SURFICIAL GEOLOGY
OF THE
BANGOR
1° X 2° QUADRANGLE, MAINE

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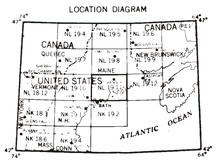
LOCATION DIAGRAM



COMPILATION RESPONSIBILITY

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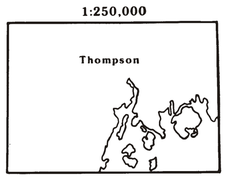

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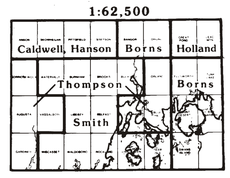

Scale 1:250,000

5 0 5 10 15 20 Statute Miles
5 0 5 10 15 20 25 30 Kilometers
5 0 5 10 15 Nautical Miles

CONTOUR INTERVAL 100 FEET

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EXPLANATION

	Geologic Unit	Materials	Topography	Origin
a	Stream alluvium (includes Holocene flood plain, stream terrace, and alluvial fan deposits)	Sand, gravel, and silt.	Flat to gently sloping on flood plains and stream terraces; gently to moderately sloping on alluvial fans.	Deposited on flood plains and stream beds by postglacial streams.
s	Swamp, marsh, and bog deposits (includes both fresh-water and salt-water marshes)	Peat, muck, clay, silt, and sand.	Flat.	Formed by accumulation of sediments and organic material in depressions and other poorly drained areas.
b	Beach deposits	Sand and gravel.	Gently to moderately sloping, with low ridges and mounds.	Includes beach sediments formed by wave and current action, and sand dunes derived from these deposits.
eb	Emerged beach deposits	Sand and gravel.	Low ridges or sloping surfaces. May be associated with wave-cut benches on hillsides.	Formed by wave erosion of till or other materials during the late-glacial marine submergence of parts of southern Maine.
e	Eolian deposits	Sand.	Dune ridges and mounds, or blanket deposit that conforms to surface of underlying unit.	Windblown sand. Derived from wind erosion of glacial sediments and deposited in late-glacial to postglacial time.
L	Lake-bottom deposits	Silt, clay, and sand. Commonly well stratified, and may be rhythmically bedded.	Flat to gently sloping except where dissected by modern streams.	Composed of sediments that washed out of late Wisconsinan glacial ice and accumulated on the floors of glacial lakes. Map unit may also include a few non-glacial lake deposits.
m	Glaciomarine deposits (fine-grained facies)	Silt, clay, sand, and minor amounts of gravel. Commonly a clayey silt (the Presumpscot Formation). Sand is dominant in some places, but may be underlain by finer grained sediments. Locally fossiliferous. Map unit includes small areas of till and other units that are not completely covered by marine sediments.	Flat to gently sloping except where dissected by modern streams. Commonly has a branching network of steep-walled stream gullies.	Composed of glacial sediments that accumulated on the ocean floor. Formed during the late-glacial marine submergence of lowland areas in southern Maine.
ms	Glaciomarine deposits (coarse-grained facies)	Sand, gravel, and minor amounts of silt.	Flat to moderately sloping. Steeper on ice-contact slopes and delta fronts. May be kettled where deposited over stagnant ice blocks.	Deposited where glacial meltwater streams and currents entered the sea. Includes glaciomarine deltas, subaqueous kames and fans (subaqueous outwash), and outwash that prograded into shallow marine waters and locally covered earlier glaciomarine silt and clay deposits.
go	Glacial outwash deposits	Sand and gravel.	Flat to gently sloping. Steeper on ice-contact slopes and delta fronts. May be kettled where deposited over stagnant ice blocks.	Deposited by meltwater streams in front of the receding late Wisconsinan ice margin. Includes non-marine outwash plains, deltas, and fans.
g	Ice-contact glaciofluvial deposits (exclusive of eskers)	Sand, gravel, and silt.	Flat-topped kame terraces and deltas which are locally kettled and bounded by steep sides, or hummocky terrain with numerous kames and kettles.	Deposited by meltwater streams adjacent to stagnant glacial ice.

