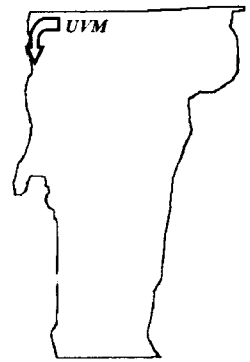
THE GREEN MOUNTAIN GEOLOGIST



QUARTERLY NEWSLETTER OF THE VERMONT GEOLOGICAL SOCIETY

SPRING, 1995 VOLUME 22 NUMBER 2

The Vermont Geological Society Spring Meeting for the PRESENTATION OF STUDENT PAPERS

SATURDAY APRIL 29, 1995, 8:30 AM

Room 1, Calkin Building
University of Vermont

See Inside For Details.

Inside This Issue

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The GREEN MOUNTAIN GEOLOGIST

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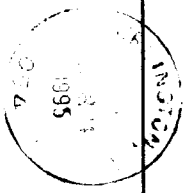
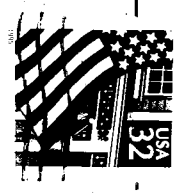




PRESIDENT'S LETTER

April 19, 1995

Dear Members,

Spring student presentations are here and we are pleased to feature sixteen very promising papers from Vermont's future geologists. The range of topics stretches from structural through geochemistry and minerology to geomorphology, with study areas that reach from close to home, encompass much of North America, and into the South Atlantic! I hope that you can join us on the 29th for what promises to be an excellent program.

We are still searching for suitable Summer and Fall field trip topics, and field trip leaders. Please contact me or any other member of the executive committee with your ideas or suggestions. Also, we need you to start thinking about your future role within the Vermont Geological Society. This organization is structured totally upon volunteerism. A number of positions will be open for election at our annual Fall meeting; please consider contributing some of your valuable time to keeping the VGS strong.

I hope you take the time to read Thomas Bell's guest viewpoint in this issue. I was going to dive headfirst into the USGS issue in this editorial, but Mr. Bell - the publisher of *U.S. Water News,* has already summed up many of the issues. He was kind enough to grant permission to reprint his editorial. Although Mr. Bell's opinions are centered around the role of the USGS in respect to water resources, we know how important a role the Survey plays in all aspects of geological research throughout this country. If the Survey were eliminated, as has been proposed by some members of Congress, there really is no other agency capable of absorbing and integrating the pivotal role that the Survey provides. The costs to us as a nation truly would be immeasurable. Yes, we should advocate responsible fiscal management in our federal government. And if that means paring down the USGS budget, along with those of other federal agencies, so be it. But to eliminate the Survey would be a folly so great that its detrimental effects will be felt for generations.

It may be true, as I have heard, that geologists are, as a scientific order, a bunch of independent cusses not prone to take political stances (*I think that came out of the dictionary of geologic terms under "Geologist"*), but the very soul of our profession - indeed our very basis for recognition as professionals, is being threatened by people who have no conception of the role that geology plays in the structure of this nation's fabric. It is time that we, as individuals, begin to take a stance and let our voices be heard in Washington. No one else is going to stand up for us; as scientists, we have never cottoned to professional lobbying organizations. It is therefore vital that we all contact our representatives and voice our opinions. Yes, use the phone preliminarily, but be sure to put your thoughts on paper, too. It is the volumes of mail that really impact the decisions our elected officials make. As constituents, it is our social responsibility to tell our government what we want, or we will only end up doing what others have decided for us.

Our Representative and our Senators work for us (*or at least they are supposed to*), so let's let them know what direction they should be going in. Elsewhere in this issue, there are listed the names, addresses and phone numbers of our representatives by proxy in Washington. Please take the time today to inform them of your feelings. And, if you feel that this is an appropriate stance for the VGS to take officially, please call and let me know; I will be pleased to present our position with your guidance.

Sincerely,
Kent S. Koptiuch

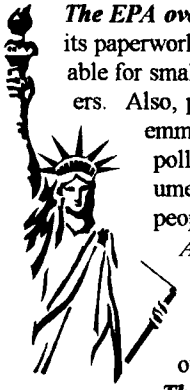
THE GREEN MOUNTAIN GEOLOGIST Volume 22, Number 2, Spring 1995

INDUSTRY & COMMUNITY NEWS

Citizens Utility is still seeking to renew it's license to operate hydroelectric generating stations on the Clyde River in the Northeast Kingdom. The Federal Energy Regulatory Commission (FERC) recently ruled that Citizens must remove the remains of breached dam #11 in Newport as a condition for the renewal of the 40 year license. Citizens has agreed to take down the dam, however, they are currently seeking approval from FERC to funnel water to the #11 powerhouse through a ½ -mile system of pipes and/or penstocks. This would again effectively bypass the riverbed and leave steelhead, trout, and landlocked salmon fisheries proponents high and dry. Citizens has indicated a willingness to negotiate how much water they would allow to remain in the riverbed.

The Palisades Landfill in Moretown has yet to come up on the auction block. A federal appeals court postponed the scheduled U.S. District Court Auction in Rutland last month due to a last minute appeal filed by the Mariden Corporation (a potential buyer and major creditor of the landfill) of Appalachin, New York. Palisades operator, Robert Dowdell, was barred by the DEC from operating any landfill in Vermont for the next ten years in November 1994 due to alleged repeated environmental violations at the site. The owners of the landfill, Rainbow Trust, are approximately $4.5 million in debt. A minimum bid of $3.5 million had been set by U.S. Bankruptcy Judge Francis Conrad

GOVERNMENT



The EPA overhaul as proposed by President Clinton includes a mandate to reduce its paperwork requirements by 25%. In addition, a waiver of fines would be available for small business that rectify violations in good faith, or are first-time offenders. Also, provisions have been made to promote EPA multi-media permits and emmissions trading. Considerable revisions and consolidations in the air pollution rules have been prepared; Clinton hopes to discard multiple volumes of federal rules. His thrust is to "...set clear goals and challenge people to come up with their own ways to meet them."

A Wetlands Regulatory Reprieve is in sight for some property owners. EPA has agreed to reform programs to allow small businesses to expand wetland impact up to two (2) acres without having to provide off-site mitigating options. Still no compensation in sight for property owners whose real estate values are decreased by wetlands delineation.

