckstorm, F. H., 1941, Indian place-names of the Penobscot Valley and the Maine coast: University Press, Orono, Maine, 272 p.

Gaudreau, M., Gray, R., and Heath, B., 2005, Hermon, Maine, then and now: Snowman Printing, Hermon, Maine, 499 p.

Stone, G. H, 1899, The glacial gravels of Maine: U. S. Geological Survey, Monograph 35, 489 p.


## 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


Anderson, J. B., and Ashley, G. M., 1991, Glacial marine sedimentation; Paleoclimatic significance: Geological Society of America, Special Paper 261, 232 p.

Foster, L. E., and Smith, T. T., 2001, Significant sand and gravel aquifers in the Hermon quadrangle, Maine: Maine Geological Survey, Open-File Map 01-92.

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Weddle, T. K., and Retelle, M. J., 2001, Deglacial history and relative sea-level changes, northern New England and adjacent Canada: Geological Society of America, Special Paper 351, 292 p.


# Hermon Quadrangle, Maine


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**Open-File No. 13-13**
**2013**
This map supersedes Open-File Map 09-2.


The recession of the late Wisconsinan Laurentide ice sheet in south-central Maine is represented by deposits of a marine-based ice sheet. These include glaciomarine sediments and nearshore deposits associated with high-stands of sea-level that accumulated in a transgressive ice-marginal sea, and younger deposits formed as relative sea level fell during postglacial emergence of the land. For a more complete review of the depositional processes for the sediments shown below refer to the citations and other sources of information section on this map. Permission for access to gravel pits must be obtained from the landowner.

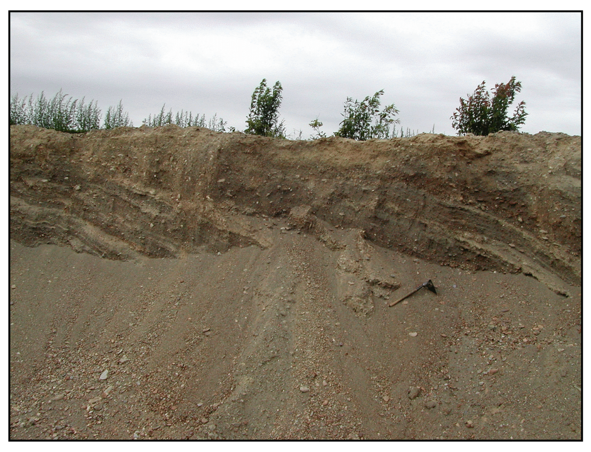

**Figure 1.** Foreset beds in glaciomarine fan (Pmf) dipping east (80-degree trend) mantled by reworked marine-regressive deposits (Pm); exposure in gravel pit on east side of Black Stream Road in Hermon (Photo location 1).

**Figure 2A.** Gravel pit in Pine Tree Road esker-fan; note very low angle of foreset bedding in far wall of pit (Photo location 2).

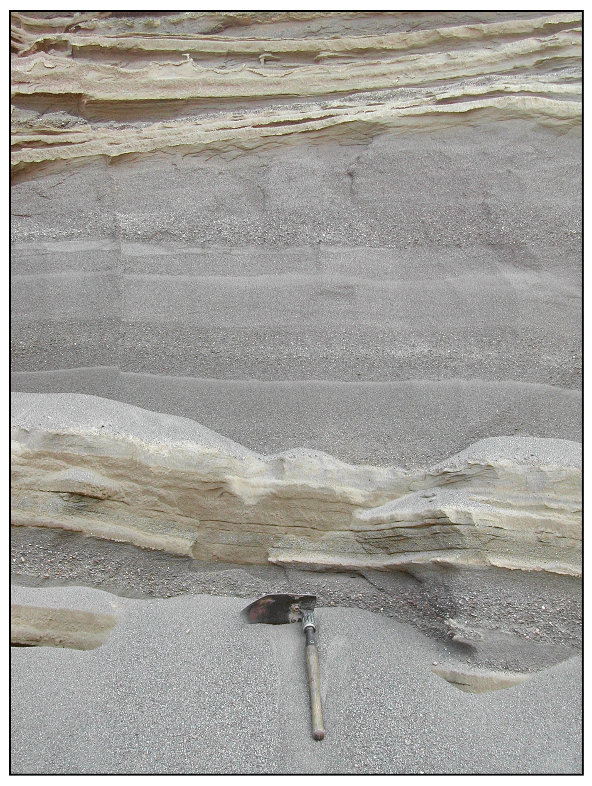

**Figure 2B.** Glaciomarine fan foreset beds showing alternating coarse sand and fine-grained layers; coarse sand layers in center of photo show discreet units within the coarse sequence. Each unit within the sequence represents a flow event, as do the individual units within the fine-grained sequences found above and below the central sequence. The low-angle foreset beds here are relatively undeformed; note a minor high-angle fault that offsets bedding on the left side of the photo, best seen in the central coarse sequence.

