



THE MAINE GEOLOGIST

THE NEWSLETTER OF THE GEOLOGICAL SOCIETY OF MAINE

DECEMBER

1982

VOL. 9 NO. 2

MEETING ANNOUNCEMENT

JOINT WINTER MEETING

GEOLOGICAL SOCIETY OF MAINE
MAINE MINERAL RESOURCES ASSOCIATION
ASSOCIATION OF ENGINEERING GEOLOGISTS

DEEP SEISMIC REFLECTION PROFILING

DATE: Friday, January 28, 1983

PLACE: Jewett Auditorium
University of Maine, Augusta
Augusta, Maine

TIME: 3:00 - 5:30 Program
6:00 - 7:30 Dinner and Business Meeting

SPEAKERS: David Stewart, USGS, Reston, VA
Pierre St-Julien, Laval Univ., Quebec
Representative from COCORP, Cornell Univ.

The program has not been finalized as of the time that the bulletin went to press. A more detailed announcement and/or a newspaper article will be published in January.

BACKGROUND: A number of private and government-funded programs have been instituted in the last four years to explore the structure of the deep crust. The COCORP group (Consortium for Continental Reflection Profiling) at Cornell has run a number of profiles in the northern and southern Appalachians. The Canadian program has run a combined deep and shallow profile across Quebec that stops at the Maine border near Jackman. The oil and gas industry has been running lines in crystalline rock areas, including western New England, in search of reservoir rocks that may be present beneath overthrust metamorphics. Of current interest to Maine geologists is the fact that the USGS plans to run a deep reflection profile through Maine - probably from the point in western Maine where the Quebec line ends, southwestward to the mid-coastal area. The items to be covered in the winter meeting program of the GSM-MMRA-ABG are as follows:

- Description of Vibroseis method used in profiling
- Results of previous work in the Appalachians and elsewhere
- Shallow and deep structure as determined by Quebec profile
- Plans for Maine line - purpose of the line and when and where it will occur

Time will be allotted in the program for questions and discussion.

PRELIMINARY ANNOUNCEMENT-SPRING MEETING - MARCH 11, 1983

PROGRAM: Student Paper Presentations
Evening Speaker

PLACE: Bates College

TIME: Afternoon and Evening

Information on student abstracts to be sent out mid-Jan.

PRESIDENT'S MESSAGE

John Tewhey

Many thanks to Hal Borns, Woody Thompson, Walt Anderson, Ollie Gates, Pat Barosh, Dave Tyler, Dave Smith, and Scott Anderson for the fine program that was presented at the GSM fall meeting at Colby on Nov. 13th. The large group that showed up for the meeting stayed around for about five hours to hear it all so it must have been good. The logistics for the meeting were handled by Don Allen and his geology students at Colby and they also did a fine job...thank you.

When I started planning the programs for this year's GSM meetings, I spoke to a number of people in order to get ideas and suggestions. When I asked Peter Garrett of the DEP he said, "There's two things I'm curious to know more about. One is neo-tectonism on the Maine coast and the other is deep seismic reflection profiling." The fall and winter meetings were conceived in the space of about three seconds. Roy Farnsworth and Florence Hoar both thought that more could and should be done at meetings and in the bulletin to let the society members know what is going on in the various geology houses in the state; i.e., the State Survey, geology departments, the DEP, the consulting shops, and individuals. Roy, the bulletin editor, is following up by including more news of this sort in the bulletin. We will also plan for more such interactions at meetings.

As the smell of wood smoke starts to get thick in the air as the temperature drops to more seasonal levels, the summer field trip and annual meeting seems a long time away...and it is. Even so, I'd like to put out the first call for field trip leaders. We'll discuss the subject at the winter meeting.

Jobs, or the lack of them, is a subject on the mind of a number of geologists in the state right now. The word-of-mouth network is fairly efficient in getting the word around on who's looking and who's hiring but if any individual or organization would like to put a "Help Wanted" or "Job Wanted" notice in the bulletin, the next one will go to press in mid-February.

