THE MAINE GEOLOGIST

THE NEWSLETTER OF THE GEOLOGICAL SOCIETY OF MAINE

DECEMBER 1981

VOL. 8 NO. 2

NOTICE OF SPRING MEETING

TIME - 1:30 PM, FRIDAY, MARCH 12, 1982

PLACE - BOARDMAN HALL, DEPT. GEOLOGICAL SCIENCES UMO, ORONO, MAINE

PROGRAM - STUDENT PAPERS and usual business meeting. The evening program may include more student papers or an invited speaker, depending on the number of abstracts submitted. Further notice to come. The format for student papers will be like that of GSA, 15 minutes for talks with 5 minutes for discussion. Teachers, please encourage your students to consider participating, particularly if their work deals with Maine geology.

GSM MEETING HELD 11/20/81 AT USM-GORHAM

by Robert G. Gerber, President

The Society met on 11/20/81 at the Univ. of So. Me. at Gorham at 3:45 PM. Irwin Novak described how the USM undergraduate geology program of 30-70 students had moved to the Gorham campus into roomy facilities. After Irwin's welcome to the 26 people present at the business meeting, the Treasurer reported that the Society had 82 paid-up members as of 11/17/81. The bank balance as of 11/17/81 was $1452.37. Arthur Hussey reported that the next Bulletin would be 85 pages long and ready for the printer in December. The members decided to collectively publish all field trip guides in the next Bulletin.

Woody Thompson reported on the recent activities of the Maine Survey. Of major interest is the planned publication of new state bedrock and surficial maps at 1:500,000 scale in the spring of 1983, thanks to funding by the Dept. of Energy under ONWI. The NRC brittle fracture and crustal warping studies are in their last year and funding may be discontinued for the New England seismic net. The crustal warping studies have combined the talents of geologists, surveyors, historians, and archaeologists to learn such things as the rate of subsidence in the Passamaquoddy Bay area is about 3' per century, and the rate of subsidence in the Sanford/Kennebunk area is about 1' per century maximum. Bjorn Andersen found that glaciomarine deltas in eastern Maine were 80-100' lower that those to the southwest. He postulated a NW-trending fault in the Machias-Wesley area which nicely coincided with a fault mapped by Ollie Gates. Phase III gravel aquifer studies in northern York County have uncovered a buried valley of the ancient Saco River. The DOE-funded peat inventory will continue another year. Maine's program has received high marks from the feds and is being held up as the model program. Marc Loiselle, the Survey's new igneous petrologist under the ONWI program, is developing a computerized data base for the Survey. The USGS CUSMAP mineral resource evaluation program is continuing with mapping in the Lewiston and Sherbrooke 2^{0} sheets. The Survey should soon select its new coastal geologist, which was funded by the legislature. The Survey is in danger of having its revolving publications account being thrown in with the rest of the larger agencies of the Dept. of Conservation. The annual report of the Survey for fiscal year 1981 will be available sometime this winter and will include summaries of the Survey's activities.

Woody Thompson also noted that the Survey has the new USGS aeromag map for the northeastern U.S. at the Survey available for inspection. On a different note, Al Ludman just published a physical geology textbook through McGraw-Hill.

The members discussed possibilities for next summer's field trip. Bill Holland agreed to lead a trip in the Tug Mountain quad on the surficial geology. The members suggested that the other field trip be in the granites of northern Penobscot Bay. We will be contacting potential candidates to lead that trip.

Irwin Novak and I suggested that the GSM and possibly the Survey could sponsor a workshop late next spring or early summer to concentrate knowledge on buried valleys in Maine. Many separate individuals and organizations have gathered information that indicate the presence of buried ancestral valleys of Maine's major rivers. We would like to organize a meeting of these people so that data locations could be plotted on a map of Maine and the trace of buried valleys could be inferred from these data. Perhaps a publication could be produced that would summarize the valley traces and data points. See the next newsletter for details.

TWO TILLS IN NORTHERN MAINE

William R. Holland and Frederick F. Bragdon,
Jordon Gorril Associates, P.O. Box 7050, DTS,
Portland, Maine.

