

QUATERNARY GEOLOGIC MAP OF THE LAKE ERIE 4° × 6° QUADRANGLE,
UNITED STATES AND CANADA

State and Province compilations by
David S. Fullerton, William R. Cowan, William D. Sevon, Richard P. Goldthwait,
William R. Farrand, Ernest H. Muller, Robert E. Behling, and Jay A. Stravers

Edited and integrated by
David S. Fullerton and Gerald M. Richmond

QUATERNARY GEOLOGIC ATLAS OF THE UNITED STATES

SOURCES OF INFORMATION

GREAT LAKES

- Bowlby, J. R., and Lewis, C.F.M., compilers, 1976, Lake Ontario surficial geology: Burlington, Ontario, Geological Survey of Canada Centre for Inland Waters, unpub. map, scale 1:400,000.
- Hartley, R. P., 1961, Bottom deposits in Ohio waters of central Lake Erie: Ohio Division of Shore Erosion Technical Report 6, 14 p.
- Lewis, C.F.M., and McNeely, R. N., 1967, Survey of Lake Ontario bottom sediments: International Association for Great Lakes Research, Conference on Great Lakes Research, 10th, Proceedings, p. 133-142.
- Thomas, R. L., Jaquet, J.-M., Kemp, A.L.W., and Lewis, C.F.M., 1976, Surficial sediments of Lake Erie: Research Board of Canada, Journal of Fisheries, v. 33, p. 385-412.
- Thomas, R. L., Kemp, A.L.W., and Lewis, C.F.M., 1972a, Distribution, composition, and characteristics of the surficial sediments of Lake Ontario: Journal of Sedimentary Petrology, v. 42, p. 66-84.
- 1972b, Report on the surficial sediment distribution of the Great Lakes, Part I—Lake Ontario: Geological Survey of Canada Paper 72-17, 52 p.
- 1973, The surficial sediments of Lake Huron: Canadian Journal of Earth Sciences, v. 10, p. 226-271.
- Verber, J. L., 1957, Bottom deposits of western Lake Erie: Ohio Division of Shore Erosion Technical Report 4.
- Wall, R. E., 1968, A sub-bottom reflection survey in the central basin of Lake Erie: Geological Society of America Bulletin, v. 79, p. 91-106.

- Wood, L. E., 1964, Bottom deposits of Saginaw Bay, Michigan: Journal of Sedimentary Petrology, v. 34, p. 173-184.

MICHIGAN

- Drake, R. H., 1980, Lake Whittlesey outlet channels and the late Wisconsinan history of the Michigan Thumb region: Michigan Academician, v. 13, p. 181-197.
- Eschman, D. F., 1978, Pleistocene geology of the Thumb area of Michigan, in Field excursions from the University of Michigan: Geological Society of America, North-central Section, Guidebook, p. 35-62.
- 1980, Some evidence of mid-Wisconsinan events in Michigan: Michigan Academician, v. 12, p. 423-436.
- Farrand, W. R., and Eschman, D. F., 1974, Glaciation of the Southern Peninsula of Michigan; A review: Michigan Academician, v. 7, p. 31-56.
- Kelley, R. W., 1962, Sand dunes of Michigan: Michigan Geological Survey, scale 1:500,000.
- Martin, H. M., 1955, Map of the surface formations of the Southern Peninsula of Michigan: Michigan Geological Survey Publication 49, pt. 1, scale 1:500,000.
- Mozola, A. J., 1969, Geology for land and ground-water development in Wayne County, Michigan: Michigan Geological Survey Report of Investigations 3, 25 p.
- 1970, Geology for environmental planning in Monroe County, Michigan: Michigan Geological Survey Report of Investigations 13, 34 p.
- Russell, I. C., and Leverett, Frank, 1908, Description of the Ann Arbor quadrangle: U.S. Geological Survey Geologic Atlas, Folio 155, 15 p.

- Sherzer, W. H., 1917, Description of the Detroit district: U.S. Geological Survey Geologic Atlas, Folio 205, 22 p.
- U.S. Department of Agriculture, published and unpublished soil survey maps of individual counties.
- Unpublished map information contributed by D. F. Eschman, Howard Scherzer, and W. A. Burgis.