GSM symposium - NEO-TECTONISM IN MAINE

Horsefaced to railroad-rights of way -- from high marshes to newly launched ships mired on the tidal flats-- from shell middens to dock remnants outside Helen's window characterizes the breadth of evidence presented to support the thesis of crustal depression in down-east Maine. The speakers program of the GSM fall meeting included much multi-discipline evidence for Neo-tectonism in Maine.

Walter Anderson filled us in on the background for the development of the study. The interest of the NRC in seismic activity in New England provided the logistical support for much of the study. Originally a 5 year study, it is expected to continue for three more years. The New England Seismic Network from Weston, Mass. has provided considerable long term data for present day seismic activity. The Deep Seismic Vibro-profile program to be completed from Coburn Gore to Lincolnville should provide us with additional data to shed light on the problem.

(Continued on P. 3)

M.G.S. NOTES

2

U.S.G.S. NOTES

by Dorothy Tepper

Shallow Land Burial Area Screening Study

Prepared for the

Low-Level Waste Siting Commission
State of Maine

Principal Investigator: Marc C. Loiselle
Compilation Assistance: E. Melanie Lanctot
Cartographic Assistance: Robert A. Johnston

Walter A. Anderson
State Geologist

ABSTRACT

In response to Federal legislation the Maine Legislature passed Public Law Chapter 439, An Act Assuring Legislative Participation in Nuclear Waste Repository Research and Development Activity Within the State. A section of this law directed the State Geologist to report on the suitability of areas within the state for a low-level radioactive waste disposal facility. This report presents the results of a geologic screening study designed to eliminate areas not favorable for a waste disposal site and identify areas suitable for a more detailed study. This study considered only geologic screening factors, and as such is only one-half of a comprehensive screening study which must also consider demographic, socio-economic, and environmental factors when determining the overall suitability of an area for a waste disposal facility.

The technical criteria for site selection outlined in the NRC Licensing Requirements for Land Disposal of Radioactive Waste (Proposed), 10 CFR 61, were used in selecting geologic screening factors for the study. Four screening factors are used to eliminate areas considered not favorable for the location of a shallow land burial waste disposal facility:

- location of the 100-year flood plain
- insufficient thickness of overburden (less than 50 feet [15 meters])
- location of high yield bedrock aquifers
- location of sand and gravel aquifers

Maps at a uniform scale of 1:250,000 (1 inch = 4 miles) were prepared from available information, and used to construct a composite map of these negative screening factors (the blue overlay in the series of county maps). This overlay may be used to eliminate areas not suitable for a low-level waste disposal facility.

A consideration of the technical criteria in 10 CFR 61 indicated two surficial materials in Maine possess the characteristics of low porosity and permeability and long ground water travel times desirable in a host material for a waste disposal facility. These are deposits of glacial marine silt and clay and deposits of basal or lodgement till. A lack of detailed surficial geologic mapping does not allow more detailed consideration of basal till at this time. A map of deposits of marine silt and clay (the Presumpscot Formation) was also prepared at a scale of 1:250,000 (the orange overlay in the series of maps). Areas of Presumpscot Formation that are not screened out by one or more of the geologic factors listed above are considered geologically favorable for

(Continued on P. 5)

EVALUATION OF THE MAINE OBSERVATION-WELL NETWORK

The U.S. Geological Survey, in cooperation with the Maine Geological Survey, is conducting an evaluation of the observation-well network in Maine. Presently, the network consists of 28 wells which are distributed statewide (see figure 3 and table 1).

The study objectives include: evaluation of the present network; development of a plan to improve the network over the next 5 years; implementation of automated information storage and retrieval systems for the data.

Field inspections have been completed at most of the sites. These inspections included running levels to establish control for the measuring points; testing the connection of the well to the aquifer by a slug injection or pump test; documenting above-ground construction; and noting the geologic setting.

This review and subsequent update of the network will improve the data available for regional analyses, for comparison with data from detailed interpretive studies, and management of ground-water resources.