The January 13, 1995 Federal Register includes amended RCRA Subtitle C provisions for testing and monitoring activities. The amendment includes Update II with new and revised methods for EPA Publication SW-846, "*Test Methods for Evaluating Solid Waste, Physical, Chemical Methods.*" In addition, SW-846 Third Edition, with Updates I, II, and IIA have been incorporated into 40 CFR 260.11(a) in a move to promote cost-effectiveness and flexibility.

Proposed Changes in Phase III Land Disposal Restrictions (LDRs) by EPA will cover wastes managed in Clean Water Act systems and Class I underground injection wells. The proposed concentration-based treatment standards apply to hazardous constituents in ignitable, corrosive, reactive, and toxic wastes.

SPRING MEETING PROGRAM

Room 1, Calkin Building
University of Vermont, Burlington, Vermont
Saturday, April 29, 1995

8:30 ***Registration, Coffee & Doughnuts (provided)***

9:00 **Amy B. Church,** and Paul R. Bierman: ***Holocene Fan Deposits in Northwestern Vermont.***

9:15 **Merideth L. Frinsko:** ***Grain Size Analysis of Amazon Deep Sea Fan Sediments and the Relationship to Physical Properties in Seismically Inferred Architectural Units.***

9:30 **Happy Hazelton:** ***The Use of Grain Size Analysis in Determining Sediment Transport of the Amazon Deep-Sea Fan.***

9:45 **Mathew J. Luecke:** ***Sediment Dynamics Within A Furrow Field East of Valcour Island, Lake Champlain.***

10:00 **Brian K. Perry:** ***Net Flow Volume Estimations Between the Northeast Arm and Main Lake Champlain, Vt.***

10:15 **Schuck, Russell:** ***Origin of Arsenic in Arrowhead Mountain Lake, Northwest Vermont.***

10:30 **Eric D. Simpson:** ***Changes in Flood Magnitudes and Processes in Northeastern Yellowstone Park.***

10:45 **James R. Anderson:** ***Stream Terraces of Lower Soda Butte Creek, Yellowstone National Park.***

11:00 **Coffeebreak**

11:15 **Darin Desilets:** ***Depositional Environment and Structure of the Pinnacle Formation and Fairfield Pond Formation Near Osgood Hill Road, Westford, VT.***

11:30 **Lars C. Cherichetti:** ***Stratigraphic Variations in the Oak Hill Group of Quebec and Vermont: Implications to Rift History of Iapetus.***

11:45 **Jonathan L. Goldberg,** Charlotte J. Mehrtens, and Ann C. Hadley: ***A Sequence Stratigraphy Interpretation of the Monkton Quartzite and Rugg Brook Formation, Western Vermont.***

12:00 **L. Alexis Richardson:** ***The Standing Pond Volcanics(?) in Northeastern Vermont***

12:15 **Gordon H. McGrath:** ***The Metamorphic Contact Aureole of the Victory Pluton, Northeastern Vermont.***

12:30 **Daniel C. Pope:** ***Finite-Difference Tomography of the San Francisco Bay Area: Three Velocity Models.***

12:45 **Kara N. Sweeney:** ***Geochemistry and Mineralogy of Mine Tailings in Colorado***

1:00 **Amy E. Young:** ***Miocene Volcanism in Southeastern Oregon: Geochemistry and Tectonic Implications.***

1:15 **VGS Executive Committee Meeting:** ***All members are welcome to brown-bag a lunch and join the Executive Committee to discuss VGS business!***

2:00 **Meeting Adjourns.**

SPRING MEETING ABSTRACTS

(in Alphabetical Order)

STREAM TERRACES OF LOWER SODA BUTTE CREEK, YELLOWSTONE NATIONAL PARK

Anderson, James R., Department of Geology, Middlebury College, Middlebury, VT, 05753

This study investigates the characteristics of stream terraces of lower Soda Butte Creek in northeastern Yellowstone National Park, Wyoming. The 256 km^2 drainage basin of Soda Butte Creek consists of steep-walled glacial troughs that produce a high sediment supply, thus much of the stream is constricted between valley-side alluvial fans. The 5.5 km-long lower valley between the Trout Lake landslide (a large late Pinedale debris avalanche) and the Lamar River confluence has more gentle side-slopes and a wider floodplain with well-formed fluvial terraces. Snowmelt produces the majority of annual runoff. Most of the Soda Butte Creek channel exhibits a braided pattern. Downcutting of Soda Butte Creek through glacial outwash deposited in the late Pinedale has formed seven distinct terraces: T0, T1a, T1b, T2, T3a, T3b, and T4, which were mapped on 1:6000 air photos. T0 is the outwash surface and the T4 is the youngest terrace. Long profiles and cross profiles of the terraces were surveyed with a laser theodolite. The data were then converted to UTM grid locations and plotted in map and profile view.

The survey data show that the terraces are paired, thus were formed by episodic (as opposed to continuous) downcutting. Stratigraphic relations reveal that the terraces are fill-cut in nature. Terrace treads formed during periods of vertical stability when the creek was eroding laterally, apparently during generally cooler and wetter periods. Slump reactivation of the Trout Lake landslide debris occurred sometime during the formation of the T3 terraces (2000-1200 yr BP). Shortly after slumping, the stream overtopped and rapidly incised the slump debris. Although the level of Soda Butte Creek was raised by several meters in the slump area, downstream aggradation due to point sediment loading by slump debris appears to have been minor. Channel armoring by boulders within the slump material, however, has retarded downcutting within the slump area and a few hundred meters below it. This control on downcutting may explain why terrace profiles diverge slightly downstream. The terraces display nearly constant gradients along the lower valley. Gradients decline only in the last 1-2 km before the Lamar River confluence, indicating that the upstream extent of this local base level control is limited. An outcrop of volcaniclastic bedrock approximately 2 km upstream from the confluence also has had a limited effect on terrace characteristics. Results of this study suggest that discharge variations in Soda Butte Creek are probably the dominant control on terrace formation and geometry, and that sediment size and load and local base level controls are of secondary importance.