NEW YORK

- Bartolomucci, H. A., 1968, A sedimentological study of the Niagara Falls moraine: State University of New York at Buffalo, M.A. thesis, 76 p.
- Blackmon, P. D., 1956, Glacial geology of the East Aurora, New York, quadrangle: State University of New York at Buffalo, M.S. thesis, 100 p.
- Braun, D. D., Daniel, T. A., Smith, L. B., and Brennan, W. J., 1985, Quaternary geologic and geomagnetic record of the upper Genesee Valley, New York: Geological Society of America Abstracts with Programs, v. 17, no. 1, p. 7.
- Bryant, J. C., 1955, A refinement of the upland glacial drift border in Cattaraugus County, New York: Ithaca, New York, Cornell University, M.S. thesis, 127 p.
- Calkin, P. E., 1970, Strandlines and chronology of the glacial Great Lakes in northwestern New York: Ohio Journal of Science, v. 70, p. 78-96.
- Calkin, P. E., Muller, E. H., and Barnes, J. H., 1982, The Gowanda Hospital interstadial site, New York: American Journal of Science, v. 282, p. 1110-1142.
- D'Agostino, John, 1957, Glacial Lake Tonawanda, history and development: State University of New York at Buffalo, M.S. thesis, 71 p.
- Fullerton, D. S., 1986, Stratigraphy and correlation of glacial deposits from Indiana to New York and New Jersey, in Richmond, G. M., and Fullerton, D. S., editors, Quaternary glaciations in the United States of America: Quaternary Science Reviews, v. 5, p. 23-37.
- Hollands, G. S., 1975, Surficial geology of the Colden quadrangle, western New York: Amherst, University of Massachusetts, M.S. thesis.
- Kindle, E. M., and Taylor, F. B., 1913, Description of the Niagara quadrangle: U.S. Geological Survey Geologic Atlas, Folio 190, 26 p.
- LaFleur, R. G., 1979, Glacial geology and stratigraphy of Webster, New York, Nuclear Science Center and vicinity, Cattaraugus and Erie Counties, New York: U.S. Geological Survey Open-File Report 79-989, 32 p.
- , 1980, Late Wisconsin stratigraphy of the upper Cattaraugus Basin: Friends of the Pleistocene, Eastern Section, Rensselaer Polytechnic Institute, Troy, New York, Guidebook.
- Leverett, Frank, 1902, Glacial formations and drainage features of the Erie and Ohio basins: U.S. Geological Survey Monograph 41, 802 p.
- Lewis, H. C., 1882, Report on the terminal moraine in Pennsylvania and western New York: Pennsylvania Geological Survey, Second Report, Progress Report Z, 299 p.
- MacClintock, Paul, and Apfel, E. T., 1944, Correlation of the drifts of the Salamanca re-entrant, New York: Geological Society of America Bulletin, v. 55, p. 1143-1164.
- Muller, E. H., 1960, Glacial geology of Cattaraugus County, New York: Friends of the Pleistocene, Eastern Section, 23rd reunion, Guidebook, 34 p.
- , 1963, Geology of Chautauqua County, New York, Part II—Pleistocene geology: New York State Museum Bulletin 392, 60 p.
- , 1964, Quaternary section at Otto, New York: American Journal of Science, v. 262, p. 461-478.
- , 1977, Quaternary geology of New York, Niagara sheet: New York State Museum and Science Service Map and Chart Series 28, scale 1:250,000.
- Pryor, Michael, 1975, The glacial history of the Langford, New York, 7 1/2' quadrangle and the southern half of the Hamburg, New York, 7 1/2' quadrangle: State University of New York at Buffalo, M.S. thesis.
- Salamon, Nina, 1976, Stratigraphy of glacial deposits along the south shore of Lake Ontario, New York: Syracuse, New York, Syracuse University, M.S. thesis, 78 p.
- Street, J. S., 1963, Significance of variation in till constitution in the Rush Creek area, New York: Syracuse, New York, Syracuse University, M.S. thesis, 68 p.
- Sweeney, J. F., 1969, Glacial geology of the Springville, New York, and the northern part of the Ashford Hollow, New York, quadrangles: State University of New York at Buffalo, M.S. thesis, 51 p.
- Symecko, R. E., 1967, Glacial geology of the Orchard park, New York, quadrangle: State University of New York at Buffalo, M.S. thesis, 64 p.
- U.S. Department of Agriculture, published soil survey maps of individual counties.

OHIO

- Baker, Jack, 1957, Glacial geology of Geauga County, Ohio: Urbana, University of Illinois, Ph.D. dissertation, 118 p.
- Baker, F. J., Schafer, G. M., and Holowaychuk, Nicholas, 1960, Surficial materials and soils of Paulding County, Ohio: Ohio Journal of Science, v. 60, p. 365-377.
- Brown, D. M., 1948, The Pleistocene geology of Clark County, Ohio: Columbus, Ohio State University, M.S. thesis, 73 p.
- Campbell, L. J., 1955, The late-glacial and lacustrine deposits of Erie and Huron Counties, Ohio: Columbus, Ohio State University, Ph.D. dissertation, 197 p.