The results of the study will be published in a report which will be completed in 1983. Questions concerning this project can be directed to Jim Adamik at the U.S. Geological Survey (622-8200) or to Andy Tolman at the Maine Geological Survey (289-2801).

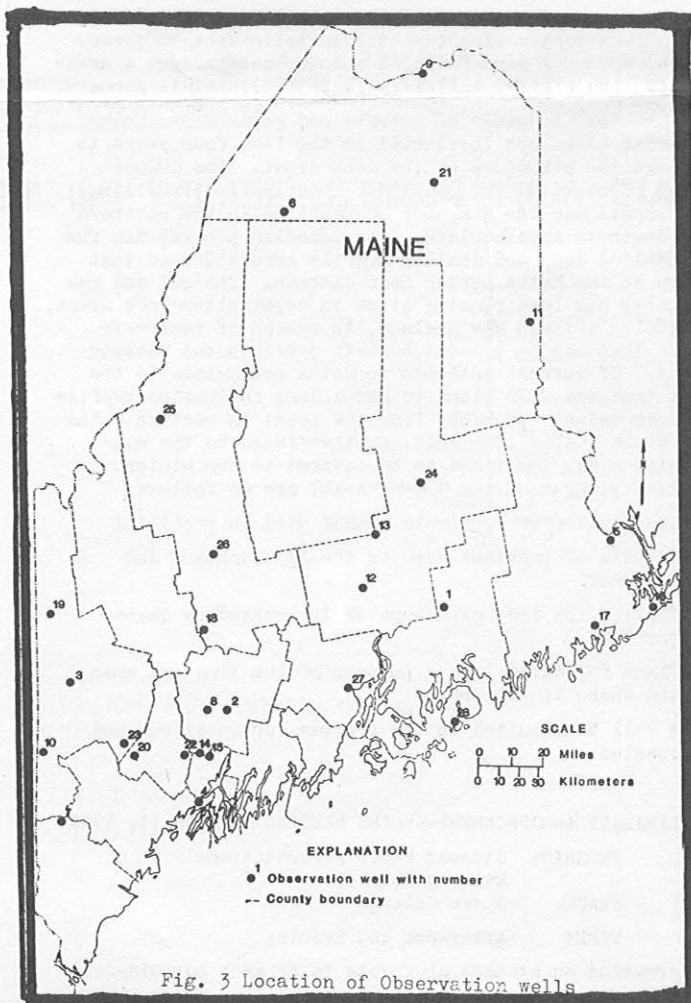


Fig. 3 Location of Observation wells

Table 1 -- Observation well information

Well number	Location		
1	Amherst	16	Lubec
2	Augusta	17	Machias
3	Bethel	18	Mercer
4	Brunswick	19	Middle Dam
5	Calais	20	Poland
6	Clayton Lake	21	Portage
7	Cornish	22	Sabattus
8	East Winthrop	23	Oxford
9	Fort Kent	24	Lincoln
10	Fryeburg	25	Jackman
11	Houlton	26	Bingham
12	Kenduskeag	27	Belfast
13	Lagrange	28	Acadia
14	Litchfield (fairgrounds)		
15	Litchfield (Condon)		