NEW EVIDENCE FROM NORTHWESTERN VERMONT SHOWS ABRUPT STRATIGRAPHIC VARIATIONS IN THE OAK HILL GROUP OF THE QUEBEC REENTRANT: IMPLICATIONS FOR RIFT BASIN MORPHOLOGY

Cherichetti, Lars C., Department of Geology, University of Vermont, Burlington VT 05405

Understanding the sediments deposited during initial subsidence is key to understanding the morphology of the Iapetan rift basin the Quebec Reentrant of the Appalachians. The Pinnacle Formation is the first rift clastic sediment deposited in this rift basin and is therefore tied to initial subsidence. The Pinnacle exposed in the Oak Hill Group (west of the Brome thrust) is of lowest greenschist facies metamorphism allowing the recognition of original depositional features. This study examines the Pinnacle Formation in northwestern Vermont in order to constrain changes in thickness and grain size from Quebec to west-central Vermont.

The Pinnacle Formation thickens drastically from north to south. New evidence from northwestern Vermont shows this transition as abrupt between relatively thin (200 m.) Pinnacle in southern Quebec to relatively thick (2,000 m.) Pinnacle in northwestern and west-central Vermont.

The Pinnacle Formation coarsens drastically from fine/medium sand in southern Quebec to medium/coarse sand and cobble/boulder conglomerates in northwestern and west-central Vermont. The depositional environment for the Pinnacle Formation in southern Quebec has been described as deltaic to nearshore marine. In Vermont the deposition of the Pinnacle is interpreted as alluvial to fluvial. The more-proximal, thick fluvial/alluvial deposits of Vermont suggest greater initial subsidence than the more-distal, thinner deltaic/marine deposits of southern Quebec.

This evidence suggests the Pinnacle Formation of southern Quebec was deposited on the upper plate of an asymmetric half graben with little initial subsidence. The Pinnacle of northwestern and west-central Vermont, on the other hand, suggests deposition on the rapidly-subsiding lower plate of an asymmetrical half graben. An accommodation zone between the oppositely dipping breakaway faults appears to be located in northern-most Vermont.

HOLOCENE FAN DEPOSITS IN NORTHWESTERN VERMONT

Church, Amy B. and Bierman, Paul R., Dept. of Geology, University of Vermont, Burlington, VT 05405

We present the first detailed description of a humid-temperate fan deposit in northeastern Vermont, including new data characterizing fan depositional activity and aggradation rates during the past 8,900 sidereal years. The fan we studied contains abundant organic material suitable for radiocarbon dating. Fan aggradation rates were constrained using calibrated radiocarbon dates obtained from wood and charcoal exposed within two trenches and from estimated volumes of sediment deposited on the fan during specific time periods. We found average aggradation rates were high during the early Holocene (8,900-8,100 ybp; 4.4 $m3y^{-1}$), lower (0.5 $m3y^{-1}$) for the next 4 ky and lower yet (0.23 $m3y^{-1}$) during for the following 4 ky. During the last 250 years of fan existence, coinciding with the time of colonial settlement and land use changes in Vermont, the average fan aggradation rate was higher than it had ever been, 6.1 $m3y^{-1}$. Grain-size analyses of depositional units within the fan suggest, by analog to a study of humid fans in England by Wells and Harvey (1987), that deposition on Vermont fans occurs by transitional- and stream-flow processes.

STRATIGRAPHY, DEPOSITIONAL ENVIRONMENT AND STRUCTURE OF THE PINNACLE FORMATION AND FAIRFIELD POND FORMATION NEAR OSGOOD HILL ROAD, WESTFORD, VERMONT

Desilets, Darin, Department of Geology, University of Vermont, Burlington VT 05405

Field mapping, at a scale of 1:6,000, has given insight into the stratigraphy, structure, and deformational history of the Pinnacle Formation in the vicinity of Westford, northwestern Vermont. The Pinnacle Formation in this area consists of a massively bedded wacke with several isolated units consisting of large quartz clasts, intraformational slate clasts, and cobbles. The massive wacke and conglomeratic horizons suggests alluvial or submarine fan deposition adjacent to basement uplands exposed during rifting. Based on the large size quartz clasts and the abundance of blue quartz, provenance is presumed to be from a local proto Adirondack source area. The nature of the transition from the Pinnacle Formation to the overlying finer grained Fairfield Pond Formation changes significantly along strike. In the southwestern portion of the field area the transition from Pinnacle to Fairfield Pond is gradual. The identification of a transitional unit consisting of fine sands characterizes the contact in this area, elsewhere in the study area the transition is abrupt.

Deformation during the Taconic Orogeny (D_2) has produced a series of open to tightly folded synclines and anticlines gently plunging to the south. The eastern limit of the Fairfield Pond Formation in this area is defined by the Brome Thrust, where it is expressed as the shearing out of the eastern limb of a west verging anticline. D_3 crenulations have since refolded D_2 cleavage.

GRAIN SIZE ANALYSIS OF AMAZON DEEP SEA FAN SEDIMENTS AND THE RELATIONSHIP TO PHYSICAL PROPERTIES IN SEISMICALLY INFERRED ARCHITECTURAL UNITS

Frinsko, Meredith L., Department of Geology, Middlebury College, Middlebury, VT 05753, and ODP Leg 155 Shipboard Scientific Party

The Amazon Fan extends 700 km off the continenal shelf near the northeastern coast of Brazil. The building of the fan has been influenced by changes in sea level due to glaciation since the Miocene. The majority of the fan was deposited during sea level lowstands. This caused a large volume of sediment in the form of turbidity currents to be deposited in a relatively short period of time.

Seismic studies imaged several channel levee complexes, referred to as the upper, middle and lower levee complexes, each one separated by acoustically transparent units, inferred mass-transit deposits. Each channel levee complex consists of numerous channel levee systems, often overlapping one another and other architectural units. The channels usually display high sinuosity and bifurcate in various areas, creating new channel pathways.

ODP Leg 155 drilled in several locations on the fan to investigate the depositional processes and fan history; site 944A samples the key architectural units of the fan. The channel levee systems, designated by colors, and the HARPs (high amplitude reflection packets) are the main units found within each channel levee complex. In between the levee complexes are mass debris flow deposits, referred to as Unit R.