INTRODUCTION

As a result of the efforts of the Maine Geological Survey and the U.S.G.S. during the past 10 years, knowledge of the glacial history of the state of Maine has advanced to the point where the major problems have been defined and work is ongoing to resolve these problems. However, because of difficult access, distance from population centers and the vast terrain, northern Maine has only recently received the attention required to begin understanding the Pleistocene history of the area. The work of Brewer, Genes, Lowell, Newman and Prescott has shown that the resolution to many key regional problems is to be found in Aroostook County. Such problems have primarily been related to the presence, extent, direction of flow and thermal regime of ice caps over northern Maine. Because of the lack of good exposures, a till stratigraphy for most of northern Maine outside of the St. John Valley has not been well documented.

(continued on Page 4)

DUES DUES DUES

The mailing list of The Maine Geologist has grown to more than 300, in part because of our hesitancy to remove the names of members whose dues are in arrears. In keeping with past custom, this issue of the newsletter has color-coded address labels: White = paid-up; Yellow = Dues owed for 1981-82; Pink = Dues owed for 1980-81 and 1981-1982; Green = Dues owed for Three or more years. Our budget can't handle the load of the non-paying customers, and unless we hear a plea for special dispensation, the mailing list of the next issue will be trimmed. To help out those who owe there is an application blank on the back page, listing rates and showing where to send your $$$$$$.

NEARP and METAMORPHISM IN MAINE

Our evening speaker at the Fall meeting of the society was Dr. Charles V. Guidotti who has recently joined the faculty at UMO as part of an expansion of the Department of Geological Sciences. This expansion is a result of new funding to the University from EPSCR (Experimental Program to Stimulate Competative Research). The UMO program that has resulted from this funding is the New England Appalachian Research Project (NEARP), a project designed to put geologic constraints on plate tectonic models for New England and to establish some time and space cross-sections for the region. At this stage, the faculty has been expanded, with more to come, and Charlie tells us that what is needed now is an increase in the number of graduate students. It certainly sounds like an exciting program with lots of field oriented projects coordinated toward some common goals.

After Charlie filled us in on the status of NEARP, he then proceeded to discuss the metamorphic history of Maine. The approach he used was to focus on the results of some detailed studies in western Maine and then compare those results with regional studies throughout New England. Both pre- and post-Acadian metamorphism have been documented in New England, but Charlie has identified at least four metamorphic events during the Acadian in Maine.

The first event was syntectonic metamorphism associated with intense folding, and it produced rocks of the greenschist facies. These rocks were then deformed without metamorphism, producing a close-spaced, low dipping slip cleavage commonly associated with small recumbent folds. A static regional metamorphism to mid-amphibolite facies followed this deformation, annealing the slip cleavage and straightening the micas which had been bent by the small recumbent folds. Cooling to ambient temperatures followed this second metamorphism, and this was followed by high grade metamorphism which retrograded rocks to the east and prograded rocks to the west (to sillimanite grade). A map of these grades looks much like the metamorphic inset on the 1967 MGS state map. Although isograds of this third metamorphic event are spacially related to the 380 m.y. old plutons in southwestern Maine, the event was not straight contact metamorphism since those plutons truncate some of the isograds. The fourth metamorphism was a contact event associated with the younger Devonian plutons.

This brief summary, based on my notes of Charlie's talk, is just part of what he had to say. He defined a thermal history for much of Maine and related it to the rest of New England and adjacent Canada. Certainly he accomplished what he had set out to do, that being to demonstrate how detailed and integrated studies of metamorphism can constrain the plate tectonic arm wavers in their efforts to establish models for the region. DSW

UPCOMING PUBLICATION

MAINE GEOLOGY BULLETIN NO. 2 January 1982

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The Waldoboro Moraine and related glaciomarine deposits, Lincoln and Knox Counties, Maine Geoffrey W. Smith, Kim S. Stemen and Ron S. Jong

Shell hash in gravel beaches on islands of the central Maine coast ..... Allen C. Meyers

A quantitative study of an end moraine at Roque Bluffs, Maine ..... Robert P. Ackert, Jr.