	Geologic Unit	Materials	Topography	Origin
ge	Eskers	Gravel and sand. May include minor amounts of till. Portions of many eskers below the marine limit are partly or entirely buried by glaciomarine deposits.	Individual or multiple ridges. Complex eskers may have anastomosing patterns and be gradational with other types of ice-contact deposits.	Chiefly deposited by meltwater streams flowing in tunnels within or beneath the late Wisconsinan ice sheet. Map unit also includes small undifferentiated areas of units "g" and "go".
sm	Stagnation moraine	Mostly till, but also includes variable percentages of undifferentiated sand and gravel.	Undulating topography with local hummocks and ridges.	Deposited during the dissipation of stagnant glacial ice.
em	End moraines	Till or sand and gravel. May be very bouldery. Commonly interbedded with or overlain by glaciomarine sediments in areas that experienced late-glacial marine submergence. Only the largest end moraines and some dense clusters of smaller ones are shown here as a separate unit (em). Elsewhere, short lines mark the crests of moraine ridges, which are locally so numerous that only selected individuals are represented.	Ridges. Commonly arcuate, discontinuous, and in groups. May be multi-crested and hummocky. Size range: 1-30 m high, 5-200 m wide, and 30 m to over 10 km long.	Deposited in the marginal zone of the late Wisconsinan ice sheet, by glacial ice and/or meltwater flowing out of the ice.
rm	Ribbed moraine	Till is the principal constituent, but stratified sediments are present in some of the deposits.	Numerous hummocks and short sub-parallel ridges which typically occur in lake basins and other lowland areas.	Origin uncertain. Deposited either at the margin of or beneath the late Wisconsinan ice sheet.
t	Till	Heterogeneous mixture of sand, silt, clay and stones. May include many boulders. Generally massive, but in many places contains beds and lenses of variably washed and stratified sediments.	Generally a blanket deposit that conforms to the underlying bedrock topography. Also forms drumlins and other glacially streamlined hills.	Deposited directly by glacial ice.
	Thin drift	Area of many bedrock outcrops and/or thin surficial deposits (generally less than 3 m thick). The type of surficial material is known or inferred.	Topography of these areas reflects the configuration of the bedrock surface, and ranges from smooth undulating hills to knobby terrain and high mountains.	Commonly the result of non-deposition of glacial sediments, but the surficial materials in some coastal areas have been largely removed by marine erosion in late-glacial time.
tdu	Thin drift, undifferentiated	Area of many bedrock outcrops and/or near-surface bedrock where the surficial materials have not been mapped.	Same as other thin-drift areas.	Same as other thin-drift areas.
rk	Bedrock	Area of extensive bedrock outcrop, or where the bedrock has only a thin cover of soil and vegetation. Surficial deposits are essentially absent. Particularly common on the ridge crests and steeper slopes of mountainous areas.	Hilly to mountainous terrain.	Same as the thin-drift areas.

GEOLOGIC SYMBOLS

	Contact	Boundary between adjacent map units.
	Moraine ridge	Lines mark the crests of individual end moraines. Symbol also is used in conjunction with unit rm to show orientation of drift ridges of uncertain origin.
	Glacial striation locality	Includes striations, grooves, crag-and-tails, and other types of ice-flow indicators on bedrock outcrops. Dot indicates point of observation. Arrowhead is omitted where ice-flow direction is uncertain. Flags indicate older trends.
	Glacially streamlined landform	Symbol shows long-axis orientation of drumlins, fluted till ridges, roches moutonnees, and other hills that have been elongated parallel to the flow of glacial ice.
	Cirque	Steep-walled, semicircular bedrock basin formed by glacial erosion in high mountainous areas.
	Meltwater channel	Channel eroded by glacial meltwater stream. Arrow indicates known or inferred direction of stream flow.
▲ 288	Glaciomarine delta	Number indicates surveyed altitude (in feet) of contact between topset and foreset beds, or of meltwater channel on delta surface, which approximately marks position of sea level in late-glacial time.
△ 343	Glaciolacustrine delta	Number indicates approximate altitude (in feet) of former glacial-lake surface.
▲ 269	Delta of uncertain origin	Delta formed near limit of late-glacial marine submergence. Number indicates approximate altitude (in feet) of contact between topset and foreset beds.

