THE MAINE GEOLOGIST

NEWSLETTER OF THE GEOLOGICAL SOCIETY OF MAINE

July, 1998

Volume 24
Number 2

The President's Message

I taught a continuing education course at the University of Maine in the evening for many years called "The Geology of Maine". This went fine, with 10-20 students per year until I was asked to "audition" and make it an Interactive Television class. I was disinclined to do this, but following a first attempt, agreed to do it. It required more work and a different style of presenting material, but the class size grew to more than 50 (which is also to say, more work).

Now I have been asked to incorporate "web material" into the course and to set up a dedicated web page for the course. This too is different and requires real effort in the evening, but it does make some material more available to students. For example, slides of outcrops have a residence time of 30 seconds on the screen during class, but can be downloaded by students from the web site and examined in more detail. It does seem to improve the course, but takes some time to initially prepare.

For next spring I was "invited" to make my "Coastal Geology of New England and the Canadian Maritimes" class a 50% web course. This means I miss only half as many of my kids' Saturday morning sports activities because half of the classes are "on the web" as activities, projects, cyber field trips etc. I read this as changing the course completely, but am going along with it.

Before starting all of this, I felt I needed some background. When I went to look for some examples on the web of geology classes, I was totally over-whelmed! Type "geology field trip" and stand back; there are many of them. John Butler of the University of Houston wrote about geology on the web in the February issue of GSA Today and has a site (**http://www.uh.edu/jbutler/anon/use.html**) that mentions 623 geoscience courses on the web as of fall, 1997!

All of this is by way of introducing a point; why doesn't the GSM get onto its own web site? It does not take much really and we could put our annual field trip and quarterly newsletters there for those who would prefer that. Required is a person willing to help out with this, and a server where we would be physically located. Perhaps we could pay an undergraduate to do some of the "heavy lifting" involved in the initial set up, and then update as we go. I would like to bring this up as a business point at the summer field trip, so come prepared.

If I can recall my high school Latin, the quote was "Oh tempora, oh mores", literally meaning "Oh the times, oh the customs". Suffice to say that times continue to change, and at what appears to me to be a faster and faster pace.

Joe Kelley

The Editor's Message

Please remember that next year will be the **25'th Anniversary of the GSM**. Please submit ideas for appropriate activities such as field trips, conferences and publications to the president, secretary, or me. An idea raised at the spring meeting was a conference featuring and in honor of founders and past presidents of the GSM.

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Geological Society of Maine
Summer Field Trip Meeting
Saturday, August 1, 1998

Dan Lux will lead a field trip on "Pleasant Bay Mafic and Silicic Layered Intrusion."
Meet at 9:00 AM at the junction of Route 1 and the road to Addison, 2 miles east of Harrington and 1.5 miles west of Columbia Falls, at the mini-mall on the south side of Rt. 1.

Sunday, August 2, 1998

Joe Kelley will lead a half-day trip on the "Surficial Geology of the Cobscook Bay area."
Meet at Coobscook Bay State Park at 8:00 AM (4 miles north of Whiting, Route 1, eastern Washington County). Accomodations are available on Friday and Saturday nights at Cobscook Bay State Park. Ask for the GSM group of sites.

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Messages from the State Geologist

Earth Science Week

By Gubernatorial Proclamation, Governor Angus S. King, Jr. has designated the second full week of October (11-17) as Earth Science Week in the State of Maine. This proclamation is part of a national effort, sponsored by the American Geological Institute (AGI) and supported by the Association of American State Geologists, to increase public awareness of geology and how it contributes to daily life. This first annual Earth Science Week was conceived by AGI as part of their 50'th anniversary celebration this year. A dozen states now have gubernatorial proclamations, with several more on

the way. Through these proclamations and Earth Science Week activities, the state geological surveys and other geological institutions hope to:

- Give students new opportunities to discover the earth sciences.
- Publicize the message that earth science is all around us.
- Encourage stewardship of the earth.
- Share our knowledge and enthusiasm about the earth.