The James Bowdoin mineral collection Benjamin B. Burbank

REVIEW OF THE HAZARDOUS WASTE AND GROUND WATER SYMPOSIUM

About 85 people gathered at Colby College on October 31, 1981 to attend a jointly sponsored symposium (GSM and ACS, Maine Chap.) dealing with hazardous waste and ground water. Tom Eastler (UMF) started the program with an overview of the problems which we currently face and a look into the future to estimate how big the problems will become. Hearing that there are more than 350,000 tons of hazardous waste to deal with in Maine each year, the group quickly realized the potential for an increase in the number of problems. Andy Tolmen (MGS) then gave the group a summary of the ground water systems in Maine, noting that more than half of Maine's population is dependant on ground water for household use. Many of Maine's wells are in bedrock, and depending on the extent of intersection of bedrock fractures, toxins may or may not become diluted during flow. John Tewhey (Jordon Gorrill Assoc.) reviewed the current status of nuclear waste management in the U.S., a topic of particular interest to Mainers since granitic terrains are high on the list of potential disposal sites for high level radioactive waste.

After a coffee break, complete with television interviews of several of the speakers, the symposium continued with a talk by Tom Potter (DEP). The focus of his talk was on current efforts to understand how specific pollutents interact with soils. Tom was followed by John Gilbert (Roy F. Weston, Inc.) who talked about evaluations of landfills. His discussion of efforts to assess the risks to health from pollution complimented Tom Potter's talk in that both noted how the systems are extremely complicated since the responses and effects of mixtures of chemicals are, for the most part, unknown. Richard Kraybill (R.F. Weston, Inc.) spoke to us about the problems associated with the construction of secure landfills. Perhaps the most notable point he made was the distinction between permeability and seepage velocity. When trying to contain a landfill leak or predict risk after contamination, in some cases it is not so much how many gallons per minute a material can transmit as it is how fast the pollutent actually moves. The final speaker was Ed Logue (DEP) who reviewed some of the legal and technical aspects of DEP's activities, with a look at possible future changes.

In the evening, a panal of the speakers (with Don Koons filling in for Tom Eastler) met with about thirty late-hangers-on. The discussion dealt with a wide variety of topics including the advisability of continuing with the landfill approach, the distribution of the cost for the clean-up of contamination, the effectiveness of superfunds, the depth of ground water systems, the safety of nuclear waste transport, and the use of peat to absorb hydrocarbons. Participants generally expressed the view that the symposium had been very educational, and had it not been Allhallows Eve, folks would have liked to keep the discussion going. It was sort of scary. DSW

NEW MAP OF FOSSIL LOCALITIES

Billings, M. P. and Lyttle, P. T., 1981, Map showing paleontological control of Paleozoic stratigraphy in New England: U.S. Geological Survey Miscellaneous Field Studies, Map MF-1302.

This is a single 39½" x 47" sheet with text and 3 map figures showing indexed Paleozoic fossiliferous areas, selected belts of metasedimentary and metavolcanic rocks, and a simplified metamorphic map. Following the explanatory text and 184 references, 98 fossiliferous areas are tabulated with ages represented and the most important references cited for each. Ten doubtful or discredited fossiliferous areas or specimens are also tabulated and referenced. Of the total areas cited, 18 are in New York, 7 in Quebec, and 5 in New Brunswick, all pertinent to New England terranes.

U.S.G.S. NOTES

HYDROGEOLOGY OF MAJOR GLACIAL AQUIFERS IN SOUTHERN MAINE

The U.S. Geological Survey, the Maine Geological Survey, and the Maine Department of Environmental Protection are currently involved in a cooperative hydrogeologic study of the major surficial aquifers in northern York and southern Cumberland counties. The study area, which is approximately 225 square miles, is bounded by Cornish, Buxton, Wells, and the New Hampshire border. The project was started in June of 1981 and a preliminary report should be completed by July of 1982.

A major objective of the project is to identify the significant aquifers and associated recharge areas. The "Sand and Gravel Aquifer Maps" compiled by the Maine Geological Survey and existing maps of the surficial geology (U.S. Geological Survey and Maine Geological Survey) have been utilized and modified as necessary. Well inventories have been conducted to assess yields.

Definition of the aquifers in three dimensions is another important objective. Information has been collected on thickness of overburden, stratigraphy, depth to water table, depth to bedrock, and bedrock surface topography. Approximately 150 1-channel and 75 12-channel seismic lines have been completed.