SITES OF SPECIAL INTEREST

● Location of special site

This list includes locations of important stratigraphic sections of Pleistocene deposits in Maine, and places where good examples of certain glacial features can be seen. The sites were selected partly on the basis of accessibility, ease of observation, and relative permanence. Some features, such as eskers and DeGeer moraines, are so numerous that only a few of the best examples are included here.

Site	Town	Name/Description	Principal References
1	Waldoboro	Waldoboro Moraine; viewpoint along Route 220 showing morphology of the moraine.	Smith (35); Stewen (45); Stone (47)
2	Warren	Group of prominent DeGeer moraines.	Jong (20)
3	Winthrop	Winthrop till section; pit exposure showing stratigraphic relationship between two regional till units.	Thompson (53)
4	Sedgwick	Group of prominent DeGeer moraines.	Bingham (2)
5	Mount Desert	Day Mountain beach; bouldery raised beach, formed during late-glacial marine transgression.	Borns (5)
6	Eddington	Eddington till section; exposure along bank of Penobscot River showing interbedded tills and fine-grained water-laid sediments.	Brady (12)
7	Aurora	The Whalesback; good example of an esker.	Borns (4); Stone (47)

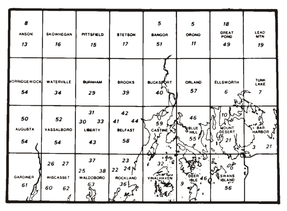
RADIOCARBON-DATED SITES

Explanation of symbols used to designate sites on the map:

- ■ Material in place between late Wisconsinan tills.
- ◧ Material that predates or is contemporaneous with the advance of the late Wisconsinan ice sheet.
- ◨ Material that postdates or is contemporaneous with the recession of the late Wisconsinan ice sheet.
- ◹ Material that approximately dates the onlap of the sea during the late-glacial marine transgression.
- ◸ Material that approximately dates the offlap of the sea.

Site	Name/Town	Date (yr B.P.)	Laboratory No.	Material	Reference
A	Whitney Corner (Warren)	11,720 ± 125	DIC-1599	shells in marine sediments	Smith (28)
B	Cape Rosier (Brooksville)	12,780 ± 160	Y-2214	barnacles on bedrock, buried by marine sediments	Stuiver and Borns (48)
C	Swans Island	12,905 ± 110	SI-4651	shells in marine sediments	Smith (28)
D	Moulton Pond (Bucksport, Dedham)	13,500 ± 300	I-5639	organic material in lake-bottom sediments	Davis and others (14)
E	Hampden	11,450 ± 100	Y-2204b	shells in marine sediments	Stuiver and Borns (48)
F	Embden Pond (Embden)	13,020 ± 240	Y-1477	shells in marine sediments	Stuiver and Borns (48)
G	Gould Pond (Dexter)	11,790 ± 395 (lacustrine sediments)	SI-5370	lake bottom sediments with plant remains, overlying fossiliferous marine sediments	Anderson, Jacobson, and Davis (1)
		13,280 ± 410 (marine sediments)	SI-5371		

