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NEW YORK GLACIOGRAM

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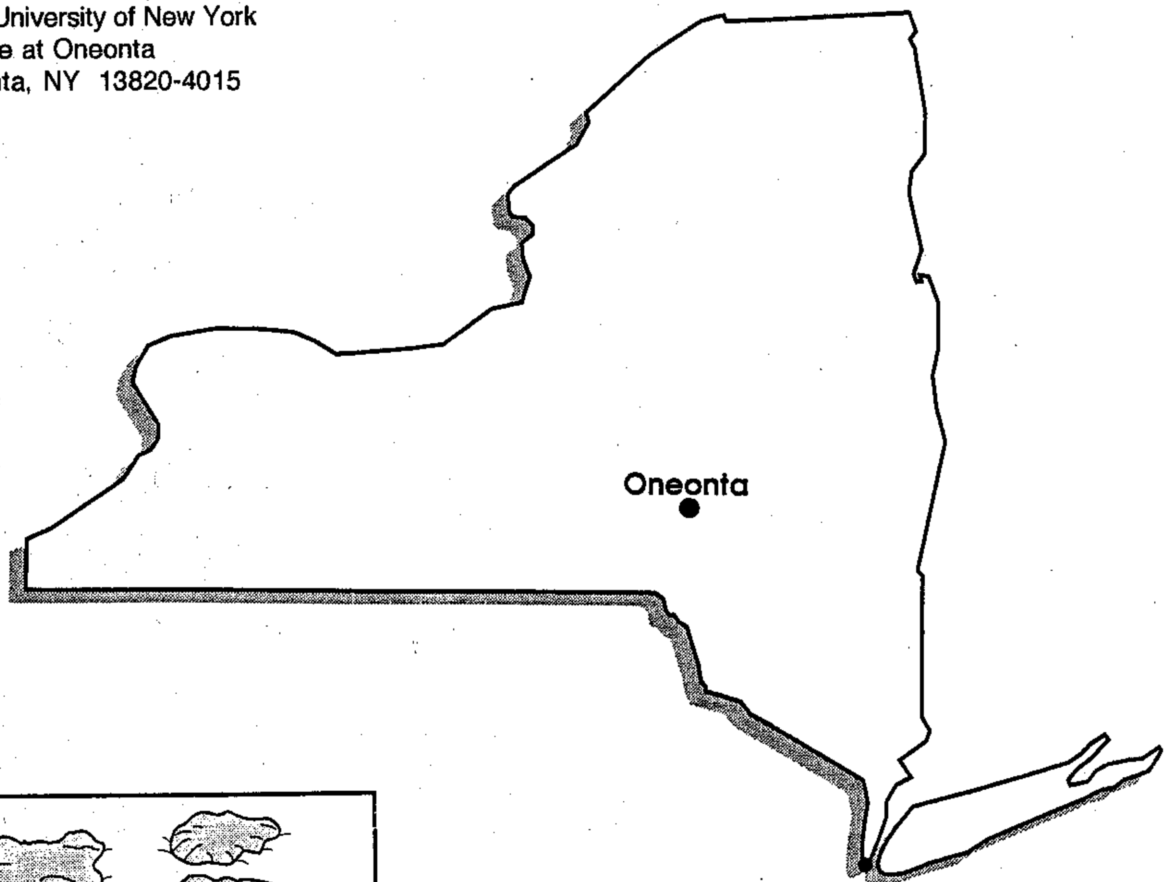
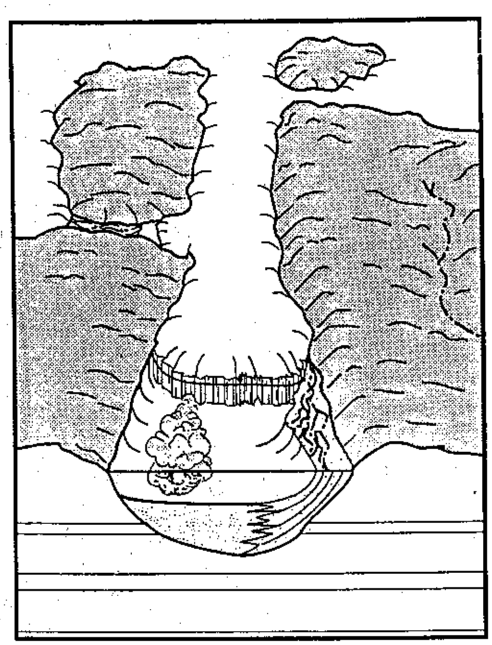
P. Jay Fleisher, Editor
Department of Earth Sciences
State University of New York
College at Oneonta
Oneonta, NY 13820-4015





DEPARTMENT OF
EARTH SCIENCES
SUNY - ONEONTA
ONEONTA, NY
13820-4015

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EDITORIAL POLICY

The **GLACIOGRAM** is intended to be a collection of informal notes concentrating on Quaternary work that relates to New York State either directly or indirectly. The **GLACIOGRAM** is not a formal publication and is not circulated to libraries, nor to individuals not engaged or interested in Quaternary research. The information included is often of a preliminary and tentative nature, and as such, should not be quoted without direct communication with the appropriate authors. It is suggested that reference to information in the **GLACIOGRAM** be identified merely as informal communication.

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INVITATION FROM THE EDITOR

As you may know, the **Glaciogram** contains volunteered notes and project summaries. As the title implies, past issues have contained entries weighted toward Glacial Geology. Perhaps it's time to expand the coverage to also include topics that may be closely related to glacial geology, such as limnology, palynology, soil science, ground water geology, environmental geology, etc., but to date have not yet been included. Should your area of interest fall within this broader realm, please consider having your work included in the spring edition by forwarding a brief (300-500 words or less) summary at your convenience. Easily duplicated, simple, line diagrams and map figures (sorry, no photos) may also be submitted. Please pass this invitation on to friends and colleagues who may wish to share their work or be placed on the mailing list.

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CONTRIBUTORS

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Eugene Domack, Dept. of Geology, Hamilton College, Clinton, NY,
edomack@hamilton.edu

Our little Quaternary group is starting a new, local project this summer. With generous support from the Levitt Public Policy Center (here at Hamilton College), we will begin a detailed mapping project of the eastern end of Oneida Lake. The goal of the project is to develop a paleoenvironmental history of shoreline progradation as marked by the beach accretionary complex that is evident from air photos. We will attempt to map each beach surface using surficial geomorphology and ground penetrating radar. We will also integrate the accretion history with alluvial processes of the Fish Creek and Onieda Creek watersheds. Impacts of the New York State Barge canal will also be investigated.

The ultimate goal is to provide a century-scale model for shoreline accretion based upon sediment supply, storm impacts, and subsidence for the shoreline community of Sylvan Beach. Hopefully this will help the communities along the eastern shore plan for flood remediation. The project is being undertaken in co-operation with the Onieda County Soil and Water Conservation Office (Jo-Anne Faulkner), the Village of Sylvan Beach (Mayor Edward McCarthy), and the Central New York Regional Planning & Development Board via the Oneida Lake Watershed Protection Project (Pamela O'Malley).

We have also been awarded funding from the Office of Polar Programs of NSF to begin a new study on the "Paleohistory of the Larsen Ice Shelf". Our first field season will be in the year 2000 and we will investigate the seafloor stratigraphy in the northwestern Weddell Sea, Antarctica. This is a region recently accesible to research vessels because of the collapse of the northern Larsen Ice Shelf.

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Todd S Miller, Hydrologist (Geol), Ithaca, NY " <tsmiller@usgs.gov>

Last year, USGS was part a massive effort to compile well records in eastern Cortland County. Wells were in both the uplands and in the valleys. This was a good opportunity to test Coates' till shadowed hill hypothesis, that he developed for the Southern Tier, (Binghamton area), in another part of New York. I mapped the thickness of unconsolidated deposits in two Towns in eastern Cortland County. The map report will be printed sometime this summer.

The results of the study were as follows:

THICKNESS AND DISTRIBUTION OF UNCONSOLIDATED DEPOSITS

The unconsolidated deposits in the study area can be classified in two depositional regimes; those in the uplands, and those in the valleys. Till predominates in the uplands, whereas a complex mixture of alluvium, glaciofluvial, glaciolacustrine, and till deposits predominate in the valleys. Till yields water to wells extremely slowly and, therefore, does not form a significant aquifer; as a result, the wells of most homeowners in the uplands tap bedrock. Saturated deposits of sand and gravel, of which are found mostly in the valleys, typically yield large amounts of water to wells and are important aquifers. Most of the large valleys in the study area contain either an unconfined or confined sand and gravel aquifer, and some valleys contain both.