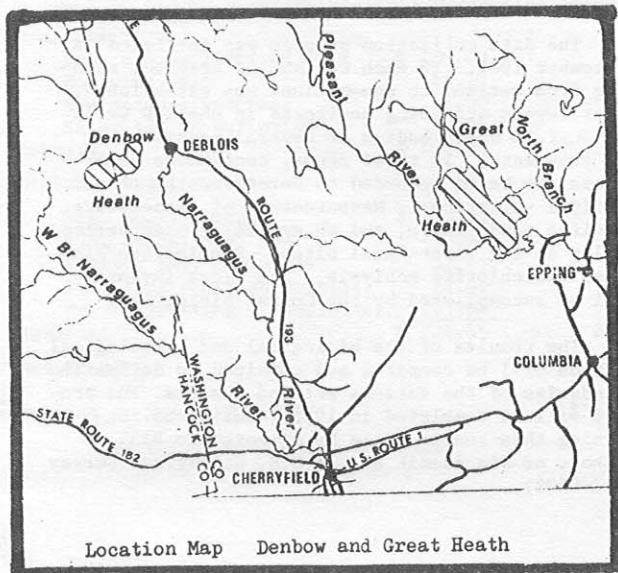
PEAT BOG HYDROLOGY

The U.S. Geological Survey, in cooperation with the Maine Geological Survey, is presently engaged in a study of peat bog hydrology. The purpose of the study is to assess the surface and ground-water hydrology of the systems and to characterize their water quality.

Two bogs currently under study are the Great and Denbow Heaths located in Washington County (see figure 4). These bog systems differ in that the Great Heath has never been mined and the Denbow Heath is actively mined.

The data-collection program was initiated in May 1980 and has been recently completed. It involved the installation of piezometer nests, stratigraphic surveys, water-quality sampling, test drilling, and field tests for hydraulic conductivity. Surface-water data were collected at numerous sites and climatological data were recorded at stations near the bogs. Ground-water levels were measured periodically. These data will be used to interpret the hydrologic characteristics of the mined and unmined bogs.

A basic-data report is being completed and should be available in 1983. Questions concerning this study can be directed to Bill Nichols at the U.S. Geological Survey (622-8208) or to Andy Tolman at the Maine Geological Survey (289-2901).



Location Map Denbow and Great Heath

The speakers covered many disciplines: Harold Borns, U. Maine, Orono - Quaternary Studies; David Smith, U. Maine Orono, covered the historical basis from agriculture; David Tyler, U. Maine, Orono, provided engineering data; Scott Anderson, U. Maine, Orono, brought out the evidence from salt marshes; Woodrow Thompson MGS, indicated the value of data from glacial marine deltas; Patrick Barosh, Weston Observatory, suggested evidence from a tectonic point of view; and Olcott Gates' insight into local structures pointed out geological coincidences as a basis for the belief in the subsidence.

David Tyler indicated that a re-survey of benchmarks along railroad rights-of-way indicates movement has occurred. A level line run from Bangor to Calais covering the period 1942-1966 shows a 200 mm drop. With a predicted error in measurements of 35mm and problems with BMs being on boulders, the indications are of a subsidence of about 9 mm/yr in the Passamaquoddy area and about 3mm/yr in the Kittery area. Attempts to do similar studies in southern New England were frustrated in that civilization destroys benchmarks as it "progresses".

David Smith brought us up to date with historical data for subsidence over the last 200 yrs.. Early settlers in the Machias area were granted segments of saltmarsh to provide hay for their animals. Transactions records and the dikes built to wall out the sea gives data which correlated with other data allows more recent dating of changes of sea level in these areas. Future research he hopes to accomplish with paleoclimatological approaches, should shed even further light on the subject.

Scott Anderson's studies involve the marshes themselves. Salt marshes reflect sea level by location of the high and low marsh flora. Studies of micro-fossils including forams and diatoms further define the position of sea level. Man's activities are also preserved in the marsh with sawdust, boards etc. being later covered by marsh as sea level has increased. He pointed out the problems of radio-carbon dating with illustrations of a range of dates: 8.8 cm/century at Holt Pond to a range of 115 cm/century to 6 cm/century at Addison Marsh.

Pat Barosh took us into broader interpretations with his relating earthquake activity - first in the Passamaquoddy area and New Brunswick, then pointing out the anomalous gravity data swinging inland along the Oak Bay Fault. His report emphasized the general earthquake activity in eastern North America along the Cretaceous shorelines. This he feels is an indicator of tectonic activity relative to general subsidence.

Woody Thompson reported on his and Kristine Crossen's studies of glacial marine deltas. The premise upon which these are used as indicators of sea level is that the intersection of the topset and foreset beds represent a referable sea level. The deltas in the Passamaquoddy area show lower elevations than in other sections of the state, hence an implication that this segment of the coast is sinking.