Grain size analyses of core samples were performed using a Malvern MasterSizer E laser-diffraction machine and a Sedigraph X-ray settling tube. The results correlate well with the onboard sedimentological and physical property investigations. Within each unit, distinct

cycles of alternating coarsening and fining of grains are noted. Down the core, a definite coarsening trend exists; the sediments of the younger channel levee system are significantly finer than those of the older system. The HARPs show slightly coarser grains compared to the channel levees, correlating with their seismic interpretation. The Unit R debris flow shows two distinct sections, differentiated by changes in grain size patterns. This split is also supported by changes in physical property data.

A SEQUENCE STRATIGRAPHY INTERPRETATION OF THE MONKTON QUARTZITE AND RUGG BROOK FORMATION, WESTERN VERMONT

Goldberg, Jonathan L., Mehrtens, Charlotte J., Hadley, Ann C., Department of Geology, University of Vermont, Burlington, VT 05405

Sea level curves have been produced for various parts of the Iapetus margin, but no attempt has been made to apply the sequence stratigraphy model to the interpretation of these formations. This model would make certain predictions about the stratigraphic sequence and variations from the predicted sequence may reflect local tectonic and sediment distribution phenomena. The Cambrian strata of western Vermont were deposited on a young passive margin. We interpret the Lower Cambrian Dunham Dolomite, the first carbonate unit on the platform, to represent a highstand systems tract on the basis of its prograding parasequences. The stratigraphically lowest facies of the overlying Lower to Middle Cambrian Monkton Quartzite represents non-marine deposition and unconformably overlies the Dunham Dolomite, suggesting that it was deposited as a lowstand systems tract. The non-marine facies of the lower Monkton consists of a white coarse-grained quartzite and is classified as an arkose to subarkose with a minimum thickness of 50 meters. Stratigraphically overlying the non-marine facies is a bioturbated, fine-grained quartzite representing shallow water marine deposition. The two facies of the lower Monkton are overlain by cyclically interbedded red quartzite, dolomite and shale interpreted to represent deposition through tidal sedimentation, and characteristic of deposition of a transgressive systems tract. Coeval with at least a portion of the Monkton are basinal deposits (Rugg Brook Fm.) which consist of beds bearing clasts of both white and red quartzite with dolomite interpreted to reflect high-density turbidity current or debris flow deposition. The Monkton is overlain by a Middle Cambrian carbonate unit, the Winooski Dolostone, which may represent a return to highstand deposition.

THE USE OF GRAIN SIZE ANALYSIS IN DETERMINING SEDIMENT TRANSPORT OF THE AMAZON DEEP-SEA FAN

Hazelton, Happy, Department of Geology, Middlebury College, Middlebury, VT 05753 and ODP Leg 155 Shipboard Scientific Party

The Amazon deep-sea fan, located off the northeastern part of Brazil, is the third largest fan of its kind. Beginning in the Miocene, the fan has predominately been built during glacio-eustatic low stands of sea-level. The Amazon channel-levee system is the last known working channel-levee system to exist prior to the most recent sea-level rise, approximately 10,000 ka. By comparing grain size of core samples from ODP cores located on the levee banks of this system, sediment transport both down-fan and within one channel-levee system has been investigated. Comparisons were based on grain size analysis and supported with physical property data. Grain size was measured using the Malvern MasterSizer E and the

SediGraph 5100. The analysis of grain size was chosen because it is the best measurable indicator of previous environments styles of transport and deposition.

The Amazon-Brown channel-levee system was drilled at four locations on the fan: the upper fan at site 939, the middle fan at sites 940 and 944, ad the lower fan at site 946. Analysis of these Amazon-Brown channel-levee system cores showed that inner fan mechanisms sort sediments, depositing finer material on the upper fan and an increasing amount of coarser material down fan. Site 940, located in the middle fan, sampled many avulsion responses of the Amazon system. Avulsions have been speculated to cause changes in channel gradient and flow regime changes. We investigated if grain size could be used as an indicator of these avulsions. Grain size changes proved to be able to mark fan development by the occurrence of increased grain size at the beginning of the Aqua levee, Brown-Aqua transition, Brown levee, and Amazon levee-channel systems.

SEDIMENT DYNAMICS WITHIN A FURROW FIELD EAST OF VALCOUR ISLAND, LAKE CHAMPLAIN

Luecke, Matthew J., Department of Geology, Middlebury College, Middlebury, VT, 05753

Sedimentary bedforms, created by the interaction of bottom currents and topography, are sustained by a combination of depositional and erosional processes providing indications of long-term conditions. The area due east of Valcour Island, in Lake Champlain, holds the necessary bathymetry and physical processes for furrow existence. These represent current stability allowing an assessment of the mobility of bottom sediments. This is crucial in regions containing highly contaminated bottom sediments.

A mooring array adjacent to the furrow field contained a pair of stereo cameras, sediment traps, a thermistor chain, and an Acoustic Doppler Current Profiler (ADCP). The cameras took pictures for 23 days, at 4 day intervals, while all other apparatus operated for 4 months between mid-June and mid-October. Correlation between the thermistor chain and the ADCP allow for analysis of currents near the bottom boundary layer. Comparison from the stereo pairs with relation to current data gives quantifiable visible analysis of erosion and deposition. A high speed event on June 22, shows erosion at this area. Though not documented by photographs, due to a malfunctioning timing circuit, other high-speed events recorded by the ADCP indicate similar erosional events during the remainder of the study.

A side scan survey was conducted in the area using a Klein system 590 dual frequency (100 and 500 kHz) side scan sonar. The side scan records have been resolved to show the full extent of the furrow field. These furrows have a width spacing ratio of 1: 4.6 which classifies them as type 1C. Furrow lengths range from 16 to 828m with approximately 54 % < 200m. Morphological difference can be seen across the furrow field from east to west, with width spacing increasing to the west, as a consequence of bathymetric variation. Comparison with side scan surveys from 1992 illustrates that similar features are visible. The depositional and erosional rates suggest continued furrow development.