The thickness of unconsolidated deposits in the uplands (mostly till) ranges from 0 to more than 150 ft. Uplands areas in which till is absent (where bedrock crops out at land surface) include: (1) the tops of hills, especially the highest ones, (2) oversteepened valley walls (valley walls severely eroded by the glacier), (3) some stream channels, and (4) some north-facing slopes, especially on the highest parts of hills. The thickest deposits of till (typically from 50 ft to as much as 150 ft thick) are in the middle parts of south-facing, amphitheater-shaped, upland basins. Some areas in which till is thicker than 100 ft may not be shown on the above map, particularly in settings similar to that at the landfill (at the northwest corner of the map), where one well log shows 152 of till in a south-facing, amphitheater-headed valley. Most of the upland valleys, however, are narrow and thus occupy relatively small areas, and the data set available to this study was inadequate to verify that these areas contain thick deposits of till.

The large valleys in the study area contain relatively thick deposits of unconsolidated sediments. The largest valleys typically contain thicker unconsolidated deposits (typically 100 to more than 200 ft) than small valleys, which typically contain less than 100 ft of unconsolidated sediment.

The distribution and thickness of unconsolidated deposits in the Towns of Solon and Taylor is generally consistent with that found by Coates (1966) in south-central New York, except for two significant differences: (1) the thickness of till in the uplands in the Towns of Solon and Taylor (as inferred from depth-to-bedrock data from 63 wells) averages 31 ft, which is only half the thickness (60 ft) found by Coates in south-central New York (1966); and (2) till in this study area along the southern ridges of elongated hills whose long axis trends roughly north-south (fig. 2) is relatively thin (5 to 25 ft thick), whereas the till found by Coates (1966) on south-facing slopes was typically much thicker. Sources of information indicating the presence of thin till along south-facing ridges for this study included: (1) soil maps, (2) several driller's logs of domestic wells along the ridges of the south-facing slopes, and (3) a geohydrologic investigation conducted for the Cortland County Landfill in the northwestern part of the Town of Solon and northeastern part of Town of Cortlandville (Barton and Loguidice, P.C., 1991).

Soil maps by the U.S. Department of Agriculture (Seay, 1961) indicate that soils 5 ft thick or less occupy 32 percent of the study area. Well logs and field mapping compiled in this investigation generally were consistent with the U.S. Department of Agriculture's information, except locally, where the soils were slightly thicker (5 to 10 ft thick). Results of this study indicate that unconsolidated deposits less than 25 ft thick occupy 76 percent of the study area, and unconsolidated deposits greater than 25 ft thick occupy 24 percent of the area, much of which includes valleys.

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Robert Fakundiny, State Geologist, New York State Geological Survey, Albany, NY, rfakundi@MAIL.NYSED.GOV

As Chair of the Association of American State Geologists ad hoc committee for the Reauthorization of the National Cooperative Geologic Mapping Act, I am happy to report that the Committee has been working with the appropriate members of the House and Senate to continue the program from FY2001 to FY2005. We are seeking full appropriation, which would provide to the U.S. Geological Survey, the state geological surveys, and universities with geologic mapping theses a total of about $250 million, of which 2%, or $5 million, would go to universities over the 5-year program. We are fairly sure the authorization bill will pass, but the appropriation bill will be another matter. The reauthorization bill has been introduced in the Senate by Senator Larry Craig (R-ID) as S607. The House bill will be introduced by Congresswoman Barbara Cubin (R-WY). We do not have a bill number as of today (3/19/99), but should have one within days. Please contact your representatives in Washington and ask them to support both the reauthorization bill and the appropriation bill. While you are at it also ask them to support the addition of $1.5 million to the current National Cooperative Geologic Mapping program for the U.S.G.S. FY2000 appropriation. This is the biggest boost for critical geologic mapping to come along. Please help us to preserve it.

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Duane Braun, 400 East Second Street, Bloomsburg University, Bloomsburg, PA 17815-1301

Glacial Lake Great Bend and the New Milford Sluiceway *

The New Milford, PA sluiceway is a deep breach in the drainage divide between streams heading north to the Susquehanna River in New York and streams heading south to the Susquehanna River in Pennsylvania. When ice receded north of the east-west trending divide, a series of proglacial lakes were impounded between the ice and the divide. Usually the lake in each individual north-trending valley would have had its own sluiceway. Thanks to the "Great Bend" in the overall course of the Susquehanna River, the New Milford sluice was positioned to receive drainage from 25 miles of ice front and 25 miles of adjacent drainages. This permitted exceptionally deep cutting of the sluice. The 600 feet of cutting in the divide is a composite of all the ice and meltwater erosion from 3 or 4 glaciations that have crossed the area.

The 5 ice margins shown on the sketch map represent different phases in the development of Glacial Lake Great Bend and its deposits. Ice margin 1 was when the ice was right at the entrance to the New Milford sluiceway and meltwater was still draining freely to the south. Ice margin 2 was when the ice had receded up the Salt Lick Creek valley, impounding the first phase of Glacial Lake Great Bend. This margin is marked today on the west side of the valley by a hanging delta (D on themap) graded to the 1160 ft. level of the lake. The next margin, 3, is marked today by a hanging delta and a sluiceway channel that extends from the next valley to the east and is graded to the level of the lake. Margin 4 was where ice recession first started to "open up" the Susquehanna Valley and permitted expansion of Glacial Lake Great Bend into valleys to either side of the sluiceway valley. This expansion process continued until the lake reached its maximum size at ice margin 5. Once the ice receded north of margin 5, the lake would have drained as meltwater freely flowed westward down the Susquehanna Valley at Binghamton, New York.

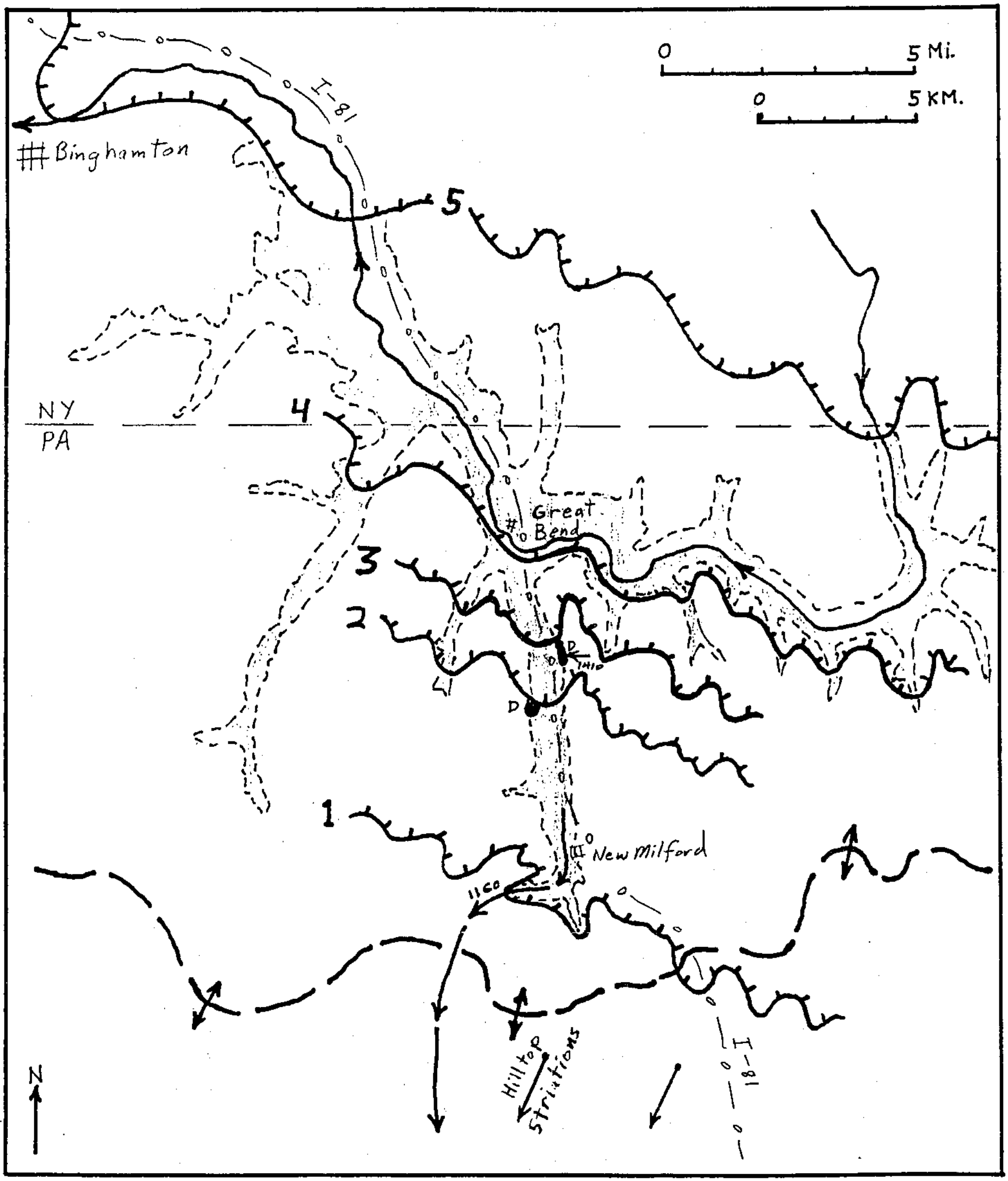
Glacial Lake Great Bend was moderately long lived. The rate of glacial recession in northeastern Pennsylvania has been estimated to be about a mile in 30 years (Braun, 1997). The distance from ice margin 1 to ice margin 5 is about 12 miles, yielding a 360 year lifetime for the lake. This is several times longer than the lifetimes of proglacial lakes in adjacent north draining valleys but is several times shorter that the lifetimes of the truly large proglacial lakes in the Hudson Valley (Glacial Lake Albany) and in the Connecticut Valley (Glacial Lake Hitchcock).