I believe it will be worthwhile for each of us involved in the earth sciences to plan some sort of activity during that week to raise the public's awareness of earth science issues. Certainly, some recent events have helped us do that (Rockland land-slide, Windham MTBE groundwater contamination) but these alone are insufficient to really raise the awareness of the valuable contributions earth scientists make to society. We at the MGS are in the process of developing a program for the week (field trips, open house, lectures) which we will publicize through our web site and by other means. The text of our proclamation is already available on our web pages: (**http://www.state.me.us/doc/nrimc/mgs/mgs.htm**) along with links to the AGI site and others participating in Earth Science Week. I plan to set up our web page as a central site for all Maine Earth Science Week activities, so let me know what you are planning! Let's all pitch in and make Earth Science Week a truly meaningful and worthwhile event in Maine!

Robert G. Marvinney, State Geologist

State Geologists Come to Maine

The Association of American State Geologists held its 90th annual meeting in Portland, Maine, June 13-18, 1998, hosted by the Maine Geological Survey assisted by the New Hampshire Geological Survey. State Geologists from 45 states and Puerto Rico attended along with many staff members and guests. Invited speakers included representatives from the U.S. Geological Survey (including Acting Director Thomas Casadevall), the Bureau of Land Manage-ment, National Park Service, Minerals Management Service, the EPA, AGI, and others. Our period of excellent Spring weather broke just as the meeting was getting underway on Saturday, June 13. For 36 hours the meeting host (yours truly) nervously waited for the driving rains to abate before outdoor activities began. Somehow our schedule meshed gears very well with the weather: while meeting indoors all day Sunday, it galed outdoors; when it came time for our Casco Bay cruise on Monday afternoon, the rain dissolved away to a light fog that did little to dampen spirits as we enjoyed a lobster bake on House Island (thanks to Hilda Dudley and crew). Even more co-operative was the weather for our Mt. Washington trip on June 18. Our bus ride began in the rain but as we approached the Cog RR base station the clouds broke and provided views of the summit. By the time we got to the summit, the conditions there were sunny, in the 50s, with little wind! The best summit weather of the season, according to those few hardy souls who live there! Thanks to Dyke Eusden (Bates College), Brian Fowler (North American Reserve), and Woody Thompson (MGS) for developing an excellent geologic tour of the summit.

Lest you should think that the State Geologists only played while in Maine, we spent more than two and one-half days in serious discussion about the goals of the Association, our relationships with federal agencies, opportunities for partnerships, such as the National Cooperative Geologic Mapping Program (NCGMP), and many others. It is through Association-led efforts that we have the NCGMP, which has brought substantial mapping funds to Maine, and the Continental Margins program which provided much of the funding to map inner continental shelf geology.

In spite of the weather all participants had a great time in Maine. Many extended their stays to take in other Maine sights and attractions. Maine presented itself very favorably to all and it could not have been so successful without the enthusiastic assistance of all MGS staff, and special assistant and general gopher, Walter Anderson. Especially helpful were the substantial financial contributions from many of you - representatives of many Maine geoscience-related businesses. My thanks to all.

Robert G. Marvinney, State Geologist

GSM Member News

Geologists on a roll… **Andy Tolman**, **Cheryl Marvinney**, and **John Tewey** will be participating in the Lung Association's Trek Across Maine. **John Tewey** and **Matt Reynolds** also bicycled in the Cancer Society's Tour for a Cure earlier this spring.

Larry Dearborn, formerly with ABB Environmental Services, Inc., is the new geologist in the DEP's Bureau of Remediation and Waste Management. Larry will be focusing on hazardous waste sites at federal facilities.

Speaking of **ABB Environmental Services, Inc**., the company has been bought by and renamed **Harding Lawson Associates**.

Lisa Cote has joined the staff of R.W.Gillespie & Associates at their new office in the Saco Industrial Park. Lisa has a graduate degree in hydrogeology from Boston University and is a native of Waterville.

Andy Tolman has taken a leave of absence from Jacques Whitford to work on the State's Wellhead

Delineation Program. Andy is housed at the Maine Geological Survey.

Art Hussey has officially retired but is continuing to teach part-time at Bowdoin and will be curating the Geology Department's collections.