THE METAMORPHIC CONTACT AUREOLE OF THE VICTORY PLUTON, NORTHEASTERN VERMONT

McGrath, Gordon H., Department of Geology, Middlebury College, Middlebury, VT 05753

The Connecticut Valley Trough in Vermont is comprised of the Waits River, Gile Mountain, and Albee Formations, metasedimentary rocks deformed during the Acadian Orogeny due to subsequent westward nappe emplacement along the Monroe Line. The Connecticut Valley Trough is intruded in northeastern Vermont by a sequence of plutons, among them the Victory Pluton, that belong to the New Hampshire Plutonic Series. Similar plutons in the vicinity yield an Rb-Sr age of 376±9 Ma.

Rocks from the contact aureole of the Victory Pluton experienced two episodes of microscopic deformation and two periods of metamorphism. The Gile Mountain Formation country rocks display NE-striking, steeply dipping S_1 schistocity that is near parallel to bedding. It is later deformed into F_2 crenulations that frequently develop into a NE-striking, moderately dipping S_2 schistocity.

Garnet porphyroblasts in the garnet-biotite-chlorite-staurolite-muscovite schists of the contact zone typically exhibit normal growth zoning, but a few indicate a more complicated history. The core to rim trend of X_{Ca} and X_{Mn} in one porphyroblast indicates two periods of garnet growth separated by a period of garnet resorption during prograde metamorphism. The steady increase in $X_{Mg}/X_{Mg} + X_{Fe}$ from core to rim indicates a steady increase in temperature conditions over the time of garnet growth.

Garnet-biotite thermometry yields temperatures of 530°C near the contact to 490°C ~1500m westward, a progression expected in a metamorphic contact aureole. Syn-deformational garnet growth indicates that the Victory Pluton may have been syn-tectonically intruded, despite field observations to the contrary. Garnet-biotite-muscovite-plagioclase barometry yields an average pressure of 4.9 kb at peak thermal conditions, slightly lower than the 6.8 kb peak conditions reported along strike in southeastern Vermont. This discrepancy may reflect northward thinning of emplaced fold nappes. The calculated thermobarometric conditions of 530°C - 490°C and 4.9 kb indicate that the rocks near the Victory Pluton are within the kyanite or sillimanite stability field rather than the andalusite stability field suggested by the Vermont state geologic map.

NET FLOW VOLUME ESTIMATIONS BETWEEN THE NORTHEAST ARM AND MAIN LAKE CHAMPLAIN, VT

Perry, Brian K., Department of Geology, Middlebury College, Middlebury, VT 05753

The interchange of water between the Northeast Arm of Lake Champlain and the Main Lake occurs at only at the Alburg Passage and between the Grand Isle and North Hero Island. The complex dynamics of flow in these areas are not well understood, but they serve as an important link in the understanding of the mass balance of water. By measuring and quantifying the net flow in these passages, it is possible to draw larger conclusions on current activity in the Lake Champlain basin.

To accomplish this, two Acoustic Velocity Meters (AVMs) were installed between the central abutments of two different bridges. They are the Alburg Bridge, which spans the channel of the same name, and the Grand Isle Drawbridge, which connects Grand Isle and North Hero Island at the eastern entrance to the Gut.

An AVM uses an ultrasonic pulse to measure the average water velocity across a width of channel. The velocity information obtained from them was used to calculate and quantify

the net flow volumes at the bridge sites. Both these bridges are situated in areas that are well suited for AVM usage, due to their turbulent, sometimes slow (>2cm/s) flow and frequent flow reversals.

The data set covers the period from September 29 to December 4, 1994. Readings were taken every half hour, stored on site and then transferred to Middlebury College by radio telemetry or portable computer. In addition to velocity measurements, temperature, the lake level and wind direction, intensity and duration were obtained to be examined in relation to lake dynamics.

This is the first long-term estimation of these flow volumes using a continuous, detailed record, and therefore should provide a much more detailed idea of the flow processes at work.

FINITE-DIFFERENCE TOMOGRAPHY OF THE SAN FRANCISCO BAY AREA: THREE VELOCITY MODELS

Pope, Daniel C., Department of Geology, Middlebury College, Middlebury, VT 05753

To gain a better understanding of the upper crustal structure in the San Francisco Bay area, the region has been tomographically mapped using a combination of earthquake travel times recorded by Northern California Seismic Network (NCSN) stations and travel times from active source experiments (e.g. BASIX, etc.) recorded at both NCSN and temporary receivers. The area was imaged on a regional scale (2 models) using a spatial grid of 5 km horizontally and 3 km vertically and a more detailed model was constructed with a 2 km (horizontal) by 2 km (vertical) grid aimed at imaging upper crustal structures ($z < 10$ km) associated with the San Andreas fault along the San Francisco Peninsula. Two overlapping regional inversions were constructed. The southern inversion encompasses an area from central Monterey Bay to 20 km north of San Pablo Bay and provides excellent ray-path coverage beneath the San Francisco Peninsula and south of San Pablo Bay to a depth of 12 km. Below 12 km the region of dense coverage is localized under San Francisco Bay and east of the Bay. The slightly smaller northern inversion model covers an approximately 120 km square centered on San Pablo Bay with a well sampled region extending 50 km out from the models center and extending to a depth of 15 km before significant decrease in resolution is seen. Although the BASIX and other active source experiments represent only between 10% and 20% of the total data volume they significantly improve resolution in the upper 6 km, particularly in the bays and the surrounding areas. Below 6 km the improvements from the active source data are restricted to San Francisco Bay, the San Francisco Peninsula and offshore. The southern model utilizes 1502 events, 55166 travel times, and 211 stations. The northern model uses 1212 events, 26375 travel times, and 113 receivers. The Peninsula model makes uses of 730 events, 11846 travel times, and 66 stations. The three models succeeded in imaging the structure of the Salinian Block, Franciscan assemblage, the Great Valley sequence, and to a lesser extent the fault boundaries and the proposed detachment surface connecting the San Andreas fault with the Hayward fault. In addition, a serpentinite diapir was imaged beneath Mount Diablo and a large ophiolite was seen within the Franciscan assemblage crossing San Francisco Bay at a depth of ~8 km and a thickness of approximately 7 km.