There remains a 200 foot rise from the Susquehanna River at Great Bend to the sluiceway at New Milford. If during the next glacial recession the ice has a significant stillstand just north of the town of Great Bend, the deposits from that stillstand may be sufficient to continue to block and permanently divert the Susquehanna River down the New Milford sluiceway. This is how the Susquehanna River was diverted out of its preglacial valley in the Bloomsburg area - blockage by 200 feet of frontal kame fan deposits marking the Late Illinoian (or older) terminus (Braun and others, 1984).

* From Braun, Inners, and Kovich, 1999, Phoebe Snow and the ice sheets: How the Delaware , Lakawanna & Western Rail-road adapted its Scranton-To-Binhamton route to a Glacially modified landscape, NE-PA and S-Central NY, abs. NEGSA.

Braun, D.D.,1997,Physiography and Quaternary history of the Scranton/Wilkes-Barre Region: in, Inners, J.D., ed.,Geology of the Wyoming-Lackawanna Valley and its Mountain Rim, northeastern Pennsylvania, Guidebook for the 62rd Field Conf. of PA Geologists, p.2 - 15.

Braun, D.D., Miller, D.S., Miller, J.C., and Inners, J.D., Abandoned Valley of the North Branch Susquehanna River at Mifflinville, Pennsylvania: Evidence for a Pre-Late Wisconsinan Ice Margin, Geol. Soc. Am. Abstr. w. Prog., v. 16, no. 1, p. 5.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Paul F. Karrow, Department of Earth Sciences, University of Waterloo, 200 University Avenue West, Waterloo, Ontario, Canada N2L 3G1, 519-885-1211, FAX 519-746-7484

At this time sunny, mild weather raises thoughts of field work, although it has been a repeated phenomenon through much of the winter. A year ago I had to rush north to survey shorelines before deciduous foliage came out blocking the view. At North Bay the curtain fell abruptly on May 2. I plan to go back there to continue surveys on the Lake Algonquin to Nipissing shoreline sequence in late April but departure and return dates remain uncertain. The latest work ties in to earlier work by John Harrison about 30 years ago in the North Bay area. High, intermediate, and low level shorelines have complex distribution in the Precambrian Shield (rocky bush country) and sites are limited by access from survey benchmarks.

Various other sorties are planned in southern Ontario this summer to visit and collect at fossil sites in glacial lake and colluvial sites. A PDF, Rich Meyrick from Cambridge, England, is expected this summer to study molluscs in tufa and marl deposits in the vicinity of Waterloo. This follows up in part on M.Sc. work by Jenny Yang (1996) on two marl deposits nearby. A paper on Yang's work is nearing completion for submission. Since the fall Glaciogram the papers on time classification and Woodstock quarry stratigraphy were submitted (before Christmas - - - never to be heard from again!)

The M.Sc. thesis by John Johnston on "Sedimentology and depositional history of the Wasaga Beach and Ipperwash areas" (Lake Huron) is about to be defended and another by Astride Silis on ostracode assemblages in Lake Algonquin sediments near Lake Huron and Georgian Bay is nearly there too.

Steve Douglas was able to continue field work at Fort Erie (across from Buffalo) through much of the winter (archeological work continued too), part of his geoarcheological thesis to provide a Late Quaternary framework for a rich human record of the last 4000 years. Reconstruction of the Peace Bridge and associated facilities has been the focus of the recent archeological work, and thus, Steve's geological study. It involves surface mapping and compilation of all available engineering records for information on bedrock topography and Quaternary stratigraphy. Although the drift is is generally shallow, there is a sequence of two tills with intervening lake clays. Fossiliferous clay and buried peat of at least two ages, (postglacial) are being investigated. We would welcome contact with anyone working on Quaternary or geoarcheology projects across the river in Buffalo.

Last but not least, I neglected to mention in the last Glaciogram that after too-long a time Geological Association of Canada Special Paper 42 "Urban Geology of Canadian Cities" co-edited with Owen White was published at the end of July. It is a 500-page volume with summary papers on engineering and environmental aspects and data systems for 23 cities from Victoria B.C. to St. John's, Newfoundland. Like much of Canadian and Ontario population, several cities strung across southern Ontario from Windsor to Ottawa are near New York and have related geology (e.g. London, Kitchener-Waterloo, Niagara Falls, Hamilton, Toronto, and Oshawa).

In October, the Quaternary Sciences Institute at UW will co-sponsor the annual Ontario Archaeological Society Symposium "The human ecology of Ontario's eleven millennia".

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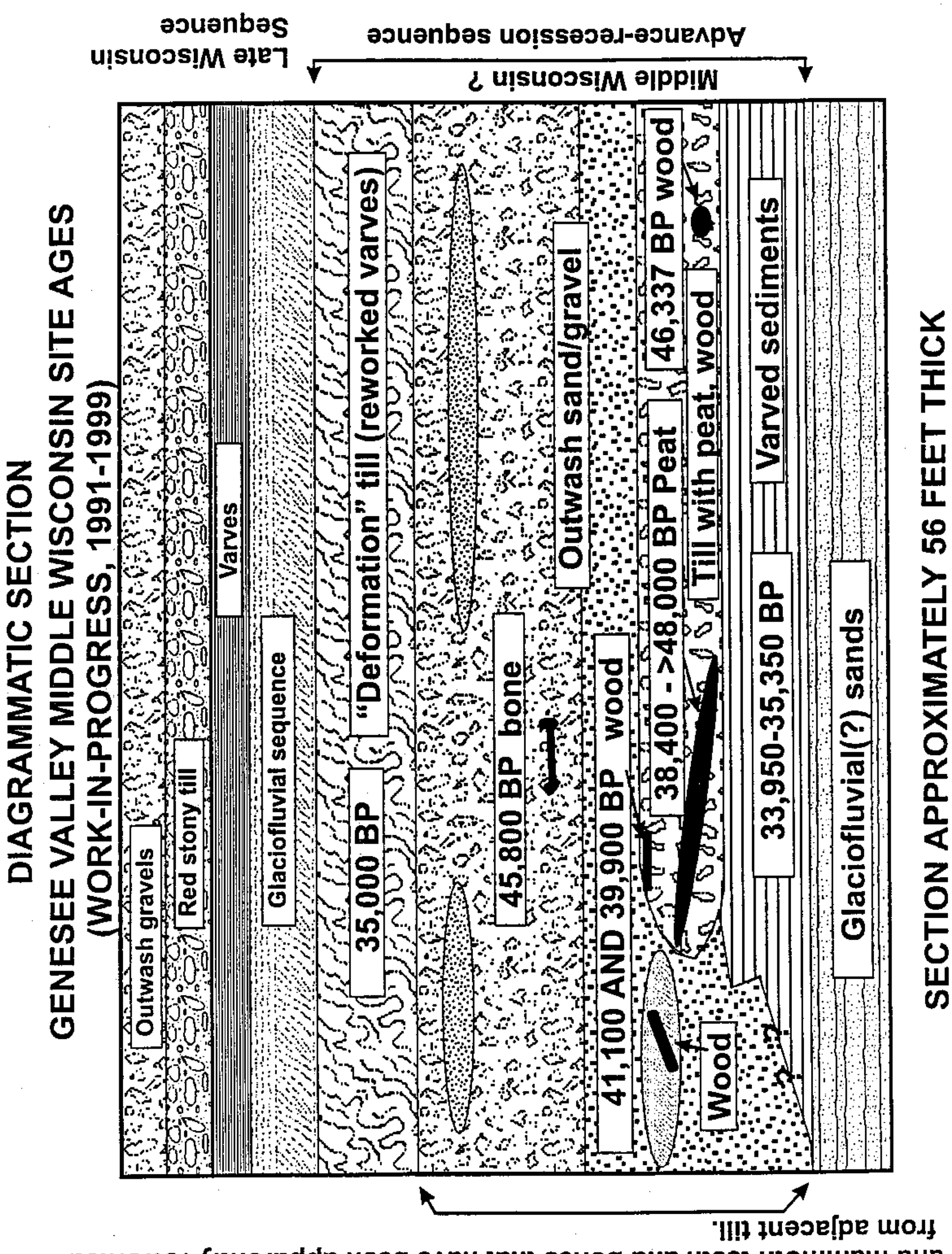
Regional Sand and Gravel Pit Site (now Elam), Northern Livingston County, NY
Report of Progress and Additional Carbon 14 Dating
Richard A. Young, Department of Geological Sciences, SUNY, Geneseo