Rachel Beane has been hired as Art's replacement in the Bowdoin Geology Department and will start teaching this fall. She holds a Ph.D. from Stanford and specializes in high pressure metamorphic rocks associated with subduction zones in the Urals.

In May and September, **Dave Kendall** will be helping lead Elderhostel programs in Rockland. He will be doing 2 days of geology lectures and field trips.

Tom Brennan and **Leo Algeo** have formed Magellan Enterprises, Inc., located on Main Street in Yarmouth, offering hydrogeologic and geologic services.

Sarah Kopczynski (Colby College) received the Walter A. Anderson award for the best oral presentation at GSM's spring meeting for the second consecutive year. **Riley Brown** (Univer-sity of Maine) received the award for best poster.

S.W. Cole has added several geologists to their staff: **Dale Chenette** and **Matt Taylor** in the Gray office, **Jeff McElroy** in Bangor, and **Heather Piper** in Caribou.

Lois Ongley and **Alison Lathrop** (Bates 1990) are taking 11 students to Mexico for field work in July. The group will continue work on an arsenic-contaminated aquifer.

Ann Thayer is now Environmental Manager (and unofficial quarry geologist) at Dragon Products Company in Thomaston.

Please send member news to Carolyn Lepage at clepagegeo@aol.com or PO Box 1195, Auburn, ME 04211-1195 or by fax to 207-777-1370 or just call 207-777-1049.

GSM Treasurer's Report

June 30, 1998

The Society currently has 343 members. Dues are paid up as follows:

2001	37 members
2000	36 members
1999	49 members
1998	41 members
1997	67 members
1996	77 members
1995	27 members
1994	07 members
1993	02 members
Total:	343 members

Unfortunately it is easy to let your dues lapse. The dues date is shown on your mailing label.

Balance on Hand 04/24/98		**$ 9169.05**
Receipts Subtotal		$ 442.00
Dues		$ 330.00
Anderson fund		$ 100.00
Education fund		$ 12.00
Publications		$ 0.00
Short Course		$ 0.00
Expenses subtotal		$ 438.15
Printing		$ 0.00
Bank Charges		$ 10.56
Bulk Mailing Charges		$ 85.00
Spring Meeting Expenses		$ 342.59
Miscellaneous		$ 0.00
Taxes		$ 0.00
Balance on Hand 06/26/98		**$ 9172.90**
Membership Total	**343**	
Regular	280	
Institutional	13	
Associate	24	
Student	26	
Fund Allocation		
Anderson Fund		$ 4372.88
Education Fund		$ 704.70
General Fund		$ 4095.32
TOTAL		$ 9172.90

Respectfully submitted,
Elizabeth A. Champeon, Treasurer

GSM Secretary's Report

GSM Spring Meeting Minutes
University of Maine, Orono, Maine
April 24, 1998
by
Rebecca Hewett

The Spring meeting began with an afternoon open house and tour of the new Bryand Global Sciences Center at the University of Maine. The items listed below were discussed at the meeting:

1. Fall 1997 Meeting Minutes: accept as is.

2. Treasurer's Report: as of April 24, 1998 -- Total Balance $9,169.05. More than half is the Walter Anderson Fund.

3. Date on Mailing Label: Is the date your annual dues are paid up to. Check date and pay the dues you owe to bring you up-to-date.

4. Short Course: Geology of Maine Short Course done last fall. Fall 1998 planning a short course on environmental geology. Plan to announce in August

1998, conduct it in October 1998 in Augusta, Maine at the University of Maine at Augusta campus. Need to approve doing, a list of speakers and an agenda by the summer meeting. Suggested topics are mines, gravel pits, water quality and coastal issues.

5. Summer Field Trip 1998: The next meeting is the Summer Field Trip, on the weekend of August 1 & 2, 1998. The field trip will be to the downeast area. Dan Lux and Joe Kelley will lead; camping in the Cobscook Bay State Park.

6. A place is needed for Research Collections (maps, rocks, thin sections, notes, etc.) from retired geologists, maybe in the basement of the Bryand Global Sciences Center building at the University of Maine.

The collections need to be organized, maybe jointly by the GSM, University and the Survey. Maybe a student could be hired to organize the collections. Walter Anderson will chair a committee to assess what we would be dealing with. He will report back at the next meeting what is out there to be dealt with.