THE STANDING POND VOLCANICS(?) IN NORTHEASTERN VERMONT

Richardson, L. Alexis, Geology Department, University of Vermont, Burlington, VT 05405

The Connecticut Valley - Gaspe trough (CVGT), a major Siluro-Devonian litho-stratigraphic belt of the northern Appalachians, is dominated, in Vermont, by two thick pelitic/psammitic sequences and a very thin amphibolitic horizon, the Standing Pond Volcanics (SPV). In southern VT, the SPV has been described as a singular, massive section of amphibolite that lies at the interface between the two metasedimentary units. In northern VT, however, this apparent continuity breaks down. The northern amphibolites occur at different stratigraphic positions that may be near, but not necessarily at, the gradational sedimentary facies interface. The SPV occurs as either: **1)** apparently discontinuous, meter-scale lenses of massive amphibolite, or **2)** centimeter-scale amphibolitic and quartz- and/or calcite-rich interbeds. The disparity between these two types of outcrops suggests that the SPV amphibolites may not represent a continuous, homogeneous volcanic protolith.

Additionally, several observations suggest that the northern SPV exposures may not represent a strictly volcanic protolith. First, thin section examination of a massive amphibolite reveals microscopic zircon-rich horizons and abundant pleochroic halos within the amphiboles. The zircon-rich bands suggest detrital heavy mineral concentration, indicative of a reworked epiclastic rock. The abundant pleochroic halos suggest that the amphibole replaced original zircon-rich biotite. Typical ortho-amphibolites are unlikely to have such a high Zr content. Second, outcrops displaying thin interbeds show sharp contacts between layers which have only a few mineral phases, a feature possibly indicative of metasomatic mineral segregation. The amphibolitic layers may be the product of extensive hydrothermal alteration and only fortuitously yield roughly basaltic compositions. The bulk composition of these layered outcrops would not be basaltic. Finally, the SPV's characteristic garbenschiefer texture is most prevalent in the thin amphibolitic layers. Previous workers have suggested that garbenschiefer textures form in rocks with substantial pelitic components. Thus, the primarily volcanic origin of the Standing Pond Volcanics in northeastern Vermont is seriously questioned; geochemical approaches that assume a volcanic protolith must be undertaken with caution.

ORIGIN OF ARSENIC IN ARROWHEAD MOUNTAIN LAKE, NORTHWEST VERMONT

Schuck, Russell, Department of Geology, University of Vermont, Burlington, VT 05405

Two sediment cores from Arrowhead Mountain Lake were analyzed for arsenic and 11 other trace metals (Ag, Al, Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb, Zn), grain size and percent organic content. The cores were dated using the radioactive isotope, cesium 137. Both cores revealed a peak arsenic concentration at the 26 to 28 centimeter interval, which correlates to a date of approximately 1964. The input of arsenic has decreased since this time and appears to have stabilized at approximately 8 $\mu g\ cm^{-2}\ yr^{-1}$. Arsenic concentrations show a strong positive correlation with Cr, Ni, Pb, and Ag. Arsenic does not show a significant correlation with Fe or Mn which indicates that geochemical remobilization associated with these metals is not responsible for the arsenic distribution in the cores.

Arsenic concentrations in the most recent sediments of Arrowhead Mountain Lake are below levels determined to be toxic to benthic organisms. Dredging of the lake sediments or similar disturbance may introduce elevated arsenic concentrations into the near surface

sediments, creating a toxic environment.

Analyses of stream sediment samples within the lake's drainage basin indicate a marked increase in arsenic concentrations in the Lamoille River immediately downstream of Johnson, Vermont. The sediments in the Gihon River, which enters the Lamoille in Johnson, also show elevated arsenic concentrations. The marked increase in Johnson is attributed to inputs from the Gihon River watershed which contains a talc mine that was active from 1906 until 1984 and from the talc processing mill in Johnson, which operated from 1906 until 1993. Analyses of talc mine spoils exhibit average arsenic concentrations of 248.5 µg/g. Analyses of these same spoils with a scanning electron microscope indicates arsenopyrite as a potential source of arsenic. Earlier studies (Clemmer 1936; Cline 1960; Chidester 1962) also suggest the sulfarsenide gersdorffite (NiAsS) as a source of arsenic associated with the talc deposits. Previous geochemical analyses of Vermont talc deposits (Chidester 1962) have identified arsenic associated with the sulfides, pyrite and pyrrhotite. The talc processing mill discharged tailings directly into the Lamoille River until 1967. Since that time, the mill has stored tailings in a large tailings pile located adjacent to the Lamoille River. The decrease in arsenic concentrations in more recent sediments of Arrowhead Mountain Lake is attributed to reduced discharge from the mill upon stockpiling of the tailings.

Background arsenic concentrations for the Lamoille River drainage basin are enriched by a factor of 3± compared to the rest of the Lake Champlain basin. These high background levels indicate that the bedrock deposits of talc have been a natural source of arsenic since before the mining operations were initiated.

CHANGES IN FLOOD MAGNITUDES AND PROCESSES IN NORTHEASTERN YELLOWSTONE PARK

Simpson, Eric D., Department of Geology, Middlebury College, Middlebury, VT 05753

Paleohydrologic techniques and dendrochronology were used to investigate the timing and magnitudes of floods over the last 200 years on the Lamar River system in northeastern Yellowstone Park. Anecdotal records exist for floods on the Lamar River in June 1918 (produced by heavy rainfall on melting snow), and on its major tributary Soda Butte Creek in June 1950 (produced by a tailings dam failure). These and earlier floods deposited extensive gravelly bars which provided new locations for conifer growth. Tree-ring dating of conifers on flood bars provides a minimum age for floods. Where dates of flood bar deposition are known (e.g. 1950), maximum tree ages postdate the flood by about 10 years. This ~10-year lag time reflects both tree germination time and the difficulty of encountering the first few years of tree growth in cores. Using this lag time, floods occurred on Soda Butte Creek in 1950, 1918, ca. 1873, and ca. 1810 flood . The Lamar River experienced flooding in 1918, ca. 1873, and ca. 1810. On lower Pebble Creek, a large Soda Butte tributary, flood bars date to 1918. A flood on the alluvial fan of a small, steep Soda Butte Creek tributary dates to ca. 1937.