Hal Borns filled in for Dave Sanger. Dave has observed shell middens which are now being wave cut and with no tidal flats visible from which the shells were derived. The flats are now flooded even at low tide. He hopes to be able to get dates from the flooded flats, however, this presents many logistical difficulties.

Ollie Gates closed the session, pointing out a number of geologic coincidences which indicate that something is occurring in the Passamaquoddy area. These coincidences include changes along the Oak Bay Fault -- the fact that no Pre-Cambrian rocks occur beyond Passamaquoddy Bay-- that nothing like the Perry Ggl., except for the Cobequid, occurs along the Atlantic seaboard -- that the Carboniferous is missing between New Brunswick and southeastern Massachusetts--and that the bay area seems to represent a major anticlinal bend, i.e., a structural reentrant.

In summary - a number of different disciplines, with a variety of approaches, have come to the same or similar conclusions. They seem to point out that the subsidence along the Maine coast not only exists but also is greater in the Passamaquoddy area.

by Roy L. Farnsworth

LITTLE ANDROSCOGGIN RIVER
VALLEY AQUIFER STUDY

The Little Androscoggin River Valley Aquifer (LARVA) study has recently been completed. The two-year project was conducted by the U.S. Geological Survey with support from the Maine Geological Survey, the Maine Department of Human Services, and the Androscoggin Valley Regional Planning Commission. The report documents the results of the first quantitative ground-water investigation conducted by the U.S. Geological Survey in Maine. The location of the study area is shown in Figure 2.

A finite-difference digital-computer model of the aquifer was constructed to simulate flow of ground water. The model was calibrated by simulating average ground-water levels and ground-water runoff observed in the aquifer during 1981. A transient verification of the model was accomplished by simulating ground-water level changes observed from June through December 1981.

The model was used to investigate the effects of increased pumping at the Norway and South Paris municipal well fields and to test placement of additional wells. Delineation of areas contributing water to both of these municipal well fields is important because of the close proximity of landfill operations. The model was also used to develop a water budget for the aquifer and to predict the effects a drought would have on ground-water levels.

The report also presents the results of ground-water quality analyses. Background levels of common inorganic and trace elements are reported along with the results of site-specific sampling programs at the South Paris landfill and South Paris sludge disposal site.

The report, which will be published as a U.S. Geological Survey Water-Resource Investigation, will contain about 50 pages of text and tables summarizing water quality analyses, seismic exploration, and aquifer stratigraphy. Several large plates also included in the report show: data collection locations; surficial geology and aquifer boundaries; bedrock altitude contours beneath the aquifer; saturated thickness of coarse-grained sand and gravel; average ground-water levels observed in the aquifer during 1981; the finite difference grid used in modeling the aquifer; the hydraulic conductivity of the aquifer; ground-water altitudes computed by the finite difference model; and predicted water level declines in response to a hypothetical drought.

Questions about this study should be directed to Dan Morrissey at USGS (622-8208).

GROUND-WATER CONFERENCE

The U.S. Geological Survey and the Maine Geological Survey will jointly sponsor a conference concerned with current ground-water investigations and policy in Maine. This will be an all-day conference and is scheduled for March 14 at the Augusta Civic Center. Topics for the three sessions include state-wide investigations, site-specific investigations, and protection of ground-water resources. Speakers will represent state and federal agencies, the University of Maine, the State Legislature, and various consulting firms. Individuals who would like to present papers are asked to submit abstracts of 200 words or less by January 15 to Dorothy Tepper (USGS) or Andy Tolman (MGS).