A third major objective of the project is to study the regional water quality. The background water chemistry will be determined from analyses of ground water from 30 observation wells installed by the project. Resistivity techniques have been used to identify the magnitude and flow direction of leachate plumes.

The report, which will be published by the Maine Geological Survey, will consist of the following maps with accompanying text: 1. aquifer boundaries and estimated yields; 2. estimated flow directions; 3. thickness of overburden (aquifer thickness where known); 4. bedrock surface topography (seismic profiles published); 5. stratigraphy (well logs published); 6. background water-quality information (chemical analyses published); 7. assessment of selected potential ground-water contamination sites.

Questions concerning this research can be directed to Dorothy Tepper at the U.S. Geological Survey or to Andy Tolman at the Maine Geological Survey.

LITTLE ANDROSCOGGIN RIVER VALLEY AQUIFER STUDY

The Little Androscoggin River Valley Aquifer (LARVA) study is a two-year project cooperatively funded by the U.S. Geological Survey, the Maine Geological Survey, the Maine Department of Human Services, and the Androscoggin Valley Regional Planning Commission. The purpose of the study is to determine the quantity and quality of water available from LARVA, to develop an understanding of how ground-water moves through the aquifer and to provide a means for analyzing various management alternatives for the aquifer.

The data collection program has been completed and involved an inventory of existing wells, test drilling, installation of water-level monitoring wells, seismic geophysics, and water-quality sampling. In addition, surface-water data were collected at several sites and ground-water levels were monitored monthly at 80 locations. All of the data will be incorporated into a regional ground-water flow model of the aquifer.

Products of the study which will be included in the report are bedrock elevation, saturated thickness, and water-level contour maps of the aquifer. Water quality of the aquifer will be discussed and a water budget for the aquifer will be presented. Any questions concerning this study can be directed to Dan Morrissey at the U.S. Geological Survey or to Andy Tolman at the Maine Geological Survey.

PEAT BOG HYDROLOGY

The U.S. Geological Survey in cooperation with the Maine Geological Survey is presently engaged in a study of the hydrology and water quality of selected peat bogs. Two bogs currently under study are the Great and Denbo Heaths located in Washington County. The study will formulate a water balance for the Great Heath and characterize its water quality. For the Denbo Heath, water-level maps will be compiled along with the results of water-quality analyses. This project will be completed in 1983. Questions concerning this research can be directed to Bill Nichols at the U.S. Geological Survey or to Andy Tolman at the Maine Geological Survey.

AEG - MAINE SUB-SECTION

An organizational meeting of the Maine Sub-section of the New England Section of the Association of Engineering Geologists was held November 5, 1981 at Colby College. Frank Bellini, President of the New England Section, had travelled up from Massachusetts along with several others to brief the local folks about the program. Approximately two dozen people were in attendence, and Garrett Morrison of Morrison Geotechnical headed up the discussion to see if sufficient local interest exists to start up a sub-section. It seems as if the group will get off the ground, and that brings the number of Maine geologic organizations to three (MGS, MMRA, and now AEG). Next meeting:

January 13, 1982 Colby College Roberts Union

Dinner: 5 - 6 PM Smith Room - Roberts

Business Meeting: 6:15 - 6:45 PM

Evening Speaker: 7 PM

Dr. John Ebel, Assist. Director of Weston Observatory and Assist. Prof. at the Dept. of Geology and Geophysics, Boston College: Earthquakes in New England

The November 5th meeting featured two evening speakers who both presented talks on oil shale. Bill Mallio led off with a talk about the magnitude of our reserves and methods of recovering the kerogen from the shale. Despite numerous problems, projects are well under way to try and make this resource a contributor to our energy supplies. Carol Sweet of Metcalf and Eddy then reported on a project which her company did in Colorado. Extensive study of both the ground water system at a potential mine site and the interaction of mine tailings and groundwater were carried out. Their conclusions were that if the waste material was disposed of by filling local canyons it would require lining and if the waste was used to backfill the mine it would contaminate the ground water. Since this study was done, Colony Oil has sold the property to Exxon who is currently building a town to take care of an expected 40,000 workers. In order for an operation like that to be economical, they would need to mine more than 100,000 tons / day so I guess they'd need a crowd on hand.