The ongoing dating of materials from this unusual site (1994 NYSGA Guidebook) has now produced the consistent AMS radiocarbon dates shown in the accompanying figure. Fourteen additional dates will be obtained this spring and summer. The "deformation" till in the upper part of the middle Wisconsin sequence has produced the only inconsistent ages (not on diagram). One of the first samples from the organic-rich, overridden varves contained in this deformation till produced an inconsistent(?) younger age of 26,680± BP on the only sample that had been exposed on the surface for an undetermined period (possible surface contamination?). All subsequent samples lower in the section have come from freshly excavated materials, mostly collect from thick, impermeable, unoxidized clays. Another sample from the same "deformation" till produced an older age of 43,700± BP. This is assumed to be contaminated with the same "older carbon" that was reworked from the lower till, and which is incorporated in the outwash sands and gravels below as scattered peat mats, wood, and crushed mammoth bones. More extensive dating of the upper deformation till unit should resolve this issue.

All the wood samples submitted for dating are in unusually good states of preservation. The wood does not oxidize on contact with air, and many of the branches collected are nearly indistinguishable from modern dried wood samples. One three-foot spruce log about 4 inches in diameter from the lower till was recently dated at 41,100± BP, another branch as 39,900± BP.

As depicted on the diagram, the middle Wisconsin advance (till plus outwash) is sandwiched between two lacustrine sequences, representing a proglacial lake into which the ice advanced near 35,000 BP. The lower till "overrode" older interstadial deposits, which are scatted throughout the till and were penecontemporaneously reworked into the subadjacent sands and gravels. The two lacustrine units are the lower varved sediments and an upper "deformation" till (Bennett & Glasser, 1996). The "deformation" till occasionally preserves the texture of the original varves. The unit is much thicker in the adjacent borrow pit to the south. However, in most exposures in the Elam pit the varves are deformed and have been thinned and homogenized by a subsequent readvance of ice into the lake. The lower part of the entire section is gray, and the tills are clast-poor. In contrast, the late Wisconsin till is distinctly red and clast-rich, as are the associated varved sediments and gravels. The color difference does not appear to be related to groundwater levels and simple oxidation. Oxidation of permeable gravels throughout the section produces a different (yellow-brown) hue.

The interpretation of events at this site depends heavily on the accuracy of the three similar ages in the lower and upper varves, plus the fact that the majority of older organics in the intervening till and associated outwash represents a warm interstadial deposit, subsequently overridden and incorporated in the lower till. If this is a correct interpretation, the single older age (43,700; not on diagram) on the upper "deformation" till must signify contamination. The contrasting colors of the two stratigraphic sequences (upper red, lower gray) suggest that the major hiatus is at the top of the "deformation" till. I anticipate that the materials associated with the lower till and outwash should ultimately produce a range of ages from >48,000 down to 35,000± BP, representing a mixing of the overridden interstadial flora, which should approach the lower time limit of the actual advance (assuming Heinrich H-4, around 35,000 BP, is the event represented). I am currently waiting for two dates on a leaf (lower till) and well-preserved mammoth bone (outwash sequence).


DIAGRAMMATIC SECTION
GENESEE VALLEY MIDDLE WISCONSIN SITE AGES
(WORK-IN-PROGRESS, 1991-1999)
Late Wisconsin Sequence
Middle Wisconsin ?
Advance-recession sequence
Outwash gravels
Red stony till
Varves
Glaciofluvial sequence
35,000 BP
"Deformation" till (reworked varves)
45,800 BP bone
Outwash sand/gravel
41,100 AND 39,900 BP wood
Wood
38,400 - >48,000 BP Peat
46,337 BP wood
Till with peat, wood
33,950-35,350 BP
Varved sediments
Glaciofluvial(?) sands
SECTION APPROXIMATELY 56 FEET THICK
Outwash sequence (sands and gravels) with mats of peat and wood and mammoth teeth and bones that have been apparently reworked from adjacent till.

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Len Mason and J. H. Willemin, Geology Department, St. Lawrence University, Canton, NY 13617, x9jt@music.stlawu.edu

TWO POPULATIONS OF ELONGATE HILLS IN THE ST. LAWRENCE VALLEY: ICE AND WIND?

Measurement of the trends of long axes of elongate hills (aspect ratio of at 3:1) in the St. Lawrence valley, St. Lawrence County, New York show two distinct populations (see rose diagram). One population trends north-south while the other population trends roughly northeast-southwest. The north-south population of hills trends from 350-010?, contains 75 members and the mode contains 32 hills making it more well sorted than the northeast-southwest population. The northeast/southwest population trends from 020-055?, contains 93 members, and has a mode of 21. The northeast-southwest population is larger and has more variance. An elliptical template with a length to width ratio of 3:1 was made. Using 1:24,000 topographical maps the template was fitted to closed contours of hills that fell within the template. The azimuth was then drawn, measured, and recorded. All the hills exceed one contour interval (6 meters) relief, and occur below the highest shoreline of glacial Lake Iroquois.

Certain morphologies appear to fall more-or less exclusively into one of the two populations. For example, most low en-echelon ridges trend north-south while very few of the northeast-trending hills have en-echelon neighbors. The north-south trending en-echelon sets are often found atop northeast-southwest trending hills. Hills consisting of coarser sediments (gravel, sand and gravel, and unsorted sediments) tend to trend northeast-southwest, while hills consisting primarily of sand tend to trend north-south, although there are exceptions. Hills in the northeast-southwest population show a roughly regular variation in trend, from N50E in northeastern St. Lawrence County to N30E in north central St. Lawrence County. This roughly matches the flow of the Laurentide Ice Sheet around the Adirondack Mountains. Hills in the north-south population show little variation in trend (N10W to N10E) across the region.

The differences in the two populations suggest two distinct origins for elongate hills in the St. Lawrence valley. Since hills in the north-south population occur as en-echelon sets, are found on top of the northeast trending hills, and are generally well-sorted sands, they were formed after the northeast-southwest population and were likely formed by eolian activity reworking glacial outwash. The northeast-southwest population are likely ice mantled features since they consist of unsorted sands and gravel and show a regular variation in trend that roughly matches the flow of glacial ice in the region. Available evidence suggests two mechanisms formed elongate hills in the St. Lawrence valley: ice and wind.