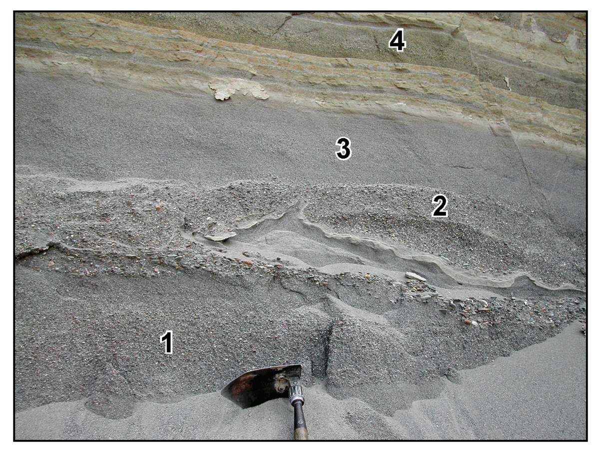


**Figure 2C.** Rapid sedimentation of low-angle glaciomarine foreset beds deformed the bedding shown in this photo. Four coarse sand beds are numbered, probably representing discrete flow events. The first flow (1) was followed by a drape of fine sand that then was eroded and incorporated as a rip-up fragment into the base of the second flow (2). The third flow (3) is slightly finer grained than the previous flows; it may be that it represents a waning phase of flow 2 rather than a unique flow. Flow three is abruptly overlain by a series of thinner rhythmic deposits that are overlain by a thicker fourth flow (4). Discharge from the glacier clearly fluctuated in sediment volume and intensity and these deposits are representative of dynamic cyclic deposition.

**Figure 2D.** Structures due to deformation and disturbance shown here are termed load casts. The lobate-shaped bodies of coarse sand surrounded by fine-grained sand and silt in the center of the photo are thought to form when conditions are such that sediment undergoes temporary liquefaction due to a shock such as an earthquake, a rise in water level, or most likely in this example by rapid deposition. Here the underlying fine-grained sediment has moved upward from beneath the coarse sand, detaching and separating the coarse layer, shown best by the lower set of load casts (round white object is a U.S. quarter-dollar for scale).

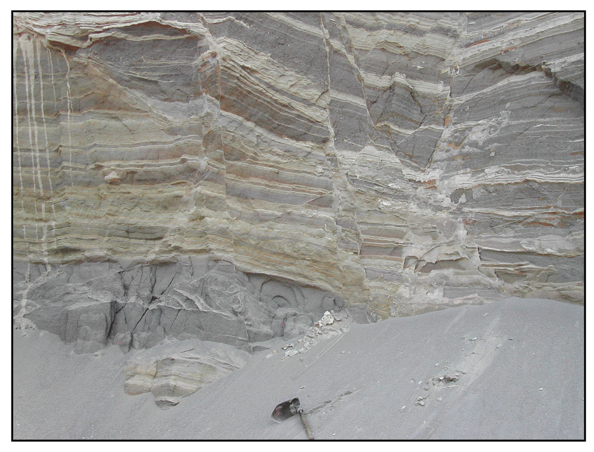

**Figure 2E.** High-to-moderately steep normal faulting in foreset beds; these deformation features in glacial deposits are commonly attributed to ice blocks buried in or abutting the sediment. As the ice melts, the bedding will slump and collapse along the fault plane. Note fault planes infilled by fine sand in center of photo.

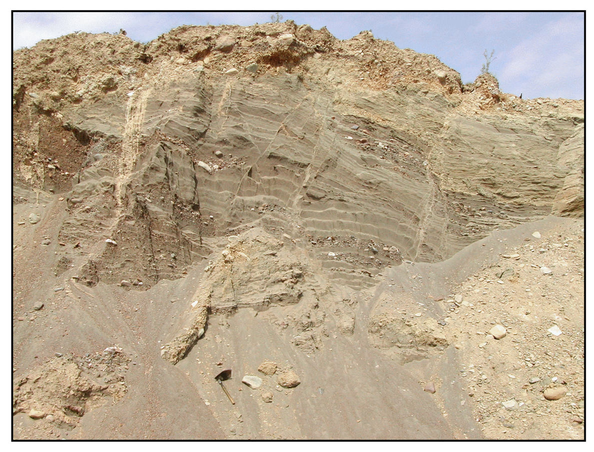

**Figure 3.** Deformed foreset beds in glaciomarine fan (Pmf); deformation was caused by ice that was buttressed against the foreset beds; melting of the ice resulted in the ice-contact collapse features (faulting and slumped beds). Exposure in gravel pit on east side of Pine Tree Road in Hermon, 0.2 miles south of the Hermon - Levant town line (Photo location 3).