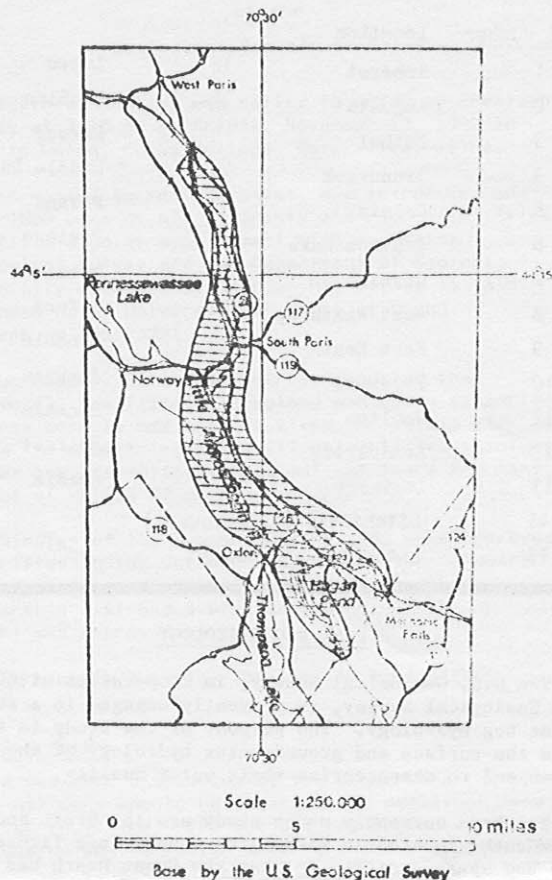


Figure 2.

TRANSITION ZONE STUDIES IN THE
NORTHEASTERN UNITED STATES

The U.S. Geological Survey, in cooperation with the Army Corps of Engineers, is conducting a study to identify wetlands boundaries for the types of wetlands occurring in the North Atlantic Region of the United States. Five representative wetland habitat types, all within a 30 mile radius of Augusta, have been chosen. These habitat types include a coastal marsh, a hillside wet marsh, a fresh-water marsh, a nontidal riparian marsh, and a tidally-influenced riparian marsh.

The data collection program was initiated in September 1981. In each wetland, a transect spanning from wetland to non-wetland was established. Water levels are being monitored in shallow wells and surface water bodies at several points along the transects. In tidal areas, continuous water levels are being recorded to determine the effect of tidal variations. Measurements of temperature, specific conductance, and pH are being made periodically at the water-level sites. Samples are also taken for chloride analysis. The flora inventory will be accomplished by the Corps' biologists.

The results of the biological and hydrological methods will be compared and combined to define the boundaries of the various wetland systems. The project will be completed in 1983. Questions concerning this research can be directed to Bill Nichols or Jim Adamik at the U.S. Geological Survey (622-8208).

(Low Level Waste continued)

a waste disposal site at this level of screening, and should be considered for more detailed study when and if it becomes necessary.

The limitations of scale and the nature of the available data used in this screening study must be kept in mind when considering the results presented in the screening maps. However, it is clear that from a geologic standpoint a number of areas appear suitable for a waste disposal facility and would warrant more detailed study if necessary.

Note from the Editor:

I am looking for ideas which you may have as to what should be included in a newsletter. This issue features the activities of the U.S.G.S. in Maine. The next issue I plan to feature our colleges and universities. I would like you to volunteer information on such questions as: what are your students doing in research? What is the staff doing in research? What new programs are being offered? I also urge you to encourage your students to participate in the annual student presentations at our Spring Meeting at Bates College, March 11th. Get them to send in their paper abstracts, it is a way for them to get published. Please submit your short articles and news so that we can make our newsletter of more service to the Maine geological community and to increase communication between all of us. Next newsletter to be published mid-February, get me information by Feb. 15th.

REMINDERS:

Renew your membership.
Bring in a new member.
Pay your dues past and present.
Make students aware of Spring Meeting.
Send news items to the Editor.
Be an active participant in GSM.