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David M. Sutphin (dsutphin@usgs.gov), Lawrence J. Drew, U.S. Geological Survey, 954 National Center, Reston, VA 20192 and Brian K. Fowler, North American Reserve, 67 Water Street, Suite 207, Laconia, NH 03246

Estimated Sand and Gravel Resources of the Soucook River Valley Part of the Loudon, New Hampshire, 7.5-Minute Quadrangle

In a study by the U.S. Geological Survey (USGS), geographic information systems (GIS) are used to estimate the volume, spatial occurrence, and resources of sand and gravel remaining in the Soucook River Valley, Loudon, NH, 7.5-minute quadrangle. The State of New Hampshire has abundant sand and gravel resources deposited as the last glaciers retreated. Large rivers, such as the Connecticut and Merrimack, and lesser ones, such as the Soucook, have abundant sand and gravel resources. However, a major problem facing the aggregate industry is the land-use conflict where land containing potentially rich sand and gravel resources is more valuable for development, recreation, or environmental uses. In such instances, sand and gravel resources are said to be sterilized, or removed from future production, because they are in areas set aside for other purposes. A method has been developed to estimate the sand and gravel resources produced by the glaciofluvial system, to identify categories of availability, and to take into account areas that have been sterilized. The method is a predictive tool, is transferable to any region where glacial effluent is pumped by eskers or directed by ice channelways into the fluvial-lacustrine environment, and gives local and regional planners a tool to estimate the impact of land-use decisions on nearby sources of sand and gravel. This GIS method consists of data collection and analysis phases. In the data collection phase, a GIS is developed by tracing, scanning, and converting into a polygon coverage the unpublished geologic map of the Loudon, NH, quadrangle (Richard Goldsmith, written commun.) and by collecting digital information from other sources, such as state and federal internet sites. Each polygon is attributed according to the geologic unit represented. In the analysis phase, the GIS calculates the volume of sand and gravel resources in the Loudon quadrangle.

Two analytical strategies are used to estimate the glaciofluvial sand and gravel resources of the Soucook River Valley part of the Loudon quadrangle. One strategy estimates the sand and gravel resources contained in esker deposits using ArcView GIS software, and the other strategy estimates those resources in non-esker stratified glaciofluvial deposits using ARC/INFO software.

Resources in eskers are calculated separately from other stratified deposits. Eskers are easily recognized on a topographic map and in the field, and industry uses a simple volumetric procedure based on a trapezoidal cross section to estimate their resources. Estimation of the amount of sand and gravel resources in the eskers, is done by identifying the eskers, finding their areas using the digital geologic map, estimating thicknesses and widths at the base and shoulder in several locations, and calculating their volumes from these values. Locations of the eskers in the Loudon quadrangle are shown in figure 1. Eskers are estimated to be 30 per cent gravel and 70 per cent sand. The yet-to-be-mined eskers in the quadrangle contain about 2,140,000 m^3 sand and gravel resources. The parts of the eskers sterilized by streams, the water table, roads, or urbanization contain about 546,000 m^3 (or over 25 percent) sand and gravel resources. Approximately 1,600,000 m^3 (or almost 75 percent) sand and gravel resources in the eskers remain available for possible exploitation. To estimate the sand and gravel resources in nonesker glaciofluvial deposits the digital geologic map is used to define the area expected to contain glaciofluvial gravel resources (this was mostly valley floor and the footprint of glacial Lake Hooksett). Much of the quadrangle is omitted, because it is outside of the valley floor and is shown as glacial till on the geologic map. Such areas are unlikely to contain sand and gravel deposits.

The analysis phase uses GIS to identify spatial relationships between maps and, ultimately, to estimate the volumes of sand and gravel resources in the glaciofluvial deposits. Digital lattices (grids) are developed representing the topography, elevation of the water table, bottom of the sand and gravel deposits, percent gravel, and areas of sterilization. A digital elevation model of the topography of the quadrangle was downloaded from the USGS website. Data about the elevation of the water table, the bottom of the sand and gravel deposits, and the per cent gravel were estimated from water-well completion reports on file with the New Hampshire Department of Environmental Services. Sterilization information was gathered in the field and from aerial photographs. Sterilized areas were subtracted from the resource estimates. The remaining areas are multiplied by the estimated thickness of the deposits and their per cent gravel to give estimates of unsterilized sand and gravel resources. It is estimated that the amount of unsterilized sand and gravel in nonesker deposits above the water table is about 40,800,000 m^3. Of this material, 8,340,000 m^3 or about 20 percent is gravel and 32,500,000 m^3 or 80 percent is sand. Adding the 1,600,000 m^3 of non-sterile material in the esker deposits brings the total non-sterile resources above the water table to 42,400,000 m^3 of sand and gravel. Esker deposits amounts to less that 4 percent of the total non-sterile sand and gravel resources in the river valley and only a little more than 4 percent of the gravel resources.

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Britt Cartwright, bcartwri@mtholyoke.edu*; Roof, Steven R.#; Werner, Alan*
*Mt. Holyoke College, Dept. of Geology and Geography, South Hadley, MA 01075;
#Hampshire College, School of Natural Science, Amherst, MA 01002

COMPREHENSIVE STUDY OF DISCHARGE VARIATIONS OF A SMALL STREAM IN WESTERN MASSACHUSETTS

Numerous studies have addressed the relationship among slope, evaporation, evapotranspiration, and stream discharge, but these studies generally concentrated on a single factor as it relates to discharge. This research contains a high-resolution time quantitative assessment of many causes of fluctuating discharge on Stony Brook, a small brook located in South Hadley, Massachusetts. For the past year we have worked to calibrate the auto-gauge station and to explain the observed discharge variations. The drainage basin of Stony Brook is small, having a total relief of 0.14 km, and its 51.7 km^2 drainage basin. River discharge, precipitation, weather observations, and air and water temperature were collected at 10-min intervals for a one-year period.

The auto-gauge was installed by a local golf course to govern the operation of irrigation pumps installed to draw water from Stony Brook. The golf course's objective is to rely on the auto-gauge to ensure that the pumps are turned off if stream flow drops below 9 CFS during pumping. The 9 CFS minimum flow was mandated by South Hadley Conservation Commission to prevent the introduction of possible ecological damages that could be caused by artificially causing low stream levels. Once functional, the auto-gauge will govern the irrigation operation. The on-campus stream gauge also represents a wonderful teaching tool to study hydrograph fluctuations as a function of changing weather conditions.

The accuracy of the auto-gauge was evaluated using two weirs and a hand held velocity meter. The constructed weir channels were further broken down into "sub-channels" to increase the accuracy of the velocity measurements. The hand collected discharge was compared to the discharge values collected by the auto-gauge for the same time period hand measurements were taken. When the two sets of discharge measurements were correlated using a lest squares trendline an R^2 of 0.9887 and an equation of y=0.997 for the line was achieved. This procedure demonstrates that the auto-gauge accurately documents river discharge.

During the study period (September 19, 1997 - November 1, 1998) discharge in Stony Brook varied from a flow greater than 45 CFS in the spring to 2 CFS in the late summer/early fall. Precipitation appears to be the dominant factor controlling summer discharge, whereas many factors, principally fluctuating temperature, precipitation, and soil moisture, influence fall and spring discharges. The winter hydrograph contained the most complex forcing/response relationship of all the seasons, driven by changing air temperatures, precipitation intensity and type, and soil conditions. During late summer/early fall Stony Brook discharge initially responds quickly to storm events, however the discharge crest can occur up to 12 h after peak rainfall.

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David DeSimone <David.J.DeSimone@williams.edu>, P.O.Box 272, Grafton,NY 12082

I heard from Larry Becker at Vermont's State Geologist's offices. The Bering Glacier will see additional traffic this summer with the association of state geologists visiting the region. It ought to be fun. I wonder if your research group is going to play host? I hope to return to Alaska and/or the Yukon later in the summer but have no firm plans.

Many thanks again for guiding us 'Keck' folks on our tour of 3 Juneau Icefield outlet glaciers last August. My vote is still for returning to the Hole-in-the-Wall Glacier for research in 2000. I hope our colleagues cast similar ballots. Apart from the fantastic sediment exposures we observed,you just gotta' love the name of the glacier. I anticipate returning to glacial field mapping in Vermont after an absence of several years from that locale. Larry Becker and I will see what package of quads I can nibble on.

Consulting work continues at a very modest pace and I am impressed by the application of this work to my teaching of environmental science and geology. The project I informed our readers about last year has come to a final conclusion with all homeowners being bought out so their homes could be demolished. Ultimately, this was the least costly alternative to alleviate air contamination in basements and living floors from volatiles under transport in the shallow unconfined aquifer beneath their homes.

There may be a writing chore in my near future and I take this opportunity to solicit references from our readers. The Pleistocene geology of the Hudson Valley - from the High Peaks to the Terminal Moraine - is the topic. If any of you out there can suggest recent papers,say from the 90's, I'd appreciate the assistance in assembling the best and most complete bibliography. You are welcome to send me reprints, photocopies or electronic copies of recently published work or work in progress. I'd like this summary to be as fresh as possible and due to my frequent absences from the local scene in recent years while I tackled health and family issues, I confess to falling a little behind in my reading!

A final note in regards to teaching. I will be teaching a 4 week Winter Study course in January."The Winter Landscape" will be a glacial and postglacial geomorphology tour of the southern Green Mtns,Taconic Mtns,upper Hudson Valley and Adirondacks accomplished on snowshoes and crampons,conditions permitting. A week will be spent in the High Peaks bagging several of the 4000+ summits. If anyone wishes to pass along suggestions on the cultural and glacial history of the ADKs, please contact me. We won't be doing any peak I haven't already done myself but I also welcome conversation on your favorite peaks and scenic views.