**Figure 4A.** Esker-glaciomarine fan deposit; coarse cobble gravel on right of car is part of an esker, an ice-tunnel deposit (Photo location 4; northwestern corner of quadrangle). Meltwater streams on the ice surface, within the ice in channels, and at the base of the ice in tunnels carried sediment to the ice-margin. In this quadrangle most of the land was submerged by the ocean as the ice-margin retreated from the area. The streams deposited the sediment into the ocean as glaciomarine fans; commonly sediment was deposited in the ice-tunnel as well, near the margin of the glacier. Later after the surrounding ice melted away, and the land began to emerge from the sea by postglacial rebound, a long, often sinuous, ridge-shaped landform comprised of coarse gravel and sand remained, known locally as a "horseback" and to geologists as an esker. Note the Horseback Road on the western edge of the quadrangle; the road is situated along the crest of the esker beginning at the junction of U.S. Route 2 and the Horseback Road just west of the Carmel - Hermon town line. Just south of here, the Horseback Road esker and the Pine Tree Road - Black Stream Road esker systems merge and continue south as a single system to Hermon Pond and Hammond Pond, and from there continue south into the Hamden quadrangle. This esker system was traced by Stone (1899) from West Cove at Moosehead Lake in Piscataquis County to Sandy Point in Stockton Springs, Waldo County, a distance of approximately 80 miles.

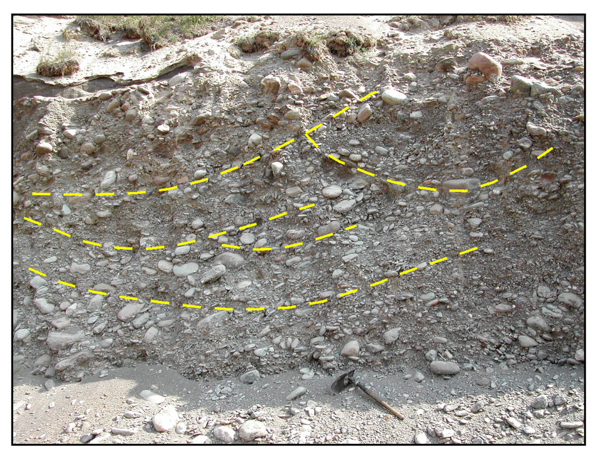

**Figure 4B.** Close-up of coarse cobble gravel in Figure 4A; note channels (outlined on image; view to south with excavation face perpendicular to esker trend, looking down flow of ice-tunnel stream). Esker sedimentation is a fluvial process; features found in stream deposits are found in eskers, such as the channel troughs shown here. However, channels like these can also be found on the surface of glaciomarine fans, especially near the head of the fan where the tunnel stream exits from the ice and sediment is first deposited. The component of the esker system shown in this photo could represent the transition from the esker ice-tunnel environment into the full glaciomarine environment.

**Figure 4C.** Mid-to-distal glaciomarine fan deposition from the ice margin is represented in this photo, especially the massive to weakly bedded gray unit overlying the rhythmically well-bedded draped deposits just above the car roof. The gray unit is fine sand and silt that may have been deposited by sediment suspension rather than by grain flow. The darker unit at the top of the section is gravelly sand reworked by emergent processes.

**Figure 4D.** This portion of the exposure in Figure 4A shows the glaciomarine fan component that is draped over the coarse cobble gravel (1.5-foot long entrenching shovel below gravel for scale). The coarse gravel represents deposition of sediment near the active ice-margin. As the margin retreats by glacial melting, deposition continues and finer-grained sediment is distributed away from the ice margin and is deposited over the sediment that was laid down at the older previous ice-margin location. Above the gravel is a succession of weak- to well-bedded, medium mid-fan coarse to medium sand with low-angle, inclined foreset beds containing some gravel and large clasts. Above these deposits is an abrupt transition to gently inclined, well-bedded, medium- to fine-grained rhythmic mid- to distal-fan sand beds that thin upsection. The foreset bedding was deposited by grain flow down the foreset slope. Gravelly sand reworked during emergence of the land from the sea by glacial rebound caps the section, found near and above the bank swallow nest holes.