- Carney, Frank, 1910, Glacial erosion on Kelly's Island, Ohio: Geological Society of America Bulletin, v. 20, p. 640-645.
- Conrey, G. W., 1921, Geology of Wayne County, Ohio: Ohio Geological Survey Bulletin 24, 145 p.
- Cummins, J. W., and Sanderson, E. E., 1947, The water resources of Tuscarawas County, Ohio: Ohio Water Resources Board Bulletin 6, 52 p.
- de Heinzelin, Jean, 1957, Pleistocene geology in the Middle West, a final report of a study travel: Brussels, Institut Royal des Sciences Naturelles de Belgique, 151 p.
- Dove, G. D., 1960, Water resources of Licking County, Ohio: Ohio Division of Water Resources Bulletin 36, 96 p.
- Dreimanis, Aleksis, and Goldthwait, R. P., 1973, Wisconsin glaciation in the Huron, Erie, and Ontario lobes, in Black, R. F., Goldthwait, R. P., and Willman, H. B., editors, The Wisconsinan Stage: Geological Society of America Memoir 136, p. 71-106.
- Ford, J. P., 1987, Glacial and surficial geology of Cuyahoga County, Ohio: Ohio Geological Survey Report of Investigations 134, 29 p.
- Forsyth, J. L., 1956, Glacial geology of Logan and Shelby Counties, Ohio: Columbus, Ohio State University, Ph.D. dissertation, 207 p.
- 1961, Pleistocene geology, in Root, S. I., Rodriguez, Joaquin, and Forsyth, J. L., Geology of Knox County: Ohio Geological Survey Bulletin 59, p. 107-138.
- 1966, Glacial map of Licking County, Ohio: Ohio Geological Survey Report of Investigations 59, scale 1:62,500.
- 1967, Glacial geology of the East Liberty quadrangle, Logan and Union Counties, Ohio: Ohio Geological Survey Report of Investigations 66.
- Forsyth, J. L., and Goldthwait, R. P., 1962, Guide to Friends of the Pleistocene (Midwest) Ohio meeting: Friends of the Pleistocene, Midwest Section, Guidebook, 26 p.
- Fullerton, D. S., 1974, Multiple tills near Galena, Delaware County, Ohio: Geological Society of America Abstracts with Programs, v. 6, no. 6, p. 509.
- 1986, Stratigraphy and correlation of glacial deposits from Indiana to New York and New Jersey, in Richmond, G. M., and Fullerton, D. S., editors, Quaternary glaciations in the United States of America: Quaternary Science Reviews, v. 5, p. 23-37.
- Fullerton, D. S., and Groenewold, G. H., 1974, Quaternary stratigraphy at Garfield Heights (Cleveland), Ohio—Additional observations: Geological Society of America Abstracts with Programs, v. 6, no. 6, p. 509-510.
- Goldthwait, R. P., 1952, Glacial deposits, in The water resources of Clark County, Ohio: Ohio Water Research Board Bulletin 22, p. 44-46.
- 1958a, Wisconsin age forests in western Ohio; I, Age and glacial events: Ohio Journal of Science, v. 58, p. 209-219.
- 1958b, Geology and water-bearing properties of the unconsolidated deposits, in Schmidt, J. J., The ground-water resources of Franklin County, Ohio: Ohio Division of Water Bulletin 30, p. 17-21.
- Goldthwait, R. P., White, G. W., and Forsyth, J. L., 1961, Glacial map of Ohio (revised in part, 1967): U.S. Geological Survey Miscellaneous Geologic Investigations Map I-316, scale 1:500,000.
- Gregory, J. F., 1956, The Pleistocene geology of Crawford County, Ohio: Columbus, Ohio State University, M.S. thesis, 87 p.
- Gross, D. L., and Moran, S. R., 1971, Grain-size and mineralogical gradations within tills of the Allegheny Plateau, in Goldthwait, R. P., and others, editors, Till—A symposium: Columbus, Ohio State University Press, p. 251-274.
- Heath, C.P.M., 1963, The mineralogy of tills in the Grand River glacial lobe in northeastern Ohio: Urbana, University of Illinois, M.S. thesis, 199 p.
- Janssens, Arie, 1963, A contribution to the Pleistocene geology of Champaign County, Ohio: Columbus, Ohio State University, M.S. thesis, 96 p.
- Jones, R. L., 1959, Outwash terraces along Licking River, Ohio: Columbus, Ohio State University, M.S. thesis, 94 p.
- Lessig, H. D., 1961, The soils developed on Wisconsin and Illinoian-age glacial outwash terraces along Little Beaver Creek and the adjoining upper Ohio Valley, Columbiana County, Ohio: Ohio Journal of Science, v. 61, p. 286-294.
- 1964, Soils and their parent geologic materials in parts of the unglaciated Allegheny Plateau, upper Ohio Valley, as interpreted from a pipeline excavation: Ohio Journal of Science, v. 64, p. 385-400.
- Leverett, Frank, 1902, Glacial formations and drainage features of the Erie and Ohio Basins: U.S. Geological Survey Monograph 41, 802 p.
- 1931, Quaternary system, in Cushing, H. P., Leverett, Frank, and Van Horn, F. R., Geology and mineral resources of the Cleveland district, Ohio: U.S. Geological Survey Bulletin 818, p. 57-81.
- Muskopf, John, 1973, Studies of till from Kelley's Island: Columbus, Ohio State University, senior thesis, 18 p.
- Quinn, M. J., and Goldthwait, R. P., 1979, Glacial geology of Champaign County, Ohio: Ohio Geological Survey Report of Investigations 111, 17 p.
- Sharpe, C.F.S., and Dosch, E. F., 1942, Relation of soil-creep to earthflow in the Appalachian Plateaus: Journal of Geomorphology, v. 5, p. 312-324.
- Shepps, V. C., 1953, Correlation of the tills of northeastern Ohio by size analysis: Journal of Sedimentary Petrology, v. 23, p. 34-48.