SOURCES OF GEOLOGIC INFORMATION

1. Anderson, R. S., Jacobson, G. L., Jr., and Davis, R. B., 1982, Late- and postglacial environmental change in central Maine: a record of marine, lacustrine, and terrestrial fossils from Gould Pond (abs.): Seventh Biennial Conference, Am. Quat. Assoc., Seattle, p. 59.
2. Bingham, M. P., 1981, The structure and origin of washboard moraines and related glacial marine sediment in southeastern coastal Maine: M.S. thesis, Univ. of Maine, Orono, 108 p.
3. Borns, H. W., Jr., 1974, Reconnaissance surficial geology of the Bar Harbor (15') quadrangle, Maine: Maine Geol. Surv., Open-File Map 74-1.
4. Borns, H. W., Jr., 1979, Eskers in Maine: Maine State Planning Office, Planning Report 67, 46 p.
5. Borns, H. W., Jr., unpublished reconnaissance data.
6. Borns, H. W., Jr., and Andersen, B. G., 1982, Reconnaissance surficial geology of the Ellsworth (15') quadrangle, Maine: Maine Geol. Surv., Open-File Map 82-3.
7. Borns, H. W., Jr., and Andersen, B. G., 1982, Reconnaissance surficial geology of the Tunk Lake (15') quadrangle, Maine: Maine Geol. Surv., Open-File Map 82-5.
8. Borns, H. W., Jr., and Hagar, D. J., 1969, Late-glacial stratigraphy of a northern part of the Kennebec River valley, western Maine: Geol. Soc. Amer., Bull., v. 76, p. 1233-1250.
9. Borns, H. W., Jr., Smith, G. W., and Thompson, W. B., 1974, Reconnaissance surficial geology of the Deer Isle (15') quadrangle, Maine: Maine Geol. Surv., Open-File Map 74-12.
10. Borns, H. W., Jr., and Thompson, W. B., 1974, Reconnaissance surficial geology of the Mount Desert (15') quadrangle, Maine: Maine Geol. Surv., Open-File Map 74-7.
11. Borns, H. W., Jr., and Thompson, W. B., 1981, Reconnaissance surficial geology of the Orono (15') quadrangle, Maine: Maine Geol. Surv., Open-File Map 81-6.
12. Brady, K. B., 1982, The Quaternary stratigraphy of a multiple-till locality in east-central Maine: M.S. thesis, Univ. of Maine, Orono, 118 p.
13. Caldwell, D. W., 1986, Reconnaissance surficial geology of the Anson (15') quadrangle, Maine: Maine Geol. Surv., Open-File Map 86-28.
14. Davis R. B., Bradstreet, T. E., Stuckenrath, R., Jr., and Borns, H. W., Jr., 1975, Vegetation and associated environments during the past 14,000 years near Moulton Pond, Maine: Quat. Res., v. 5, p. 435-465.
15. Hanson, L. S., 1986, Reconnaissance surficial geology of the Pittsfield (15') quadrangle, Maine: Maine Geol. Surv., Open-File Map 86-35.
16. Hanson, L. S., 1986, Reconnaissance surficial geology of the Skowhegan (15') quadrangle, Maine: Maine Geol. Surv., Open-File Map 86-38.
17. Hanson, L. S., 1986, Reconnaissance surficial geology of the Stetson (15') quadrangle, Maine: Maine Geol. Surv., Open-File Map 86-39.
18. Holland, W. R., 1986, Reconnaissance surficial geology of the Great Pond (15') quadrangle, Maine: Maine Geol. Surv., Open-File Map 86-62.
19. Holland, W. R., 1986, Reconnaissance surficial geology of the Lead Mtn. (15') quadrangle, Maine: Maine Geol. Surv., Open-File Map 86-63.
20. Jong, R. S., 1980, Small push moraines in central coastal Maine: M.S. thesis, Ohio Univ., Athens, 75 p.
21. Lowell, T. V., 1980, Late Wisconsin ice extent in Maine: evidence from Mount Desert Island and the Saint John River area: M.S. thesis, Univ. of Maine, Orono, 180 p.