7. Organization for meetings: Difficult task, maybe we should look ahead more in planning meetings so they are organized better or more easily. Also, next year in the 25th anniversary of the GSM organization. Any volunteers to host the Fall 1998 meeting?

8. Disposition of the Walter Anderson Award: It is to go where the spring meeting is held and remain there for the year.

9. Certification Board: Must take the National Exam. The Board is writing rules and the local knowledge section of the exam is being written. Also, Andy Tolman is working on well head protection area of sand & gravel aquifers. He is located at the Survey @ 287-7173.

10. Student Presentation Awards:

Poster: Riley Brown, University of Maine

Oral: Sarah Kopczynski, Colby College

11. Walter Anderson stated the Geology of Maine Short Course held last fall was great, and Joe Kelley did a great job.

12. Meeting adjourned.

Following the business meeting was a social hour and dinner. Then, Brenda Hall, Post-Doctoral Associate, University of Maine Institute for Quaternary Studies gave a talk entitled "Abrupt Climate Change From a Southern Hemispheric Perspective."

Student Abstracts from the Spring 1998 Meeting April 24, 1998 University of Maine, Orono, ME

CLAY MINERALOGY FINDINGS FROM A CORE TAKEN FROM WARWICK POND, BERMUDA

BAYLES, **Simeon H.; ALLEN, Donald B.,** and **RUEGER**, **Bruce F.,** Dept. of Geology, Colby College, Waterville, ME 04901-8858

Warwick Pond is the largest continually nonmarine pond on Bermuda. The pond rests on the Town Hill Fm, one of five aerially exposed calcarenite units on Bermuda which is overlain terrestrially by the red Ord Road Paleosol. A 247-cm core with a basal date of 2450 ± 55 yBP was sampled at 10-cm intervals for mineralogic analysis.

The Ord Road Paleosol may represent the sediment at the base of the core. These paleosols are believed to have source areas in the Sahara Desert, the Mississippi River Valley and possibly the Great Plains. Geochemical analysis by Herwitz et al.(1996) showed that the Sahara Desert provided the clearest chemical signature as a source area of the sediments in the red paleosols. Clay minerals in the eolian dust from this source area are kaolinite, chlorite, mica, smectite, calcite and quartz (Herwitz and Muhs, 1995).

In Warwick Pond, the upper 146 cm was dominated by calcite and quartz with peat from 146 cm to 174 cm depth. The basal part of the core from 174 cm to 247 cm was dominated by clay. Analysis of the core samples using x-ray diffraction, provided evidence of the presence of clinochlore and kaolinite in the basal clay section of the core. Quartz and calcite also gave off strong diffraction patterns throughout all levels of the core sample except for the peat layer.

Minerals found specific to the aerosol dust from the Sahara include quartz, mica, kaolinite, chlorite and calcite (Herwitz and Muhs, 1995). The x- ray diffraction analysis carried out on the Warwick Pond core samples found strong evidence for the presence of calcite, quartz, kaolinite and clinochlore. The mineralogy of the core samples matched very closely that of the red paleosols on the island as well as the proposed primary source area in the Sahara Desert. While vermiculite was reported in other areas of Bermuda in more definitive studies of the island's clay mineralogy (Ruhe et al., 1961), none was encountered in this investigation.

HOLOCENE LAKE LEVEL CHANGES AT MANSELL POND, MAINE

BROWN, Riley, Department of Geological Sciences, University of Maine, Orono, Maine 04469, rbrown51@maine.maine.edu; **ALMQUIST-JACOBSON, Heather**, Department of Geological Sciences and Institute for Quaternary Studies, University of Maine, Orono, Maine 04469,

almquist@maine.maine.edu; **SANGER, David**; Department of Anthropology and Institute for Quaternary Studies, University of Maine, Orono, Maine 04469, sanger@maine.maine.edu

Mansell Pond is a small [4 ha] kettle lake located within an esker complex in central Maine [45°02'30" N, 68°44'00"]. The basin is isolated from the local groundwater table by clay drape sediment that was deposited during a marine transgression ca. 11,000 radiocarbon years ago (YBP). Holocene lake level fluctuations are interpreted from changes in sediment type and plant macrofossil content of eight sediment cores collected along a littoral to sub-littoral transect.