- Stauffer, C. R., Hubbard, G. D., and Bownocker, J. A., 1911, Geology of the Columbus quadrangle: Ohio Geological Survey Bulletin 14, 133 p.
- Steiger, J. R., and Holowaychuk, Nicholas, 1971, Particle-size and carbonate analysis of glacial till and lacustrine deposits in western Ohio, in Goldthwait, R. P., and others, editors, *Till—A symposium*: Columbus, Ohio State University Press, p. 275–289.
- Totten, S. M., 1965, Multiple tills near Shenandoah, Richland County, Ohio: Ohio Journal of Science, v. 65, p. 353–357.
- 1973, Glacial geology of Richland County, Ohio: Ohio Geological Survey Report of Investigations 88, 55 p.
- U.S. Department of Agriculture, published and unpublished soil survey maps of individual counties.
- Westgate, L. G., 1926, Glacial geology of Delaware County, Ohio: Ohio Geological Survey Bulletin 30, 147 p.
- White, G. W., 1939, Illinoian drift of eastern Ohio: American Journal of Science, v. 237, p. 161–174.
- 1949, Geology of Holmes County, Ohio: Ohio Geological Survey Bulletin 47, 373 p.
- 1951, Illinoian and Wisconsin drift of the southern part of the Grand River lobe in eastern Ohio: Geological Society of America Bulletin, v. 62, p. 967–977.
- 1953a, Geology and water-bearing characteristics of the unconsolidated deposits of Cuyahoga County, in Winslow, J. D., White, G. W., and Webber, E. E., *The water resources of Cuyahoga County, Ohio*: Ohio Division of Water Bulletin 26, p. 36–42.
- 1953b, Geology and water-bearing properties of the unconsolidated deposits, in Smith, R. C., and White, G. W., *The ground-water resources of Summit County, Ohio*: Ohio Division of Water Bulletin 27, p. 18–27.
- 1953c, Sangamon soil and early Wisconsin loesses at Cleveland, Ohio: American Journal of Science, v. 251, p. 362–368.
- 1960, Classification of Wisconsin glacial deposits in northeastern Ohio: U.S. Geological Survey Bulletin 1121-A, p. A1–A12.
- 1961, Classification of glacial deposits in the Killbuck lobe, northeast-central Ohio: U.S. Geological Survey Professional Paper 424-C, p. C71–C73.
- 1963, Glacial geology of Stark County, Ohio, in DeLong, R. M., and White, G. W., *Geology of Stark County*: Ohio Geological Survey Bulletin 61, p. 118–156.
- 1967, Glacial geology of Wayne County, Ohio: Ohio Geological Survey Report of Investigations 62, 39 p.
- 1968, Age and correlation of Pleistocene deposits at Garfield Heights (Cleveland), Ohio: Geological Society of America Bulletin, v. 79, p. 749–752.
- 1969, Pleistocene deposits of the north-western Allegheny Plateau, U.S.A.: Quarterly Journal of the Geological Society of London, v. 124, pt. 2, p. 131–149.
- 1971a, Glacial geology of Trumbull County, Ohio: Ohio Geological Survey Report of Investigations 80.
- 1971b, Thickness of Wisconsinan tills in Grand River and Killbuck lobes, northeastern Ohio and northwestern Pennsylvania, in Goldthwait, R. P., and others, editors, *Till—A symposium*: Columbus, Ohio State University Press, p. 149–163.
- 1973, Glacial geology of Holmes County, Ohio: Ohio Geological Survey Report of Investigations 91.
- 1977, Glacial geology of Ashland County, Ohio: Ohio Geological Survey Report of Investigations 101.
- 1980, Glacial geology of Lake County, Ohio: Ohio Geological Survey Report of Investigations 117, 20 p.
- 1982, Glacial geology of northeastern Ohio: Ohio Geological Survey Bulletin 68, 75 p.
- 1984, Glacial geology of Summit County, Ohio: Ohio Geological Survey Report of Investigations 123, 25 p.
- White, G. W., and Totten, S. M., 1979, Glacial geology of Ashtabula County, Ohio: Ohio Geological Survey Report of Investigations 112, 48 p.
- 1985, Glacial geology of Columbiana County, Ohio: Ohio Geological Survey Report of Investigations 129, 25 p.
- Winslow, J. D., and White, G. W., 1966, Geology and ground-water resources of Portage County, Ohio: U.S. Geological Survey Professional Paper 511, 80 p.
- Unpublished manuscripts and maps, Ohio Geological Survey:
- Carney, Frank, 1913, Quaternary geology of the Cleveland district described in handwritten text on reverse sides of topographic quadrangles.
- 1917, Manuscript and notes on the beach ridges of the glacial lakes, 162 p.
- 1953, Supplement to manuscript and notes on the beach ridges of the glacial lakes, 16 p.
- Totten, S. M., Glacial geology of Medina County, Ohio, scale 1:62,500.
- Glacial geology of Lorain County, Ohio, scale 1:62,500.
- Totten, S. M., and White, G. W., Glacial geology of Mahoning County, Ohio, scale 1:62,500.
- Unpublished maps of landslides and strip mines, Canton and Pittsburgh 1° x 2° quadrangles, by W. E. Davies, U.S. Geological Survey, scale 1:250,000.