SPECIAL AWARDS ?

The September 1981 Newsletter (Vol. 10, No. 1) of the Atlantic Geoscience Society had a neat little note that might make for some worthwhile contemplation by GSM, as follows:

"A sly technique of getting publicity is used by the Newfoundland section of G.A.C. They give awards to the newspaper, radio or TV reporter who has produced the best article on a geological topic during the past year. They have proved this to be a good method of winning friends among the news media. Should we do the same, and whom do we nominate?"

"I think it is fortunate that as a result of this conference we are not likely to arrive at any one answer to the question of the origin of granites. It might be pleasant to have one neat solution leading to petrographic tranquility instead of controversy, but it would stop a lot of interesting discussion. The Chinese, who are a philisophical race, balanced the relative advantages very aptly in these words: "Who can compare the tranquilizing grace of a maiden with the joy of witnessing a well-contested rat fight?"
Waters, A.C. (1948), Origin of Granite, G.S.A. Mem. 28

HOLLAND and BRAGDON - TWO TILLS (Continued from Page 1)

Genes and Newman (1979) have proposed a three-fold stratigraphy which included what was interpreted to be a single Mid-Wisconsinan till and two Late-Wisconsinan tills. The oldest till (St. Francis till) has been described as a gray clayey till with an east-west fabric and clasts composed primarily of the Devonian Seboomook Slate (Genes, 1980). The younger tills are described as brown in color, having distinctly different clast lithologies from the St. Francis till. The difference between the two younger tills has been described as being the relative abundance of granite gneiss erratics derived from the Canadian Shield. The younger tills have been referred to as the Mars Hill (no granite gneiss) and Van Buren (3 to 5 percent granite gneiss). The two tills are judged to have been emplaced contemporaneously by either different ice masses or ice with a non-homogeneous internal thermal regime (Genes, 1980). Lowell (1980) addressed this till stratigraphy in northwestern Maine and concluded that the difference in appearance between St. Francis till and the two brown tills was not due to a significant difference in clast lithology or provenance, but to clast and matrix oxidation.

On the basis of subsurface information gathered during the course of projects throughout much of northern Maine, it appears that the color difference in tills is indeed best explained as a result of weathering. The purpose of this paper is to present a two-fold till stratigraphy based not on the apparent properties of the tills themselves, but on a documented time-stratigraphic unit. Because of the gross similarity in properties of tills across this unit, it would appear that hand specimen criteria for distinguishing time-stratigraphic units in northern Maine tills are inappropriate.

Recent detailed subsurface investigations of sites in northern Maine have resulted in the definition of at least two separate tills, separated locally either by: a) glaciofluvial and deltaic sands and gravels; b) glaciolacustrine silty clays; or c) a paleosol. The thickness of the upper till as identified ranges from 30 feet to almost 70 feet. The thickness of the lower till ranges from 40 feet to 60 feet. Similar stratigraphy has been documented along the St. John Valley (Prescott, 1973) and in the Aroostook Valley near Limestone. Although it is impossible to correlate deposits from basin to basin on the basis of facies lithologies, it appears that the thickness of lake clays (particularly along the St. John) and the soil development at depth, records a significant period of time during which the regional land surface was subaerially exposed. A possible candidate for such a non-glacial event might be the "Gayhurst Interstadial" of southeastern Quebec (Gadd, 1975). As there are no absolute dates on any of the subsurface deposits, the ages of the units are quite speculative.

METHODOLOGY

The data upon which this report is generated were gathered from test boring, test pit and seismic explorations. The most widespread sampling method employed was by split spoon. These samples were collected at 5-foot increments in borings at sites in northern Maine. All samples were inspected visually and selected samples were analyzed in the laboratory for grain-size distributions, Atterberg limits, permeabilities and consolidation performance. A sample of lake-bottom clayey silts was sent to the Institute of Quaternary Studies at the University of Maine for an analysis of the diatom flora.

Seismic refraction techniques were employed at one site in order to define bedrock/overburden contacts. These data also identified a seismic signature for each till. These signatures corroborated contacts established by boring and laboratory results. Test pits excavated by backhoe provided in situ information concerning shallow (less than 20 feet) deposits.