Radiocarbon dating of these changes reveals that lake level was 6 to 7 m lower than today from 9,000 to 7,000 YBP. It fell to a maximum low stand of 9 m below the present level between 7,000 and 6,000 YBP and remained low until between 6000 and 5000 YBP. Lake level rose rapidly (4.5 m) from 5000 to 3000 YBP and remained relatively stable at 3 m below the present level from 3000 to 1000 YBP. During the past 1000 years, lake level has risen ca. 3 m and an irregular floating mat has developed along the lake margin.

The results show three stages of relatively dry climate conditions in central Maine. The first was prior to 9000 YBP, when lake levels fell from an early post-glacial high stand. The second was centered around 6000 YBP, when lake levels were at the maximum low stand. The third was from 3000 to 1000 YBP, when the late Holocene lake level rise was temporarily arrested.

A PALEOCLIMATE STUDY OF GLACIAL AND POST-GLACIAL SEDIMENTS, SHINGOBEE LAKE, MINNESOTA

DANIELSON, Kurt, Geology Department, Bates College, Lewiston, ME

A sixteen-meter sediment core taken from Shingobee Lake, north central Minnesota, reveals changes in sedimentary patterns during the late Pleistocene and Holocene. The lithology of the bottom 5 meters of the core contains surge-type deposits bedded with sections of laminations that have been interpreted to be varves. At 1135.5 cm core depth a surge deposit comes into sharp contact with a 1.3 m section of laminations above, which are also interpreted to be varves. This contact is well-recorded in magnetic susceptibility, grain size, loss-on-ignition, and mineralogy analyses as a large and sudden change in the sediment composition. This contact indicates a catastrophic event, marking the end of large allochthonous sedimentary input into the lake basin. The varves continue up to about 980 cm depth, where a transition begins to more homogenous material. The presence of varves below and above the contact indicates a period of meromixis in the lake, possibly caused by higher lake levels that joined several of the basins in the Shingobee River watershed. The varves are replaced by zones of frequent, and then occasional, white laminations, indicating that with the infilling of the basin, stratification in the lake was no longer strong enough to preserve varves. An olive-brown homogenous gyttja replaces the zone of occasional laminae at 580 cm depth and continues to the top of the core. Higher and more variable magnetic susceptibility and grain sizes, along with lower loss-on-ignition in the top 1.3 meters of the core suggest an increase in lake level that exposed new shoreline areas to erosional processes.

POPULATION DYNAMICS OF OSTRACODE AND GASTROPOD SPECIES IN ORGANIC-RICH SEDIMENTS FROM WARWICK POND, BERMUDA

DREISBACH, **Erik T.,** and **RUEGER, Bruce F.,** Dept. of Geology, Colby College, Waterville, ME 04901-8858

The upper 1-m of a core taken from Warwick Pond, Bermuda was analyzed at 10-cm intervals for the abundance of invertebrate life. Warwick Pond, centrally located on Bermuda, is a large (1.66 ha) brackish water pond. An age of 1000 yBP at 1 m depth was estimated using sedimentation rates from a core taken 5 m away with a basal AMS ^{14}C date at 2.47 m of 2450 ± 55 yBP. Volumetric samples (cc) were freeze-dried and sieved through 1.0 and 0.5 mm screens. All gastropod and ostracode specimens > 0.5 mm were extracted and counted.

The core contained one gastropod species, *Hydrobia bermudensis* and one brackish water ostracode species, *Cyprideis* sp. Molting of ostracodes results in vast quantities of small juvenile carapaces in fractions < 0.5 mm that were not included in the numerical data; ostracodes counted represent the adult population. *Cyprideis* sp. ranged from 2.2 to 50.4 individuals/cc. Few gastropods were found in the <0.5 mm samples. *Hydrobia bermudensis* ranged from 0.13 to 23.6 individuals/cc. The percentages of each species relative to the total number of specimens were then compared over the length of the core. The data collected indicated an initial increase in gastropod population and decrease in ostracode population. At a depth of 0.3 m a sharp increase in the ostracode population and subsequent decrease in the gastropod population occurred. Cause for this change may be related to salinity changes or the human occupation of Bermuda, which began about 300 years ago.