22. Smith, G. W., 1974, Reconnaissance surficial geology of the Camden (7.5') quadrangle, Maine: Maine Geol. Surv., Open-File Map 74-14.
23. Smith, G. W., 1974, Reconnaissance surficial geology of the Rockland (7.5') quadrangle, Maine: Maine Geol. Surv., Open-File Map 74-16.
24. Smith, G. W., 1974, Reconnaissance surficial geology of the West Rockport (7.5') quadrangle, Maine: Maine Geol. Surv., Open-File Map 74-19.
25. Smith, G. W., 1976, Reconnaissance surficial geology of the Waldoboro West (7.5') quadrangle, Maine: Maine Geol. Surv., Open-File Map 76-39.
26. Smith, G. W., 1976, Reconnaissance surficial geology of the Wiscasset (7.5') quadrangle, Maine: Maine Geol. Surv., Open-File Map 76-41.
27. Smith, G. W., 1977, Reconnaissance surficial geology of the Damariscotta (7.5') quadrangle, Maine: Maine Geol. Surv., Open-File Map 76-35.
28. Smith, G. W., 1985, Chronology of late Wisconsinan deglaciation of coastal Maine, in Borns, H. W., Jr., LaSalle, P., and Thompson, W. B., (eds.), Late Pleistocene History of Northeastern New England and Adjacent Quebec, Geol. Soc. Amer., Special Paper 197, p. 29-44.
29. Smith, G. W., 1986, Reconnaissance surficial geology of the Burnham (15') quadrangle, Maine: Maine Geol. Surv., Open-File Map 86-3.
30. Smith, G. W., 1986, Reconnaissance surficial geology of the Liberty (7.5') quadrangle, Maine: Maine Geol. Surv., Open-File Map 86-4.
31. Smith, G. W., 1986, Reconnaissance surficial geology of the Palermo (7.5') quadrangle, Maine: Maine Geol. Surv., Open-File Map 86-5.
32. Smith, G. W., 1986, Reconnaissance surficial geology of the Vinalhaven (15') quadrangle, Maine: Maine Geol. Surv., Open-File Map 86-52.
33. Smith, G. W., 1986, Reconnaissance surficial geology of the Washington (7.5') quadrangle, Maine: Maine Geol. Surv., Open-File Map 86-64.
34. Smith, G. W., 1986, Reconnaissance surficial geology of the Waterville (15') quadrangle, Maine: Maine Geol. Surv., Open-File Map 86-51.
35. Smith, G. W., in press, Late Wisconsinan glaciomarine deposits and end moraines, Lincoln and Knox Counties, Maine, in Thompson, W. B., and Smith, G. W., Pleistocene Stratigraphy of the Augusta and Waldoboro Areas, Maine: Guidebook for 46th Annual Friends of the Pleistocene Meeting: Maine Geol. Surv., Bull. 27.
36. Smith, G. W., and Andersen, B. G., 1974, Reconnaissance surficial geology of the Thomaston (7.5') quadrangle, Maine: Maine Geol. Surv., Open-File Map 74-20.
37. Smith, G. W., and Andersen, B. G., 1975, Reconnaissance surficial geology of the Jefferson (7.5') quadrangle, Maine: Maine Geol. Surv., Open-File Map 75-24.
38. Smith, G. W., and Andersen, B. G., 1975, Reconnaissance surficial geology of the Waldoboro East (7.5') quadrangle, Maine: Maine Geol. Surv., Open-File Map 75-25.
39. Smith, G. W., and Thompson, W. B., 1986, Reconnaissance surficial geology of the Brooks (15') quadrangle, Maine: Maine Geol. Surv., Open-File Map 86-2.
40. Smith, G. W., and Thompson, W. B., 1986, Reconnaissance surficial geology of the Bucksport (15') quadrangle, Maine: Maine Geol. Surv., Open-File Map 86-8.
41. Smith, G. W., and Thompson, W. B., 1986, Reconnaissance surficial geology of the Lincolnville (7.5') quadrangle, Maine: Maine Geol. Surv., Open-File Map 86-11.