Unpublished map information contributed by J. L. Forsyth, D. S. Fullerton, R. P. Goldthwait, G. H. Groenewold, Nicholas Holowaychuk, R. J. Larson, H. D. Lessig, and G. W. White.

ONTARIO

- Barnett, P. J., 1975, Till matrix characteristics of the upper and lower tills of the Niagara Peninsula, Ontario: Waterloo, Ontario, University of Waterloo, M.S. thesis, 131 p.
- 1978, Quaternary geology of the Simcoe area, southern Ontario: Ontario Division of Mines Geoscience Report 162, 74 p.
- 1982, Quaternary geology of the Tillsonburg area, southern Ontario: Ontario Geological Survey Report 220, 87 p.
- 1984, Quaternary geology of the Port Burwell area, southern Ontario: Ontario Geological Survey Geological Series Preliminary Map P.2624, scale 1:50,000.
- Barnett, P. J., and Zilans, Andis, 1983, Quaternary geology of the Long Point area, southern Ontario: Ontario Geological Survey Geological Series Preliminary Map P.2616, scale 1:50,000.
- Berger, G. W., 1984, Thermoluminescence dating studies of glacial silts from Ontario: Canadian Journal of Earth Sciences, v. 21, p. 1393–1399.
- Brookfield, M. E., Gwyn, Q.H.J., and Martini, I. P., 1982, Quaternary sequences along the north shore of Lake Ontario: Canadian Journal of Earth Sciences, v. 19, p. 1836–1850.
- Chapman, L. J., and Putnam, D. F., 1984, The physiography of southern Ontario (3rd ed.): Ontario Geological Survey Special Volume 2, 270 p.
- Coleman, A. P., 1932, The Pleistocene of the Toronto region: Ontario Department of Mines Map 41G, scale 1:63,360.
- Cooper, A. J., 1979, Quaternary geology of the Grand Bend-Parkhill area, southern Ontario: Ontario Geological Survey Report 188, 70 p.
- Cooper, A. J., and Baker, C. L., 1978, Quaternary geology of the Bothwell-Ridgetown area, southern Ontario: Ontario Geological Survey Geological Series Preliminary Map P.1973, scale 1:50,000.
- Cooper, A. J., Baker, C. L., and Fitzgerald, W. D., 1978, Quaternary geology of the Strathroy area, southern Ontario: Ontario Geological Survey Geological Series Preliminary Map P.1972, scale 1:50,000.
- Cooper, A. J., and Fitzgerald, W. D., 1977, Quaternary geology of the Goderich area, southern Ontario: Ontario Geological Survey Geological Series Preliminary Map P.1232, scale 1:50,000.
- Cooper, A. J., Fitzgerald, W. D., and Clue, Jack, 1977, Quaternary geology of the Seaforth area, southern Ontario: Ontario Geological Survey Geological Series Preliminary Map P.1233, scale 1:50,000.
- Cowan, W. R., 1972, Pleistocene geology of the Brantford area, southern Ontario: Ontario Department of Mines and Northern Affairs Industrial Mineral Report 37, 66 p.
- 1975, Quaternary geology of the Woodstock area, southern Ontario: Ontario Division of Mines Report 119, 91 p.
- 1976, Quaternary geology of the Orangeville area, southern Ontario: Ontario Division of Mines Report 141, 98 p.
- 1979, Quaternary geology of the Palmerston area, southern Ontario: Ontario Geological Survey Report 187, 64 p.
- Cowan, W. R., Cooper, A. J., and Pinch, J. J., 1986, Quaternary geology of the Wingham-Lucknow area, southern Ontario: Ontario Geological Survey Geological Series Preliminary Map P.2957, scale 1:50,000.
- Cowan, W. R., Sharpe, D. R., Feenstra, B. H., and Gwyn, Q.H.J., 1978, Glacial geology of the Toronto-Owen Sound area, in Currie, A. L., and Mackasey, W. O., editors, Toronto '78 field trips guidebook: Geological Association of Canada, p. 1–16.
- Dreimanis, Aleksis, 1958, Wisconsin stratigraphy at Port Talbot on the north shore of Lake Erie, Ontario: Ohio Journal of Science, v. 58, p. 65–84.
- 1964, Pleistocene geology of the St. Thomas area (west half), southern Ontario: Ontario Department of Mines Geological Series Preliminary Map P.238, scale 1:50,000.
- 1970, Pleistocene geology of the St. Thomas area (east half), southern Ontario: Ontario Department of Mines Geological Series Preliminary Map P.606, scale 1:50,000.
- 1972, Surficial geology, Port Stanley (40I/11 west), Ontario: Geological Survey of Canada Open-File Report 85, 4 p.
- 1980, Field trip to the "Bradville"-Plum Point area, north shore of Lake Erie, 11 October 1980: London, University of Western Ontario, Department of Geology Contribution 533, 12 p.
- 1982, Middle Wisconsin substage in its type region, the eastern Great Lakes and Ohio River Basin, North America: Quaternary Studies in Poland, v. 3, pt. 2, p. 21–28.
- 1987, London to Port Stanley area, in Barnett, P. J., and Kelly, R. I., editors, Quaternary history of southern Ontario: International Union for Quaternary Research, 12th Congress, Ottawa, Ontario, Excursion guide book A-11, p. 44–53.
- Dreimanis, Aleksis, and Barnett, P. J., 1984, Quaternary geology of the Port Stanley area, southern Ontario: Ontario Geological Geological Series Survey Preliminary Map P.2827, scale 1:50,000.