Peak discharge estimates for the 1918 event were calculated using **(1)** the slope-area method, **(2)** a modified slope-area method that eliminates the roughness coefficient by correlation of roughness with slope, and **(3)** velocity estimates from maximum sizes of flood-transported clasts, and geomorphic indicators of flood stage. Discharges were calculated for **(1)** the Lamar River just upstream of Soda Butte Creek: 16800 ± 1100 cfs; **(2)** Soda Butte

Creek just above Pebble Creek: 5900 ± 1300 cfs; and **(3)** Pebble Creek: 2100 ± 600 cfs. These estimates show that in relation to basin area, the 1918 peak discharges are substantially greater than those for 100-yr floods in the Yellowstone region, where Q100 is estimated by flood-frequency analysis of gage records from the last ~35 years. The lack of such high discharges on trunk streams in recent decades suggests a decline in flood magnitudes, which is supported by the Yellowstone River gage records of 1911 to the present. The highest recorded discharge on the Yellowstone River at Corwin Springs and Billings, Montana occurred in June 1918, and seven of the ten highest discharges occurred before 1930. Dated floods on the alluvial fans of small tributary basins postdate the mainstem floods, and have been attributed to localized high-intensity thunderstorm precipitation (e.g. ~1937, 1988). The dominant flood-generating processes appear to have changed over the last century from prolonged frontal storms and snowmelt to localized thunderstorms which produce floods in small, steep basins with large areas of runoff-generating bare bedrock.

GEOCHEMISTRY AND MINERALOGY OF MINE TAILINGS IN COLORADO

Sweeney, Kara N., Department of Geology, Middlebury College, Middlebury VT, 05753

Mining has exposed sulfide ores and waste rock to an arid/semi-arid weathering environment in Colorado. Many mine dumps exhibit alteration patterns due to acid sulfate weathering. While the surfaces are composed of unaltered waste rock and fresh sulfides, the interiors contain well-indurated zones of highly soluble sulfate minerals produced through exposure to water, dissolved oxygen, ferric iron and chemoautotrophic bacteria. These sulfate minerals, including copiapite ($Fe_{14}O_3(SO_4)_{18}$•$63H_2O$), zincobotryogen ($ZnFe(SO_4)_2(OH)$•$7H_2O$) and jarosite ($KFe_3(SO_4)_2(OH)_6$) precipitate from fluids with pH=1.0 to 5.0 and are 15% to 100% soluble. During snow melt and rainstorms, these soluble portions dissolve and become mobile. Acid drainage in the Central City District of the Front Range Mineral Belt, as well as at Bonanza and Summitville in the San Juan Mountains, has been identified as a source of metal contamination, impacting surface water along Clear Creek, North Clear Creek, and the Alamosa River, Iron Creek, and Bitter Creek, some of the main hydrological systems in the study areas.

The chemistry of 41 samples from 16 mines representing the three mineralization zones in Central City as well as the mines at Bonanza and Summitville was evaluated by XRD, SEM, ICAP, pH and solubility analysis. Results in all districts show an increase in solubility as pH decreases. Concentrations of Al, Fe, Cu, Co, Ni, and Mn in dissolved sulfates show a common trend with the water chemistry at drainages in different districts. XRD and SEM analysis of sulfate precipitates shows some correlation with primary mineralogy/ zonation, as well as with deposit type and host rocks.

Acid mine drainage is an accumulation of dissolved precipitates from complex weathering systems, involving several parameters including hydraulics, mineralogy, pH, solubility, and slope aspect, among others. Taking into account the differences in sulfate mineralogy and chemistry in different mining areas, before they are dissolved and diluted by the surface water of a specific hydraulic system, may help to provide effective remediation in the future.

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MIOCENE VOLCANISM IN SOUTHEASTERN OREGON: GEOCHEMISTRY AND TECTONIC IMPLICATIONS

Young, Amy E., Department of Geology, Middlebury College, Middlebury, VT 05753

The Juntura field area is an area of extensive Miocene (13 to 10 Ma) volcanism located in southeastern Oregon 60 miles east of Burns. Geochemistry, petrography, stratigraphy and age constraints show that the volcanic rocks of the Juntura may be associated with the Strawberry Mountain, Columbia River, Steens Mountain or Lake Owyhee Volcanic field series.

Volcanic rocks were collected from three 7.5 minute quadrangles - Beulah, DeArmond Mountain and Stemler Ridge. The stratigraphy consists of basaltic flows, interlayered with volcanic sediments, diatomite, ash flow tuffs and tuffaceous sediments. Major and trace element analysis performed on thirty five flow samples indicates that the flows are primarily tholeiitic basalts and basaltic andesites, with some high-alumina olivine basalts. The rocks separate out into two different geochemical groups as seen on Harker and Mg number divariant diagrams: a main group has moderate TiO2 content (~ 1 wt. %) and Mg # from 75 to 65 whereas a second, smaller group has higher TiO2 contents (~ 2 wt.%) and Mg # from 65 to 55. Rare earth element patterns are slightly enriched in the light rare earth elements, similar to many continental tholeiites, including Columbia River Basalts. The basaltic rocks plot together as mid ocean ridge basalts and island arc tholeiites on Ti/100-Zr-Y*3, Zr-Ti, Zr-Zr/Y and TiO2-MnO*10-P2O5 tectonic discriminant diagrams. In the Y-Cr diagram, the basalts plot in the mid-ocean ridge field distinct from the island arc field. The overlap between mid-ocean ridge and island arc fields in tectonic discriminant diagrams is typical of many back-arc basalts and continental tholeiites.

The Juntura volcanic series may represent a continental rift environment as a result of asthenosphere upwelling and regional extension. The widespread regional extension, also seen by north-trending imbricate normal faults, may be associated with the subduction of the Juan De Fuca Plate under the North American Plate.

VERMONT GEOLOGICAL SOCIETY BUSINESS AND NEWS

The VGS is pleased to welcome our Newest Members!