These data suggest that in a confined environment like Warwick Pond, with limited nutrients and living space, fluctuations of one species' population are significantly influenced by changes of biotic or abiotic nature.

EFFECTS OF CLEAN AIR ACT REGULATION: COMPARING HIGH ELEVATION ORGANIC SOIL CHEMISTRY FROM VERMONT TO QUEBEC IN 1979 AND 1996

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High elevation organic soils were sampled in 1996 along a transect from Vermont to the Gaspé Peninsula, Quebec, and analyzed for total Ca, Mg, Mn, Pb, and pH. Samples were

also collected from the same sites and analyzed for the same parameters in 1979. Most data are from analysis of forest litter (0_i), but at Goose Eye, Maine, soil cores were separated into litter, fermentation, and humic layers. Only Pb concentration and burden changed significantly through time in the soil cores. Lead decreased from 113 to 35 and from 140 to 70 µg/gdw in the litter and fermentation layers, respectively. Lead increased from 59 to 91 µg/gdw in the humic layer.

In 1979, Pb concentration in the litter decreased strongly from southwest to northeast. Decreases in Pb from 1979 to 1996 range from 195 to 37 µg/gdw at Killington Peak, Vermont, to 61 to 41 µg/gdw in Quebec. Soil pH has changed little, except at Killington, where pH increased significantly from 3.3 to 3.5. Calcium and Mg increased from southwest to northeast in 1980. Hanson (1980) interpreted the trends as being caused by stronger leaching of exchangeable cations at the lower pHs present to the southwest. Calcium, K, and Mg concent-rations were not statistically different between from 1979 and 1996. At Killington and Katahdin, Maine, Mn increased signif-icantly from 49 to 105 µg/gdw and 259 to 559 µg/gdw, respectively.

A dramatic reduction of Pb emissions since 1979 has reduced the concentrations of Pb in litter of high elevation soils. The peak concentration for Pb in the profile has migrated downward as organic matter continues to accumulate. However, although reduction of SO_x has increased the pH of precipit-ation along the transect, the 1979-1996 comparison indicates that recovery of the concentrations of Ca, K, and Mg in organic soils will be a slow process due to continued leaching and slow restoration of base saturation (exchangeable cations) in the organic soil.

BIOSTRATIGRAPHY OF ORGANIC-RICH HOLOCENE SEDIMENTS FROM LOVERS LAKE, BERMUDA

HAMZI, Walid M., and **RUEGER, Bruce F.,** Dept. of Geology, Colby College, Waterville, ME 04901-8858

Lovers Lake is a marine pond in the southwestern corner of St. George's Island, Bermuda. A cavern system in the deepest part of the lake connects it with the Atlantic ocean. In this study, a 1-m core was taken, and was then sampled at 5-cm intervals. The volume of each sample was recorded in cubic centimeters (cc), and samples were freeze-dried and all invertebrate fossils and seeds were extracted. An AMS ^{14}C date of 3800 ± 50 yBP was determined a 0.78 m depth in the core.

The flora and fauna in the core were dominated by a single species of ostracode in the brackish water genus*Cyprideis* and an unidentified seed. *Cyprideis* sp. abundance ranged from 0.0 to 66.0 individuals/cc, with highest abundance concentrated between depths of 0.40 to 0.65 m. Seed abundance ranged from 0.0 to 28.5 individuals/cc, with the highest abundance concentrated between 0.45 and 0.70 m. Between 0.80 and 0.90 m the fauna was dominated by forams of the suborder *Textularina* sp. A, whose abundance ranged from 11.5 to 18.9 individuals/cc. Also present in the samples were eleven species of foraminifera, and although diversity was high, the abundance of most of these was quite low.