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Dr. David Franzi, Center for Earth and Environmental Science, SUNY-Plattsburgh, Plattsburgh, NY 12901, david.franzi@plattsburgh.edu

My work with Ken Adams on the development of the upper Little Chazy River watershed at Altona Flat Rock as a field laboratory for teaching undergraduate hydrogeology and ecology continues. We are in the process of compiling a GIS database for the entire watershed (142 km^2) as part of a new basin-wide teaching and research initiative. Trevis Gigliotti, currently a graduate student at SUNY-ESF in Syracuse, recently completed a land-cover layer as part of this effort. Surficial geology and depth to bedrock layers are planned for this year. Ken and I are preparing an NEIGC field trip to the Clinton County "Flat Rocks" for the fall meeting in Burlington. The trip will focus upon the geomorphic history of the "Flat Rocks" and the impact of glacial and post-glacial processes on ecosystem-level processes.

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Dr. Donald Cadwell, dcadwell@mail.nysed.gov, NYS Geological Survey, Albany, NY 12230

I will be continuing work for the New York State Emergency Management Office on Seismic Hazard Assessment in New York State. This year we will be working in Westchester, Manhattan and Queens counties collecting seismic shear-wave data for the interpretation of seismic hazards and obtaining detailed information about the varied surficial materials across New York. The biggest change will be the use of a shear-wave generator, instead of explosives, in the metropolitan area. Specific site locations for interpretation of seismic data are chosen based on the type of surficial materials and the susceptibility to liquefaction, landslide and ground shaking amplification. Potential landslide, liquefaction (thixotropic) and ground shaking amplification hazard regions will be identified. In addition this seismic hazard assessment program will include (1) determination of shear-wave velocities, (2) classification of glacial deposits in terms of seismic building code site profiles, and (3) identification of potential areas of earthquake-induced landslide and liquefaction (thixotropic). The seismic data collected will be included with previously collected data.

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Don Thieme, 203 7th Street, Apt. 5, Honesdale, PA 18431; (570) 251-7939; dthieme@hotmail.com

We have been asked to investigate the possibility that intact Holocene floodplains and other land surfaces are preserved despite being drowned by over 10 m of local relative sea level rise since the early Holocene. We have now identified at least one such microenvironment on the interfluve between the Kill Van Kull and the Hudson River. A basal date of 9400±150 B.P. on peat (Beta-127019) indexes a profile from which foraminifera and pollen are now being analyzed by Drs. Ellen Thomas and Kristina Beunig of Wesleyan University.

These investigations are also providing age constraints on the underlying Pleistocene stratigraphy. Varved sediments are definitely attributable to proglacial impoundments in recently remapped recessional morphosequences (glacial lakes Flushing, Hudson, and Hackensack). However, radiocarbon dates on both wood and bulk sediment from massively bedded silts and clays generally date prior to the known age of the terminal moraine. We just obtained a date of 29,570±360 B.P. (Beta-127020) from a boring in Newark Bay and 25,940±300 B.P. (Beta-127022) from the "Buttermilk Channel" between Brooklyn and Governor's Island.

While there are possible sources of contamination, including recent reports of carbon recycled by bacteria in waters beneath continental ice sheets, we are tentatively attributing these sediments to the development of freshwater or brackish systems during the oxygen isotope stage 3 interstadial. We believe they will prove to be distinct sedimentologically from overlying varved proglacial lake deposits although this is a challenge using geotechnical borings sampled at 5 foot intervals.

We are also currently conducting borings in Manhattan to sample the sediments of the "Collect Pond" and underlying ice-contact deposits.

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Andrew J. Logan, Department of Geology, Amherst College, Amherst, MA 01002; ajlogan@amherst.edu

THE INFLUENCE OF AN INTERSTATE HIGHWAY ON THE HYDROLOGY AND GEOCHEMISTRY OF A WETLAND: THE GREAT SWAMP OF WHATELY, MASSACHUSETTS

The Great Swamp is a sub-catchment of the Mill River, which drains a 130 km^2 region in the Connecticut River Valley of western Massachusetts. The Great Swamp occupies 5 km^2 in a lowland area within the watershed. It formed in sandy glaciofluvial deposits which overlie the glaciolacustrine silt and clay deposited by Glacial Lake Hitchcock. The swamp is drained by Great Swamp Brook, which has an average gradient of less than 1 degree. The catchment is bounded to the east by Interstate 91. Otherwise, there is relatively little human activity within the swamp, making this a good site for studying the ways in which a major highway affects the hydrology and geochemistry of a wetland.

The geography of the Great Swamp makes the catchment particularly well-suited for such a study. Great Swamp Brook is formed from three tributaries (western, central and eastern) which drain areas of the swamp that are similar in area and have similar slopes, vegetation cover and soil type. The three tributaries differ only in their proximity to Interstate 91. The western and central tributaries flow through undeveloped regions. The eastern tributary flows near Interstate 91 for much of its course; during storms it receives a large amount of engineered runoff from the highway.

The water chemistry and hydrology of the three streams are markedly different. It is hypothesized that, prior to the construction of Interstate 91, all of Great Swamp resembled the western tributary today. Farthest from the highway, it has dilute, highly acidic waters (with a negative acid neutralizing capacity (ANC)), its flow is relatively stagnant, and its soil exchange sites are dominated by acidic cations.

Closest to the highway, the eastern tributary has been contaminated by NaCl from road salting, Mn^{+2}, Zn^{+2}, Pb^{+2} and possibly B^{+3} from vehicular traffic, and Ca^{+2} from weathering of the large amounts of road fill needed to build a highway through a wet area. Its waters have conductance and ANC values two orders of magnitude greater than those seen in the west. Its hydrologic character has been substantially altered by construction of the interstate. Flow is highly channelized, causing sharp storm peaks and decreased low flow. Residence time is lower in the east, reducing the influence of soil and plant reactions on the composition of the water.

Road salt input has a far greater effect on water chemistry than a simple increase in Na^+ and Cl^- concentrations. The incoming NaCl significantly increases the concentration of non-road salt base cations in surface water by exchange of Na^+ with the soil complex. Soils near the highway, in contrast to those in the interior of the swamp, have a high base saturation, dominated by Na^+ and Ca^{+2}. Up to 70% of the base cations (other than Na^+) present in the eastern tributary are attributable to exchange with incoming Na^+ in the summer, and this contribution jumps to 80-85% during snow melt, when weathering is less of a factor. Most ominously, road salt was shown to mobilize heavy metals (particularly Zn^{+2}) which are typically bound tightly to the organic soils of wetlands.

Soil exchange reactions vary seasonally, controlled by concentrations in runoff. When runoff is both highly acidic and enriched in NaCl, as it is during the spring snow melt, incoming Na^+ and H^+ exchanges for Ca^{+2}, Mg^{+2}, K^+, Fe^{+3}, Mn^{+2} and trace heavy metals (dominantly Zn^{+2}) in the soil. During the summer, when runoff is high in NaCl but has a low acidity, Na^{+} in runoff exchanges with Mg^{+2}, Mn^{+2}, Fe^{+3} and trace metals. Whereas Ca^{+2} in the winter comes primarily from cation exchange, during the summer the Ca^{+2} found in surface waters results almost exclusively from weathering reactions, generating a high ANC.