42. Smith, G. W., and Thompson, W. B., 1986, Reconnaissance surficial geology of the Morrill (7.5') quadrangle, Maine: Maine Geol. Surv., Open-File Map 86-6.
43. Smith, G. W., and Thompson, W. B., 1986, Reconnaissance surficial geology of the Razorville (7.5') quadrangle, Maine: Maine Geol. Surv., Open-File Map 86-66.
44. Smith, G. W., and Thompson, W. B., 1986, Reconnaissance surficial geology of the Searsmont (7.5') quadrangle, Maine: Maine Geol. Surv., Open-File Map 86-65.
45. Stemen, K. S., 1979, Glacial stratigraphy of portions of Lincoln and Knox Counties, Maine: M.S. thesis, Ohio Univ., 67 p.
46. Stewart, D. B., unpublished data.
47. Stone, G. H., 1899, The glacial gravels of Maine: U.S. Geol. Surv., Monograph 34, 499 p.
48. Stuiver, M., and Borns, H. W., Jr., 1975, Late Quaternary marine invasion in Maine: its chronology and associated crustal movement: Geol. Soc. Amer., Bull., v. 86, p. 99-104.
49. Tepper, D. H., unpublished reconnaissance data.
50. Thompson, W. B., 1977, Reconnaissance surficial geology of the Augusta (15') quadrangle, Maine: Maine Geol. Surv., Open-File Map 77-23.
51. Thompson, W. B., 1977, Reconnaissance surficial geology of the Bangor (15') quadrangle, Maine: Maine Geol. Surv., Open-File Map 77-24.
52. Thompson, W. B., 1977, Reconnaissance surficial geology of the Vassalboro (15') quadrangle, Maine: Maine Geol. Surv., Open-File Map 77-35.
53. Thompson, W. B., in press, Glacial and glaciomarine deposits in the Augusta area, Maine, in Thompson, W. B., and Smith, G. W., Pleistocene Stratigraphy of the Augusta and Waldoboro Areas, Maine: Guidebook for 46th Annual Friends of the Pleistocene Meeting: Maine Geol. Surv., Bull. 27.
54. Thompson, W. B., unpublished reconnaissance data.
55. Thompson, W. B., and Borns, H. W., Jr., 1977, Reconnaissance surficial geology of the Blue Hill (15') quadrangle, Maine: Maine Geol. Surv., Open-File Map 77-36.
56. Thompson, W. B., and Borns, H. W., Jr., 1977, Reconnaissance surficial geology of the Swans Island (15') quadrangle, Maine: Maine Geol. Surv., Open-File Map 77-37.
57. Thompson, W. B., Borns, H. W., Jr., and Andersen, B. G., 1982, Reconnaissance surficial geology of the Orland (15') quadrangle, Maine: Maine Geol. Surv., Open-File Map 82-21.
58. Thompson, W. B., Calkin, P. E., Fahnestock, R. K., and Smith, G. W., 1986, Reconnaissance surficial geology of the Belfast (7.5') quadrangle, Maine: Maine Geol. Surv., Open-File Map 86-7.
59. Thompson, W. B., Prescott, G. C., Jr., Calkin, P. E., and Fahnestock, R. K., 1977, Reconnaissance surficial geology of the Castine (15') quadrangle, Maine: Maine Geol. Surv., Open-File Map 77-41.
60. Thompson, W. B., and Smith, G. W., 1979, Reconnaissance surficial geology of the East Pittston (7.5') quadrangle, Maine: Maine Geol. Surv., Open-File Map 75-26.
61. Thompson, W. B., and Smith, G. W., 1977, Reconnaissance surficial geology of the Gardiner (15') quadrangle, Maine: Maine Geol. Surv., Open-File Map 77-43.
62. Thompson, W. B., and Smith, G. W., 1977, Reconnaissance surficial geology of the North Whitefield (7.5') quadrangle, Maine: Maine Geol. Surv., Open-File Map 7X-44.
63. Thompson, W. B., and Smith, G. W., 1978, Reconnaissance surficial geology of the Union (7.5') quadrangle, Maine: Maine Geol. Surv., Open-File Map 78-22.

INDEX TO SOURCES OF GEOLOGIC INFORMATION