Distribution of forams, ostracodes and seeds has allowed the zonation of the core into three distinct assemblage zones. The upper zone, from 0.0 to 0.35 m, has scant fossil remains, but is designated the *Broeckina* zone. The *Cyprideis* - seed zone extends from 0.35 to 0.75 m depth, which may represent a brackish water interval in the history of the pond. The *Textularina* sp. A zone is the basal zone and extends from 0.75 to 0.90 m depth. These changes in species zonation through the section may reflect changes in environment as sea level has risen over the past 3800 years.

HYDROGEOCHEMICAL INVESTIGATION OF ROAD DE-ICING SALT ON GROUNDWATER IN WINTERPORT, MAINE

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Sodium and chloride concentrations measured in groundwater samples from domestic wells in Winterport, Maine since 1986 indicate that a nearby salt storage facility has impacted groundwater quality. The goals of this study are: 1) to characterize the impact of a leachate from deicing salt storage facility on groundwater quality, 2) to use a salt (NaCl) plume to characterize mass transport in a fractured bedrock aquifer, 3) to utilize hydraulic and chemical data to characterize groundwater movement in a fractured bedrock aquifer overlain by glacial deposits, and 4) to identify chemical processes caused by interaction of the NaCl-rich solutions with geologic materials. The extensive time-series water chemistry data will be combined with new geochemical data, soil properties, water-table maps, and geophysical data to examine the contaminant concentrations and their changes through space and time.

SUSPENDED SEDIMENT INVESTIGATIONS AT THE MATANUSKA GLACIER, SOUTH-CENTRAL ALASKA

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A medium sized glacier, the Matanuska is unique because conduits discharging sediment-laden water are exposed at the terminus and can therefore be instrumented to obtain pure suspended sediment data. Sediment concentrations from different conduits were determined for the 1997 May-Sept. melt season as well as total sediment yield and net sediment deposition on the pro-glacial floodplain. The data also allowed for the re-evaluation of Borland's (1961) empirical value.

Matanuska river discharge varied from 440 cfs to 5,296 cfs averaging 2,51 1 cfs over the season. Suspended sediment load varied from 395 tons/day to 44,587 tons/day averaging 10,346 tons/day over the season. Measurements indicate 1,362,026 tons of suspended sediment discharged from the terminus while only 1,344,999 tons passed through a sampling station 1 mile downstream, indicating net sediment deposition of 0. 1 inches in the basin.

Early season trends in suspended sediment concentrations indicate discordant relationships between the different conduits until the middle of the summer when the concentrations

fluctuate in harmony. Suspended sediment concentration drops suddenly for 1 hour at peak diurnal discharge, a probable result of increased melting of debris poor surface ice.

Borland (1961) computed an empirical value (λ) which estimated sediment yield at the terminus of a typical south-central Alaskan glacier to be 65 acre-ft/mi^2 /year. However, application of 1997 Matanuska data indicate Borland's interpolated value is 87% too high.

EPIDOTE NODULES IN THE SHEETED INTRUSIVE COMPLEX OF THE TROODOS OPHIOLITE, CYPRUS

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Massive epidotization of the sheeted dikes of the Troodos ophiolite has been identified as fossil upflow zones that fed hydrothermal fluid to 'black smokers', now present as massive sulfide deposits. The flow of hydrothermal fluids turned greenschist-altered diabase into epidosite, a rock composed almost entirely of epidote and quartz. Within some of the epidotized areas, 0.5 mm to 12 cm epidote nodules are found in both the epidosite and the diabase dike. In general, the epidote "eggs" are in sharp contact with the groundmass, are very spherical or ovoidal, commonly zoned, and primarily composed of epidote, which is coarser-grained and more abundant than in the groundmass, and quartz. The nodules were separated petrographically into three types: (1) Type A nodules showing characteristics that indicate growth into a void, such as euhedral crystals and growth impingement structures, (2) Type B nodules showing overgrowth characteristics that retain the textures of the original diabase, (3) Type C nodules showing type B overgrowth attributes but containing a small type A core.

The smaller type A nodules are identified as amygdules. The metasomatic front and overgrowth textures seen petrographically indicate a diffusional process of formation. It is possible that the type A “eggs" represent a seed for the growth of the larger type B "eggs." The epidote nodules formed in an event distinct from the massive epidotization, possibly before the epidotization. Initial growth of epidote along voids and fractures could have led to the formation of the epidote nodules or the massive epidotization.