GSM Treasurer's Report
Quarter ending 29 October 1982

Membership

Regular members	171
Associates	22
Students	29
Total Members	222

Balance on hand 7/31/82

\$1147.48

Receipts:

Dues and Application fees	\$ 128.00
Bulletin Sales	43.10
NOW account interest	15.50
Sales tax on Bulletins	.25
Subtotal	\$ 186.85

186.85

Disbursements:

Bul. No. 1 Refund	\$ 5.00
1982 Annual Mtg. fee	20.00
Stamped Env. & Postage	32.41
F.M. Beck - Office Supplies	24.08
French Printing - Newsletter	123.06
Subtotal	\$ 204.55

204.55

Net Change

17.70

Balance on Hand 10/29/82

\$1129.78

s/ Robert G. Gerber, Treasurer

Minutes of the Fall Meeting
of the
Geological Society of Maine

The business meeting was called to order by President Tewhey at 7:30 pm on Friday, November 12, 1982 in Roberts Union, Colby College, Waterville, Maine.

Joseph Kelly, Marine Geologist, was introduced and described some of his interests and responsibilities. Joe fills a joint appointment with the Maine Geological Survey and the Department of Geology, University of Maine at Orono. His office is in Boardman Hall, University of Maine at Orono (Telephone 581-7322).

Arthur Hussey, Bulletin Chairman reported that Volume #3, the field trip volume was being assembled, and one article had been received for Volume #4. He urged the submitting of additional articles. Volume #1 has been essentially sold out but there are many copies of Volume #2 on hand.

The minutes of the Summer Meeting 1982 were approved as written in the October 1982 Newsletter. Robert Gerber, Treasurer, reported 232 members on our membership list and a bank balance of \$1129.78. His report was approved as read.

Roy Farnsworth accepted the task as Newsletter Editor.

Old Business

There was much discussion at the summer meeting about when officers should be elected. No decisions were made at that time. The subject was tabled for further discussion in the Fall. After a short discussion a motion was made and passed that the officers study this subject and report to the members in the spring '83 meeting.

Bob Gerber requested assistance from anyone with "Buried Valley" information.

Walter Anderson reported on the status of the new State Maps. Work on the Bedrock and Glacial Maps were proceeding according to schedule. A draft of the bedrock map is nearly ready to present to the private sector hopefully in exchange for unpublished information in various areas of the state.

New Business

Walter Anderson reported that the Maine Geological Survey would be cooperating with the U.S. Geological Survey, The Canadian Geological Survey and several other organizations in a Deep Seismic Reflection Profile along a line from the St. Lawrence to the Coast of Maine.

The next meeting of the Geological Society of Maine will be in mid-March at Bates College in Lewiston and will feature student papers.

Andy Tolman and others are working on a Groundwater Symposium to be held probably in late April or May 1983.

The meeting was adjourned at 8:50.

s/ Archie Berry Secretary

Map Collection Offer

Bates College Geology Dept. has a large collection of topographic maps of the U.S. (other than New England), which it wants to give to an educational institution which has the use for and facilities to store them. Please contact John Creasy, Chairman, Dept. of Geology, Bates College Lewiston, Maine 04240.

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

NAME _____
 (Please print or type)

ADDRESS _____
 (Permanent Mailing Address)

Zip Code

Regular Member \$5 per year \$ _____

Associate Member \$4 per year \$ _____

Student Member \$2 per year \$ _____

Application Fee \$2 One-time \$ _____

TOTAL ENCLOSED : \$ _____

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MAIL TO: ROBERT G. GERBER, TREASURER
 Ash Point Road
 South Harpswell, Maine 04079

THE GEOLOGICAL SOCIETY OF MAINE, INC.

82-83 SOCIETY YEAR STARTED AUGUST 1st - PLEASE SEND IN YOUR DUES

THE GEOLOGICAL SOCIETY OF MAINE
 c/o Arthur M. Hussey, Dept. of Geology,
 Bowdoin College, Brunswick, Maine 04011

THE MAINE GEOLOGIST is published four times a year, more-or-less, in early Fall, late Fall, late Winter, and maybe June or July, for members of the Geological Society of Maine, a non-profit educational Maine corporation interested in all aspects of the geology of the State of Maine.

Correspondence about membership in the Society should be mailed to Robert G. Gerber, Ash Point Rd., South Harpswell, 04079. Items for inclusion in the newsletter may be directed to Roy L. Farnsworth, Dept. of Geology, Bates College, Lewiston 04240.

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