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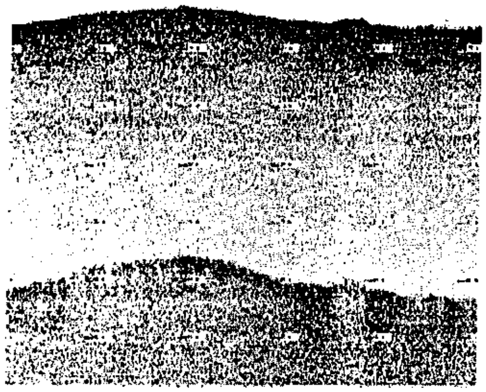
EXPLORATORY SUB-BOTTOM PROFILING OF LATE GLACIAL AND RECENT SEDIMENTARY DEPOSITS IN EASTERN LAKE ONTARIO, NEW YORK

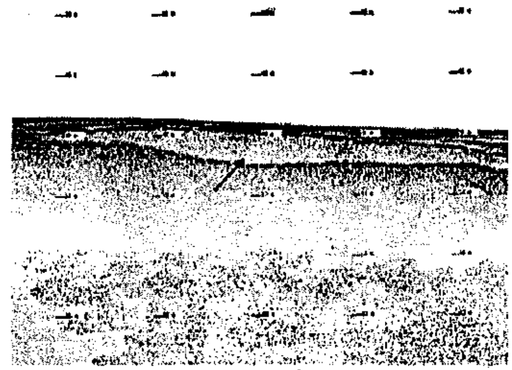
STEINGLASS, Jedd S., Dept. of Geology, Colgate University, C.U. Box #X5465, Hamilton, NY 13346, jsteinglass@colgate.mail.edu; McCLENNEN, Charles, E., Dept, of Geology, Colgate University, Hamilton, NY 13346

Tracklines of high-resolution seismic-reflection data were collected off the eastern coast of Lake Ontario from Nine Mile Point, past the Salmon River, to Stony Point using the Edge Tech (formerly EG&G) X-Star model 216-s sub-bottom profiler. Five distinct sedimentary units are identified and mapped form both acoustic and video records: 1) An acoustically hard reflective surface, which displays a topographically rough sediment-water interface, interpreted to be compacted glacial till. Often in this unit are erosional cobble-boulder lag deposits and discontinuous sub-surface acoustical reflectors displaying considerable relief. 2) An unconsolidated acoustically transparent layer with only extremely vague indications of stratification, which is interpreted as an unsorted proglacial retreat deposit. This unit also contains numerous dropstones profiled as parabolic point source reflectors. 3) A distinctly well stratified series of mostly parallel and horizontal sediment layers which are often situated in topographical lows adjacent to elevated portions of the glacial till. 4) A continuous, thickly stratified sediment sequence with distinct, nearly horizontal and parallel layers visible and a strong sonic reflector at the lake bed surface. In this unit, reflectors interpreted as entrapped biogenic gas pockets are often recorded. In the lower portions of this unit, there are internal deformations of the otherwise horizontal sediment layers. These features indicate the presence of small normal faults and collapse features which probably formed as the last of buried glacial ice pockets melted. 5) A continuous, thin, micro-stratified lake bed sediment layer which is less than 1 m in thickness.

These sediments are interpreted as representing a time series of glacial or late glacial and lacustrine, ice-proximal, and recent or contemporary deposits and erosional features. Sediment volume calculations comparing recent profiled lake bed sediments and sediments eroded from the retreating Lake Ontario shoreline support these classifications and interpretations as well as the reconstructed sediment history.



Unit 1



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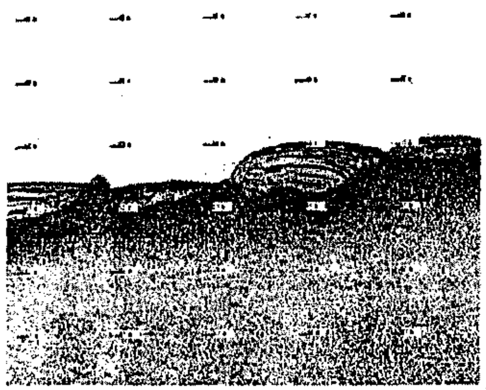

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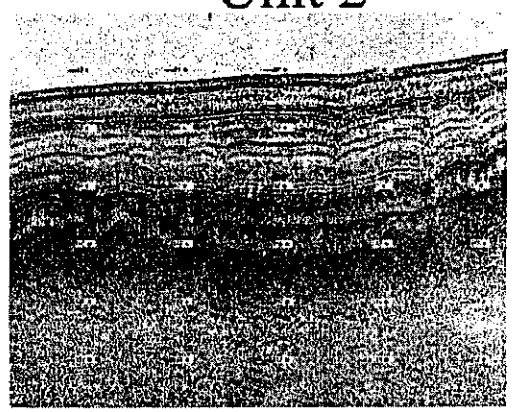
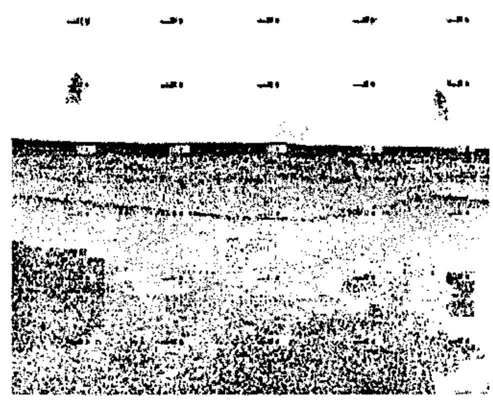
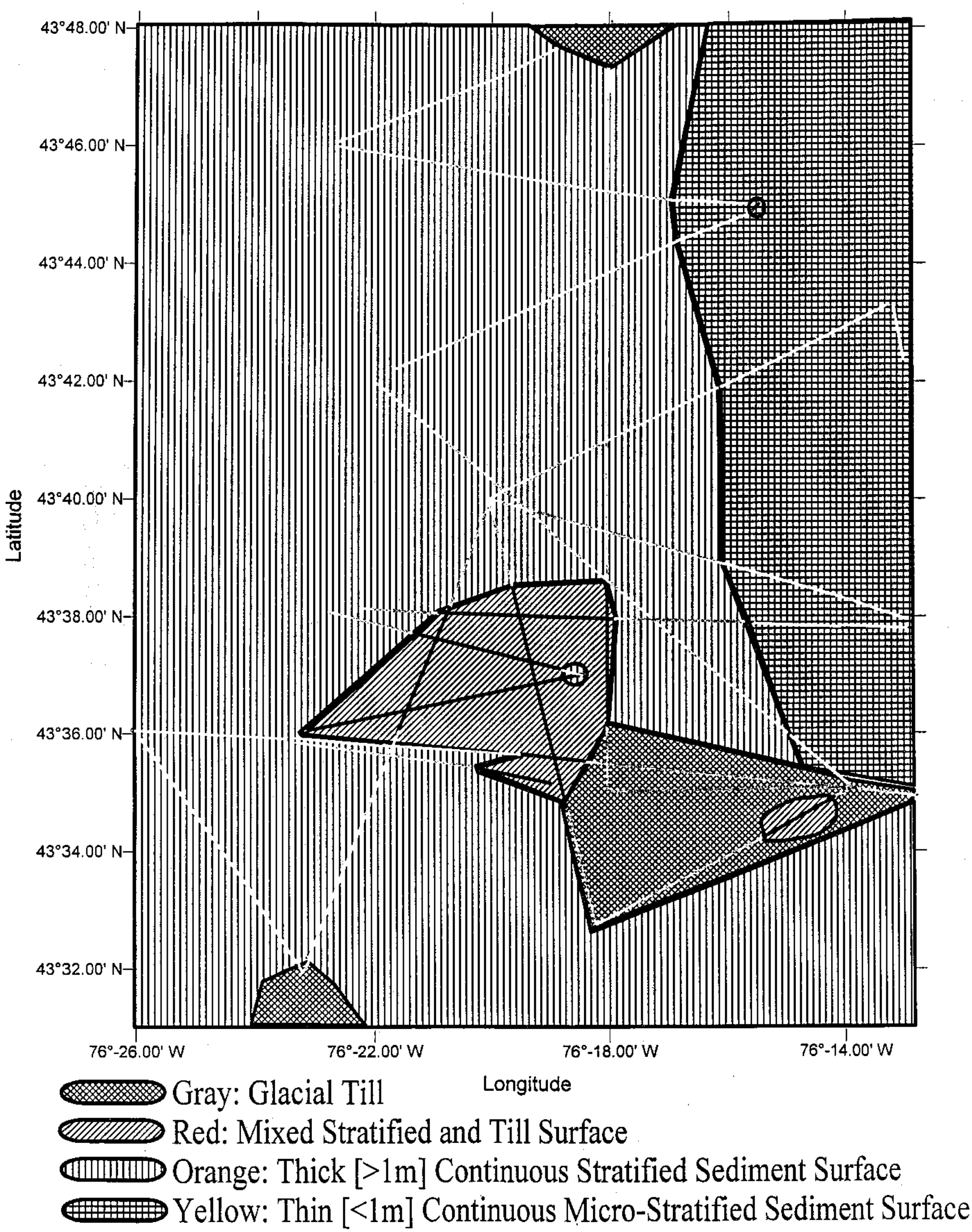


Unit 4



Unit 5

Fig. 4 Examples of sedimentary units 1-5. 10X vertical exaggeration.