- Dreimanis, Aleksis, and Karrow, P. F., 1965, Southern Ontario: International Union for Quaternary Research, 7th Congress, Guidebook for field conference G, Great Lakes-Ohio River Valley, p. 90-110.
- Dreimanis, Aleksis, Terasmae, Jaan, and McKenzie, G. D., 1966, The Port Talbot interstade of the Wisconsin glaciation: Canadian Journal of Earth Sciences, v. 3, p. 305-325.
- Feenstra, B. H., 1972a, Quaternary geology of the Niagara area, southern Ontario: Ontario Division of Mines Geological Series Preliminary Map P.764, scale 1:50,000.
- 1972b, Quaternary geology of the Welland area, southern Ontario: Ontario Division of Mines Geological Series Preliminary Map P.796, scale 1:50,000.
- 1974a, Quaternary geology of the Dunnville area, southern Ontario: Ontario Division of Mines Geological Series Preliminary Map P.981, scale 1:50,000.
- 1974b, Quaternary geology of the Grimsby area, southern Ontario: Ontario Division of Mines Geological Series Preliminary Map P.993, scale 1:50,000.
- 1975, Late Wisconsin stratigraphy in the northern part of the Stratford-Conestogo area, southern Ontario: London, University of Western Ontario, M.S. thesis, 232 p.
- 1980, Quaternary geology and industrial minerals of the Niagara-Welland area, southern Ontario: Ontario Geological Survey Open-File Report 5361, 260 p.
- Fitzgerald, W. D., Janicki, Edward, and Storrison, D. J., 1979, Quaternary geology of the Sarnia-Brights Grove area, southern Ontario: Ontario Geological Survey Geological Series Preliminary Map P.2222, scale 1:50,000.
- Fitzgerald, W. D., and Hradsky, Milan, 1980, Quaternary geology of the Wallaceburg-St. Clair Flats area, southern Ontario: Ontario Geological Survey Geological Series Preliminary Map P.2368, scale 1:50,000.
- Gravenor, C. P., 1957, Surficial geology of the Lindsay-Peterborough area, Ontario, Victoria, Peterborough, Durham, and Northumberland Counties, Ontario: Geological Survey of Canada Memoir 288, 60 p.
- Gwynn, Q.H.J., 1976a, Quaternary geology and granular resources of the western part of the Regional Municipality of Durham, southern Ontario: Ontario Geological Survey Open-File Report 5161, 5 p.
- 1976b, Quaternary geology and granular resources of the central and eastern parts of the Regional Municipality of Durham, southern Ontario: Ontario Geological Survey Open-File Report 5176, 7 p.
- Hewitt, D. F., 1969a, Industrial mineral resources of the Brampton area: Ontario Department of Mines Industrial Mineral Report 23, 22 p.
- 1969b, Industrial mineral resources of the Markham-Newmarket area: Ontario Department of Mines Industrial Mineral Report 24, 41 p.
- Karrow, P. F., 1963, Pleistocene geology of the Hamilton-Galt area: Ontario Department of Mines Geological Report 16, 68 p.
- 1967, Pleistocene geology of the Scarborough area: Ontario Department of Mines Geoscience Report 46, 108 p.
- 1968, Pleistocene geology of the Guelph area, southern Ontario: Ontario Department of Mines Geoscience Report 61, 38 p.
- 1969, Stratigraphic studies in the Toronto Pleistocene: Geological Association of Canada Proceedings, v. 20, p. 4-16.
- 1970, Pleistocene geology of the Thornhill area: Ontario Department of Mines Industrial Mineral Report 32, 51 p.
- 1971, Quaternary geology of the Stratford-Conestogo area, Ontario: Geological Survey of Canada Paper 70-34, 11 p.
- 1974, Till stratigraphy in parts of southwestern Ontario: Geological Society of America Bulletin, v. 85, p. 761-768.
- 1977, Quaternary Geology of the St. Marys area, southern Ontario: Ontario Division of Mines Geoscience Report 148, 59 p.
- 1983, Quaternary geology of the Hamilton-Cambridge area: Ontario Geological Survey Open-File Report 5429, 147 p.
- 1984, Quaternary stratigraphy and history, Great Lakes-St. Lawrence region, in Fulton, R. J., editor, Quaternary stratigraphy of Canada— A Canadian contribution to IGCP Project 24: Geological Survey of Canada Paper 84-10, p. 138-153.
- Karrow, P. F., Cowan, W. R., Dreimanis, Aleksis, and Singer, S. N., 1978, Middle Wisconsinan stratigraphy in southern Ontario, in Currie, A. L., and Mackasey, W. O., editors, Toronto '78 field trips guidebook: Geological Association of Canada, p. 17-27.
- Karrow, P. F., and Morgan, A. V., 1975, Quaternary stratigraphy of the Toronto area, in Telford, P. G., editor, Field excursions guidebook: Geological Association of Canada, North Central Section, Annual Meeting, Waterloo, Ontario, p. 161-177.
- Lamothe, Michel, Dreimanis, Aleksis, Morency, Maurice, and Raukas, Anto, 1984, Thermoluminescence dating of Quaternary sediments, in Mahaney, W. C., editor, Quaternary dating methods: New York, Elsevier, p. 153-170.
- Martini, I. P., Brookfield, M. E., and Gwyn, Q.H.J., 1984, Quaternary stratigraphy of the coastal bluffs of Lake Ontario east of Oshawa, in Mahaney, W. C., editor, Quaternary dating methods: New York, Elsevier, p. 417-427.