SEDIMENT AND FLOW CONTROLS ON SALT-MARSH TIDAL CHANNEL MORPHOLOGY, NONESUCH RIVER, MAINE

PAVRI, Eric H., Geology Dept., Bowdoin College, Brunswick, Maine 04011 (epavri@arctos.bowdoin.edu)

The Nonesuch River is one of three converging drainages which dissect Scarborough Marsh, a 1200-hectare salt marsh approximately 10 km SW of Portland, Maine. The Nonesuch exhibits a strong tidal influence, including semidiurnal flow reversals on its downstream sections.

Map and air-photo analysis of the channel, together with total-station, GPS, and bathymetric field surveys, reveals several distinct longitudinal trends. Channel sinuosity is low near the mouth, high several kilometers from the coast, and low further inland. Width/depth ratios decrease upstream, corres-ponding with a shift from classic point bar/cut bank morph-ology to a deep V-shaped channel to a narrow U-shaped channel.

Grain size (as expressed by % fines <63 microns) of both bed and bank material increases downstream, with some variation due to localized sources of sand on upper stretches. Both bed and bank sediment exhibit a consistent fining trend toward the outside of individual meanders. This pattern can be explain-ed by a combination of several processes, including sandy point-bar deposition on inner banks, muddy bench deposition on outer banks, and gradual incorporation of muddy slump blocks into the outer portion of meander beds.

Stage and velocity were closely tracked at five stations over full tidal cycles. Flood flow is consistently faster and shorter than ebb flow, with these effects decreasing with distance from the river mouth.

Statistical correlation of sinuosity, width/average depth ratio, and channel cross-sectional area with sedimentological and flow regime variables reveals significant correlations between these morphological features and bank percent fines, peak discharge, and the ratio of peak flood velocity to peak ebb velocity.

SUSPENDED SEDIMENT LOAD IN THE CARRABASSETT STREAM, CANAAN, MAINE

PEARSALL, Adam E., Dept. of Geology, Colby College, Waterville, Maine, 04901

Discharge and suspended sediment load on the Carrabassett Stream in Canaan, Maine, were measured for 27 continuous weeks between September 17th, 1997 and March 13th, 1998, at two sites approximately one mile apart. Spring water temperature averaged 6°C, with a pH of 6.7. Discharge varied from 2.4 cubic feet per second (cfs)[0.07 cubic meters per second (cms)] to 791 cfs (22 cms) at the fourth-order upstream site, and 6 cfs (0.2 cms) to 1635 cfs (46 cms) at the fifth-order downstream site. Suspended sediment load varied from 3 kilograms per day (kg/day) to 5030 kg/day at the up-stream site, and from 11 kg/day to 6110 kg/day at the down-stream site. Approximately 173 tons (157 tonnes) (approx-imately 2050 ft^3) of sediment, consisting mainly of quartz, clinochlore, muscovite, albite, and organic particles (determined by x-ray diffraction), were transported during the sampling period. The average rate of erosion over this 7-mi^2 (18-km^2) drainage [below several hydroelectric dams] for the past 27 weeks is 1.2 x 10-5 mm per week (3.2 x 10^{-3} mm/27weeks). This is a significant amount of fine sediment that can be transported to and potentially deposited in the Kennebec River system or on the coast.

MEMBERSHIP DUES STATEMENT

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

The Society holds three meetings each year, in the late fall (Annual Meeting), early spring, and mid-summer (usually field trips). A newsletter, ***The Maine Geologist***, is published for all members three times a year. The Society year runs from August 1 to July 31. Annual dues and gift or fund contributions to the Society are tax deductible. There are three classes of memberships:

$7.00	REGULAR MEMBER	Graduate geologists, or equivalent, with one year of practice in geology, or with an advanced degree.
$6.00	ASSOCIATE MEMBER	Any person or organization desirous of association with the Society.
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1998/99 SOCIETY YEAR BEGINS AUGUST 1 - PLEASE SEND DUES TO TREASURER

THE GEOLOGICAL SOCIETY OF MAINE
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Address Correction Requested

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