STRATIGRAPHY

It has been recognized for some time that tills are two basic colors in northern Maine. The surface till is almost exclusively brown to olive-brown below the upper C horizon. By the Unified Soil Classification, it is a gravelly silty sand to sandy silt with 35 to 50 percent by weight passing the No. 200 sieve (3.75Ø). The thickness is generally 10 to 14 feet and the contact between the brown and an underlying gray is generally gradational over 3 to 5 feet. Existing moisture contents of the brown till range from 10 to 14 percent and the average liquid limit and plasticity indices are 24 and 6, respectively. Results of standard penetration tests (SPT) range from 20 to greater than 100 blows per foot, indicating that the material is dense to very dense. Laboratory permeabilities range from 10^{-5} to 10^{-6} cm/sec. No borehole permeability tests were done on the brown till. The seismic velocity of the brown till is 3000 to 4000 ft/sec. Fabric data are limited, but clast orientation appears to be random. The brown till locally contains lenticular fluvially-bedded sands and gravels which exhibit collapse deformation in some places.

The gray till is generally encountered where bedrock is greater than 15 feet deep. The thickness ranges from a few feet to many tens of feet. It is generally closer to the surface or at the surface in areas where the water table is high. The gray till is typically a slightly gravelly sandy silt, with the weight percent passing the No. 200 (3.75Ø) sieve ranging from 40 to 55 percent.

The range of existing moisture content is from 7 to 12 percent and the average liquid and plastic limits are 24 and 6, respectively. Blow counts range from 20 to greater than 100 blows per foot indicating the till is very dense. Results of laboratory permeabilities were similar to those in the brown till. In situ permeabilities range from 10^{-4} to 10^{-5} cm/sec. The upper 10 to 20 feet of gray till often contain stratified lenses similar to those in the brown till. The seismic velocity of the upper 20 to 60 feet of the gray till is similar to that of the brown till (3000 to 4000 ft/sec).

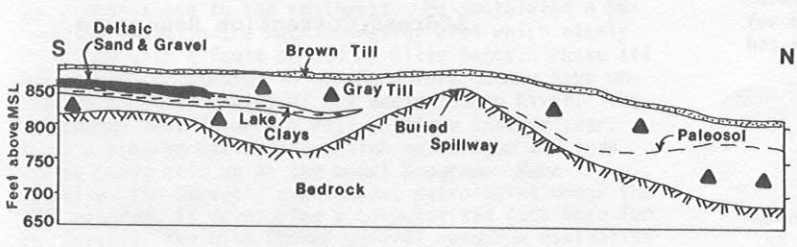
On the basis of over 50 grain-size analyses, it appears that the average mean grain-size of the brown till is slightly coarser than that of the gray, but the textural shift, when observable, rarely coincides with the color change. The slight textural change generally occurs below the color transition. It would appear that brown till and the upper part of the gray till is ablation facies material, having a random fabric, a granular matrix and containing reworked stratified materials.

(Continued)

Because of their texture, the shallow materials are susceptible to oxidation except where saturated by a shallow water table condition. Because of the similarity in properties and structures between the brown till and the uppermost part of the gray till, the lower contact of the ablation facies seems not to coincide precisely with color change. The indications are that till color is dependent on secondary processes as well as lithology. Therefore, unless the influence of weathering can be ruled out, time-stratigraphic units based on color may lead to erroneous interpretations of history.

Figure 1 is an interpretive cross-section based on subsurface exploration at a site in northern Maine. The cross-section indicates a horizon ranging in depth from 60 to 85 feet which appears to provide a relatively effective time-stratigraphic marker between tills. The horizon is wholly within the gray till. The horizon is represented by the top of lake bottom and deltaic deposits, a paleosol and a buried bedrock spillway. It should be noted that the contact between the brown and the gray till in no way corresponds to this marker zone.