43°48.00' N
43°46.00' N
43°44.00' N
43°42.00' N
43°40.00' N
43°38.00' N
43°36.00' N
43°34.00' N
43°32.00' N
Latitude
76°-26.00' W
76°-22.00' W
76°-18.00' W
76°-14.00' W
Longitude
Gray: Glacial Till
Red: Mixed Stratified and Till Surface
Orange: Thick [>1m] Continuous Stratified Sediment Surface
Yellow: Thin [<1m] Continuous Micro-Stratified Sediment Surface

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Mike Lewis, Geological Survey of Canada, Box 1006, Dartmouth NS B2Y 4A2, Canada, lewism@agc.bio.ns.ca or C.F. Michael Lewis PhD, Senior Research Scientist Emeritus, Geological Survey of Canada (Atlantic), 1 Challenger Drive (P.O. Box 1006), Dartmouth N.S. B2Y 4A2, Canada, 902 426 7738 voice, 902 426 4104 fax

This year I am working up an Open File report with cruise participants to describe the offshore data acquired 1993-1997 in Lake Ontario and eastern Lake Erie by profiling and coring from surface vessels, and by submersible diving. At the forthcoming Great Lakes Conference, I'll be presenting talks about eastern Lake Erie on 1) subglacial erosion and the regional Late Wisconsinan unconformity, and 2) the occurrence of a lowstand shore zone indicating closed basin conditions in the Early Holocene. Over the next few months with Pierre Gareau we hope to put out an Open File illustrating digital reconstructions of the geography of the paleo-Great Lakes for 8 time slices between 11.3 and 7.7 ka. These images were first presented at the Toronto GSA meeting last fall. This year I'll be writing a paper on the assessment of lakebed ridges beneath eastern Lake Ontario as drumlins rather than fault scarps for an issue of Tectonophysics. It is hoped this issue under the chief editorship of Bob Fakundiny will contain many of the papers presented in the Fault Reactivations, Neotectonics and Seismicity Symposium convened under the leadership of Bob Jacobi at the Toronto GSA meeting.

Here's a question for students of the landscape of northern New York. The southern shore zone of easternmost Lake Ontario has eroded and truncated a field of prominent onshore N-S drumlins as shown in topographic maps. However, west of Sodus Bay, Lake Ontario, this drumlin field is 'truncated' onshore along a line trending west-southwest through Williamson NY. I'd be very pleased to hear from anyone who has ideas about this line of drumlin 'truncation' or who can suggest a relevant publication.

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P. Jay Fleisher, Earth Sciences Department, SUNY-Oneonta, Oneonta, NY 13820-4015; (607)436-3707; fleishpj@oneonta.edu

As some of you may recall, when worked with Don Cadwell's team on the NYS Surficial Map in the mid-80s, we encountered field relations in western New York that challenged our understanding of deglacial processes. Consequently, in 1988 Don, Ernie Muller, Bill Morrow (grad student at the time) and I set off on a mission that will enter its twelfth season in late May, 1999. The New York State-based Bering Glacier Research Group (BERG), now also involves Dorothy Peteet (Lamont Doherty Earth observatory), Brian Tormey (Penn State), Palmer Bailey (formerly with CRREL), Matt Lachniet (Syracuse) and undergraduates from SUNY-Oneonta (this summer Matt Chartier and Chris Kinnick). We will return to Bering Glacier to advance field projects involving 1) rates of advance and retreat, 2) measurement of ablation rates, 3) temperature and sediment load of discharged subglacial meltwater, 4) bathymetric changes in ice-contact lakes, 5) rates of ice-contact lake sedimentation, 6) measurements of subglacial discharge, 7) topographic effects of surging on newly exposed terrane, 8) GPS data on eastern foreland landforms, 9) Holocene stratigraphy, and 10) microstructure analysis of overridden drift. How all of this applies to NYS glacial history remains to be determined, but we sure do enjoy working in the modern glacial environment.

Part of our work dealing with the late Pleistocene extent and thickness of the Bering/Steller piedmont lobe was featured in Geotimes, January, 1999. Here we (Fleisher, Muller, Peteet, and Lachniet) announced, described and illustrated our discovery of till beneath muskeg on foreland uplands. Les Sirkin's reaction to this article is reproduced here (by his request), along with our response.

4/6/99

To: The Editor, Letters to the Editor, Geotimes, 4220 King Street, Alexandria, VA 22302-1502

Re: In their article 'Arctic Enigma' Fleisher, et al (Geotimes, January,1999) make an argument for localized late Pleistocene glaciation specific to the Bering Glacier in coastal southern Alaska based mainly on the presence beneath muskeg and basal muskeg ages to 11.3 ka. Their evidence includes the till at Cape Martin cited in Sirkin and Tuthill (1987) but fails to acknowledge the nature and probable early Wisconsinan age of the Cape Martin till, a well cemented basal or lodgement till, as well as a considerable data base supporting regional glaciation by an ice sheet with a Copper River Basin-Chugach Mountains-Copper River Valley Source (Sirkin and Tuthill, 1972 and 1987). Among other data, the Sirkin-Tuthill research documented a northerly source for the Cape Martin till based on till fabrics and erratics, interstadial marine clayand silt beneath meltout till and outwash at Whale Island; abundant erratic-rich gravels in Katalla beach ridges;radiocarbon-dated pollen stratigraphy in the Katalla beach ridges defining late Pleistocene glacial recession beginning around 14,430 years ago and the nature of the late glacial shrub-herb tundra.

Geomorphic evidence for north to south glacial advance includes glacial troughs and extension of the ice into areas south of the present shoreline, while south to north glacial recession is recorded in the radiocarbon-dated stratigraphy of meltwater channels parallel to the Copper River valley and decreasing in elevation northward and of bogs on recessional moraines that demonstrate eastward and westward deglaciation of the major Copper River tributaries. Regional correlations show agreement with the onset of glacial recession in the Kenai Peninsula, dated at 14,5 ka, and the late glacial herb pollen zone.

Since Dr. Fleisher and his group were supplied copies of the Sirkin-Tuthill papers early on in their studies, the contrasting interpretations of regional versus local glaciations could have been better served in their deliberations.

Respectfully submitted, Les Sirkin

Les Sirkin, Earth Science, Adelphi University, Garden City, NY 11530, and Sam Tuthill, S.J., 1972, Late Pleistocene palynology and stratigraphy of Controller Bay egion, Gulf of Alaska, in Ters, M., ed. Edudes sur le Quaternaire dans le Mopnde: International Quaternary Association Congress, 8th, Paris, France, v. 1, pp 197-208.

Sirkin, L. and Tuthill, S.J., 1987, Late Pleistocene and Holocene deglacaition and environments of the southern Chugach Mountains, Alaska: Geological Society of America Bulletiin, v. 99, p. 376-384.

Response:

Dr. L. A. Sirkin's letter reacts to our article (Arctic Enigma: Was Alaska's late Pleistocene Bering Glacier really out of step with its neighbors? New terrestrial evidence suggests otherwise) in the January 1999 issue of Geotimes. He suggests that we have not adequately considered regional glaciation of Wisconsinan age in the Copper River - Chugach Range, and in the process overlooked the published work of previous investigators. Indeed, we acknowledge and appreciate the open exchange and sharing of information by Tuthill and Sirkin throughout our research. However, it was not our intention to refute, support or debate present information to support or refute previous interpretations.

To the contrary, Geotimes, a "trade journal", was selected for this article because it reports timely issues and events. Our primary purpose at this time is to announce the discovery of new field evidence, namely the existence of till beneath muskeg on foreland uplands, which has for nearly a century eluded detection. Our reference to chronology and glacial extent is substantiated in the article by data. Actually, the article was intentionally limited in scope because, with field work still in progress, it would be inappropriate to do otherwise. We refer to published information from sites close to those from which our data are derived. For example, we cite bog bottom dates which, by virtue of their location, provide limiting ages for the substrate of adjacent muskeg. Hence, we acknowledge agreement of our findings with published information within a common area, specifically that of Dr.Sirkin. Certainly, when our future field work supports the development of a regional perspective, be it consistent with or in opposition to previously published interpretations, all pertinent references will be acknowledged and cited.

Although our existing data base comes from all major sectors of the Bering/Steller foreland, it remains fragmentary. Consequently, we are not yet in a position to react to previously published interpretations. Field work planned for summer 1999 may provide additional information from which we may advance interpretations beyond the brief, general summary given in Geotimes. Obviously, a comprehensive discussion in a "journal" manuscript would include consideration of the valid points raised by Dr. Sirkin, including a consideration of the regional glacial history.

P. J. Fleisher, E. H. Muller, D. M. Peteet, M. S. Lachniet