- Ontario Soil Survey, published soil survey reports of individual counties.
- Sado, E. V., and Vagners, U. J., 1975, Quaternary geology of the Lucan area, southern Ontario: Ontario Division of Mines Geological Series Preliminary Map P.1048, scale 1:50,000.
- Singer, S. N., 1973, Surficial geology along the north shore of Lake Ontario in the Bowmanville-Newcastle area: International Association for Great Lakes Research, 16th Conference on Great Lakes Research, Proceedings, p. 441-453.
- Terasmae, Jaan, Karrow, P. F., and Dreimanis, Aleksis, 1972, Quaternary stratigraphy and geomorphology of the eastern Great Lakes region of southern Ontario: International Geological Congress, 24th session, Montreal, Quebec, Guidebook to field excursion A42, 75 p.
- Vagners, U. J., 1972a, Quaternary geology of the Windsor-Essex area (western part), southern Ontario: Ontario Department of Mines and Northern Affairs Geological Series Preliminary Map P.749, scale 1:50,000.
- 1972b, Quaternary geology of the Windsor-Essex area (eastern part), southern Ontario: Ontario Department of Mines and Northern Affairs Geological Series Preliminary Map P.750, scale 1:50,000.
- Watt, A. K., 1957, Pleistocene geology and ground-water resources of the Township of North York, York County: Ontario Department of Mines Annual Report, v. 64, pt. 7, 64 p.
- 1968, Pleistocene geology and ground-water resources, Township of Etobicoke: Ontario Department of Mines Geoscience Report 59, 50 p.
- White, O. L., 1975, Quaternary geology of the Bolton area, southern Ontario: Ontario Division of Mines Geoscience Report 117, 119 p.
- Cunningham, R. L., Ciolkosz, E. J., Matelski, R. P., Petersen, G. W., and Pennock, R., Jr., 1974, Characteristics, interpretations, and uses of Pennsylvania soils developed from colluvium: Pennsylvania State University Agricultural Experiment Station Progress Report 344, 50 p.
- Cunningham, R. L., Ciolkosz, E. J., Petersen, G. W., and Pennock, R., Jr., 1977, Characterization, interpretations, and uses of Pennsylvania soils developed from acid shale materials: Pennsylvania State University Agricultural Experiment Station Progress Report 362, 81 p.
- Denny, C. S., 1951, Pleistocene frost action near the border of the Wisconsin drift in Pennsylvania: Ohio Journal of Science, v. 51, p. 116-125.
- 1956, Surficial geology and geomorphology of Potter County, Pennsylvania: U.S. Geological Survey Professional Paper 288, 72 p.
- Goodman, K. V., 1953, Brown forest, polygenetic, and congeliturbate profiles of Potter County, Pennsylvania: Soil Science Society of America Proceedings, v. 17, p. 399-402.
- Gross, D. L., and Moran, S. R., 1971, Grain-size and mineralogical gradations within tills of the Allegheny Plateau, in Goldthwait, R. P., and others, editors, Till—A symposium: Columbus, Ohio State University Press, p. 251-274.
- Leggette, R. M., 1936, Ground-water in northwestern Pennsylvania: Pennsylvania Geological Survey Bulletin W3, 215 p.
- Leverett, Frank, 1902, Glacial formations and drainage features of the Erie and Ohio basins: U.S. Geological Survey Monograph 41, 802 p.
- 1934, Glacial deposits outside the Wisconsin terminal moraine in Pennsylvania: Pennsylvania Geological Survey Bulletin G7, 123 p.
- Lewis, H. C., 1882, Report on the terminal moraine in Pennsylvania and western New York: Pennsylvania Geological Survey, Second Report, Progress Report Z, 299 p.
- Muller, E. H., 1977, Quaternary geology of New York, Niagara Sheet: New York State Museum and Science Service, Map and Chart Series no. 28, scale 1:250,000.
- Patton, J. B., 1956, Earth slips in the Allegheny Plateau region: Journal of Soil and Water Conservation, v. 11, p. 28-31.
- Pennsylvania Geological Survey, 1981, Glacial deposits of Pennsylvania: Pennsylvania Geological Survey Map 59, scale approximately 1 inch = 31 miles.
- Pomeroy, J. S., 1982, Landslides in the greater Pittsburgh region, Pennsylvania: U.S. Geological Survey Professional Paper 1229, 18 p.
- Pomeroy, J. S., and Davies, W. E., 1975, Map of susceptibility to landsliding, Allegheny County, Pennsylvania: U.S. Geological Survey Miscellaneous Field Studies Map MF-685-B, scale 1:50,000.