The lake bottom deposits are up to 20 feet thick and contain small amounts of non-marine diatom flora of the type found in Antartic lakes (Borns and Kellogg, pers. comm.). There is thus no biostratigraphic evidence that the lake was interstadial. However, considering the proximity of the buried soil (which is at least 5 feet thick in places) it may be deduced that the lake was pro-glacial, dammed either by advancing ice following an interstadial or by retreating ice preceeding one. Neither the lake-bottom clayey silts nor the deltaic sands and gravels are weathered, which suggest that the lake followed the interstadial. Consolidation testing on the lake-bottom deposits shows them to be overconsolidated, reflecting overriding by ice. The till above the lake deposits and paleosol is therefore considered to be of a distinctly different age than the till below. The color, grain-size distributions, permeabilities and clast lithologies between the two tills are similar with the exception of the weathered top of the lower till. However, a marked increase in seismic velocity appears to correspond with the top of the lower till as inferred from the presence of the paleosol and lake deposits. Velocities for the upper unit ranged from 3000 to 4000 ft/sec, while velocities in the lower unit ranged from 6000 to 8000 ft/sec. This suggests that the lower till has been overconsolidated with respect to the upper till. This is almost certainly due to a readvance of ice over the lower till and further supports a stratigraphic division. As stated previously, no seismic "kicks" were observed between the brown and the gray color zones of the upper till.



HORIZONTAL SCALE 1:17,000

FIG. 1

INTERPRETIVE CROSS-SECTION AT A SITE IN NORTHERN MAINE

Subsurface exploration at other sites in northern Aroostook suggests that multiple till sections are quite common in the deeper bedrock valleys. The stratigraphic units separating the tills may vary from lake-bottom clays to significant accumulations of glaciofluvial sands and gravels. In no case of which the writers are aware does color change in tills with depth coincide with a documented time-stratigraphic marker such as described above.

CONCLUSIONS

On the basis of the data presented, four conclusions can be reached:

1. There are at least two tills of distinctly different ages in northern Maine. The tills are similar to each other in appearance except where they have been oxidized to an olive-brown or brown color. A substantial seismic velocity increase in the lower of the two tills suggests that it has been overconsolidated with respect to the upper till.

2. Because of the presence of a buried soil and the widespread distribution of buried stratified deposits in northern Aroostook, there appears to have been at least one regional interstadial in northern Maine previous to the Late-Wisconsinan. Correlation with the Gayhurst deposits of southeastern Quebec would suggest that this interstadial has a late Mid-Wisconsinan age. Such a correlation is based solely on relative stratigraphic position and is thus quite tentative.

3. Deeply buried interstadial deposits not mapped or otherwise evident at the surface may be significant hydrogeologic and/or geotechnical entities and could control design parameters for certain types of projects.

4. There seems to be insufficient corroborative evidence to support a time-stratigraphy for northern Maine tills based on color.

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MEMBERSHIP DUES STATEMENT

THE GEOLOGICAL SOCIETY OF MAINE, INC. is a non-profit Maine corporation established as an educational Society to advance the professional improvement of its members; to inform its members and others of current and planned geologic programs in Maine; to encourage continuing social contact and dialogue among geologists working in Maine; and to further public awareness and understanding of the geology of the State of Maine, and of the modern geologic processes which affect the Maine landscape and the human environment.

The Society holds three meetings each year, in the late fall, early spring and (with the Annual Meeting and sometimes field trips) in mid-summer. A newsletter, THE MAINE GEOLOGIST, is published for all members four times a year (more or less), approximately on a quarterly basis starting in September. The Society year runs from August 1st to July 31st. Annual dues and gift contributions to the Society are tax deductible. There are three classes of annual memberships:

$5 REGULAR MEMBER - Graduate geologists, or equivalent, with 1 year of practice in geology, or with an advanced academic degree in geology

$4 ASSOCIATE MEMBER- Any person or organization desirous of association with the Society

$2 STUDENT MEMBER - Persons currently enrolled as students in college who are interested in geology

$2 APPLICATION FEE - A one-time fee to all new members, payable when applying for membership

ANNUAL RENEWAL or APPLICATION FOR MEMBERSHIP - THE GEOLOGICAL SOCIETY OF MAINE

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(Please print or type)

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(Permanent Mailing Address)

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_____
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Correspondence about membership in the Society should be mailed to Frederick M. Beck, 140 Main St., Yarmouth 04096. Items for inclusion in the newsletter may be directed to D.S. Westerman, Dpt. Geol., Colby College, Waterville 04901

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