PENNSYLVANIA

- Briggs, R. P., Pomeroy, J. S., and Davies, W. E., 1975, Landsliding in Allegheny County, Pennsylvania: U.S. Geological Survey Circular 728, 18 p.
- Ciolkosz, E. J., Latshaw, G. J., Cunningham, R. L., and Sevon, W. D., 1971, Parent material, topography, and time as soil forming factors in eastcentral Pennsylvania: Pennsylvania State University Agronomy Department, Agronomy Series no. 21, 53 p.
- Ciolkosz, E. J., Peterson, G. W., Cunningham, R. L., and Matelski, R. P., 1979, Soils developed from colluvium in the Ridge and Valley area of Pennsylvania: Soil Science, v. 128, p. 153-162.
- Crowl, G. H., and Sevon, W. D., 1980, Glacial border deposits of late Wisconsin age in northeastern Pennsylvania: Pennsylvania Geological Survey General Geology Report 71, 68 p.

- Preston, R. W., 1950, Glacial foreland of northwestern Pennsylvania: Pennsylvania Geologists, 16th Annual Meeting, Pittsburgh, Guidebook, 47 p.
- Sharpe, C.F.S., and Dosch, E. F., 1942, Relation of soil-creep to earthflow in the Appalachian Plateaus: *Journal of Geomorphology*, v. 5, p. 312-324.
- Shaw, E. W., 1911, High terraces and abandoned valleys in western Pennsylvania: *Journal of Geology*, v. 19, p. 140-156.
- Shepps, V. C., 1955, Glacial geology of a part of northwestern Pennsylvania: Urbana, University of Illinois, Ph.D. dissertation, 109 p.
- Shepps, V. C., White, G. W., Droste, J. B., and Sitler, R. F., 1959, Glacial geology of northwestern Pennsylvania: *Pennsylvania Geological Survey Bulletin G32*, 59 p.
- Shepps, V. C., and others, 1960, Geologic map of Pennsylvania: *Pennsylvania Geological Survey Map 1*, scale 1:250,000.
- Sitler, R. F., 1957, Glacial geology of a part of western Pennsylvania: Urbana, University of Illinois, Ph.D. dissertation.
- Tharin, J. C., 1958, Textural studies of the Wisconsin tills of northwestern Pennsylvania: Urbana, University of Illinois, M.S. thesis.
- U.S. Department of Agriculture, published soil survey maps of individual counties.
- Wagner, W. R., and others, 1970, Geology of the Pittsburgh area: *Pennsylvania Geological Survey General Geology Report G59*, 145 p.
- White, G. W., 1969, Pleistocene deposits of the northwestern Allegheny Plateau, U.S.A.: *Quarterly Journal of the Geological Society of London*, v. 124, pt. 2, p. 131-149.
- 1971, Thickness of Wisconsinan tills in Grand River and Killbuck lobes, northeastern Ohio and northwestern Pennsylvania, in Goldthwait, R. P., and others, editors, *Till—A symposium*: Columbus, Ohio State University Press, p. 149-163.
- White, G. W., Totten, S. M., and Gross, D. L., 1969, Pleistocene stratigraphy of northwestern Pennsylvania: *Pennsylvania Geological Survey Bulletin G55*, 88 p.
- Unpublished maps of landslides, strip mines, and rock waste deposits, Canton and Pittsburgh 1° × 2° quadrangles by W. E. Davies, U.S. Geological Survey, scale 1:250,000.

WEST VIRGINIA

- Lessing, Peter, Kulander, B. R., Wilson, B. D., Dean, S. L., and Woodring, S. M., 1976, West Virginia landslides and slide-prone areas: *West Virginia Geological and Economic Survey Environmental Geology Bulletin 15*, 64 p.
- Unpublished maps of landslides and strip mines, Canton 1° × 2° quadrangle by W. E. Davies, U.S. Geological Survey, scale 1:250,000.