• Tania Bacchus	Johnson, VT
• Arlen Bloodworth	Pittsford, VT
• Stephen Bracket	Keene, NH
• Kathleen Callum	Brandon, VT
• Allen Carpenter	South Burlington, VT
• Richard Chamberlain	Wayland, MA
• Timothy Grover	Castleton, VT
• Julia Nicholson	Woodstock, VT
• Jeffrey Kelly	Montpelier, VT

Treasurer's Report

Stephen Howe is on vacation. A treasurer's report was not available at the time of this publication. As of March 24, 1995, however, the VGS stood in excellent financial condition with a balance of $4,795.02 in our account. As of that same date, our paid membership stood at 123 members, with several institutional renewals still pending.

I am saddened to announce that Stephen will be resigning as Treasurer of the VGS, effective in May. He has accepted an offer from Northwestern University in Chicago and will begin in June. We will miss his tireless dedication to the Society; his efforts to keep us running smooth, both financially and administratively, have been very rewarding and appreciated.

Please join me in wishing Stephen the best of luck and success in his new position!

Respectfully Submitted,
Kent S. Koptiuch

SEND US YOUR MEMBER NEWS CARE OF:
THE GREEN MOUNTAIN GEOLOGIST, *VGS, DEPT. OF GEOLOGY, UVM, BURLINGTON, VT. 05405-0122*

Executive Committee Meeting Summary -

(Note: the official minutes were not available at time of publication. The following is a summary of meeting discussions)

The Executive Committee of the Vermont Geological Society was called to order at 5:30 p.m. on March 27, 1995 at the University of Vermont, Burlington, Vermont. Members present included Stephen Howe, Nancy Keller, Kent Koptiuch, Helen Mango, Ronald Parker, Bruce Cox, Rolfe Stanley, and Stephen Wright.

- ***Treasurer's Report:*** Steve Howe reported an approximate balance of $4,795.00 in the VGS account. Eight new members have joined the Society since the last Executive Committee meeting. Dues and membership renewals have slowed to a trickle. Only a few institutional renewals are pending. Current paid membership is 125. Stephen announced that he will be resigning as Treasurer effective in May; he will be moving to Chicago to take on a new position at Northwestern University. The Treasurer's responsibilities will be shifted to one of the other members of the executive committee until a new Treasurer can be elected at the Fall Annual Meeting.
- ***Reciprocal Agreements:*** Stephen Wright reported that our reciprocal agreement with the New Hampshire Geological Society has been established; the VGS now shares reciprocal agreements with the *Maine Geological Society,* the *Soil and Water Conservation Society (SWCS),* and the *New Hampshire Geological Society.*
- ***Publications/Editorial Committee:*** The Spring Meeting and the next issue of the GMG was discussed. The date suggested for the Spring Meeting was April 29, 1995. The location would be at Calkin Hall, University of Vermont. The Spring GMG would then feature abstracts from those students presenting papers at the Spring Meeting.
- ***VGS Research Grants:*** The deadline for the VGS Research Grant proposals is May 15, 1995. Ron Parker has agreed to head the review and approval process.
- ***Constitution and Bylaw Changes:*** Changes to the constitution and bylaws as prepared by Steve Howe and Shelley Snyder will be passed on to Kent Koptiuch. The proposed changes will be circulated among the members of the Executive Committee, and an amended version will appear in the Summer 1995 GMG. A final, referendum vote of the proposed changes will take place at the Fall 1995 meeting.
- ***VGS/GSA Campus Representatives:*** Helen Mango indicated that Tania Bacchus has agreed to be the representative for Johnson State College.
- ***Membership Drive:*** Kent Koptiuch is working on an ad, for review and approval by the Executive Committee at the next meeting, to be run in the June 1996 issue of Rock and Mineral magazine; the issue will be featuring Vermont minerals. Kent also reported that he and Ron Parker have not yet had the opportunity to put together the pamphlet to educate others about the VGS. This pamphlet would be mailed to other geologists in Vermont who are not currently members of the VGS. The Executive Committee approved of this mailing in November, 1994. Progress will be reviewed at the next Executive Committee meeting.
- ***Summer Field Trip Topics*** were discussed, but no topic or trip leader was finalized.
- ***Next Meeting:*** The Executive Committee will meet following the Spring Meeting on April 29, 1995.

Meeting adjourned at 6:30 p.m.
Respectfully submitted, Kent Koptiuch

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Leave a message with whoever answers; your legislator will call you back.

Question of the Quarter

Should the taxpayer-funded, Vermont Department of Environmental Conservation, R.A. LaRosa State Environmental Laboratory continue to operate in direct competition with private industry laboratories?

Background

The State laboratory does not need to make a profit. They are offering their services to private consultants at-cost to fill their capacity. This is in direct competition to private industry laboratories whose taxes go to fund the State laboratory.

What do YOU think?

Please let me and your State representatives know your opinions.

Kent Koptiuch
164 Osgood Hill
Essex, VT 05452

SEMINARS, MEETINGS, and FIELD TRIPS

- **April 28, 1995:** ***Our Waters - Whose Rights are Right? A Conflict Resolution Workshop*** sponsored by the New Hampshire-Vermont Chapter of the Soil and Water Conservation Society. To be held at the Lake Morey Inn, Fairlee, Vermont. Contact: Nick Comerci at (802) 748-3885.
- **April 29, 1995:** ***Spring Meeting***, Vermont Geological Society, **Tentative date**, University of Vermont, ***Presentation of Student Papers.***
- **May 5-7, 1995:** ***Sixth Annual Maine Mineral Symposium*** at the Senator Inn and Conference Center, Augusta, Maine. Contact Robert Hinkley at (207) 657-3732.

At only $15.00 per year the VGS offers one of the best bargains in Professional Association dues around. Do you know a "rock head" who'd like to enrich his/her depositional environment? Let's get their mudcast today!

- **May 10, 1995:** ***Protecting Your Home Water Supply - Part 1***, A Vermont Interactive Television Program. 6:30 - 10:00 PM, Contact UVM Extension Service.
- **May 9-11, 1995:** ***New England Environmental Expo***, World Trade Center, Boston, MA. Contact (617) 489-2302.
- **May 12-14, 1995:** ***The 1995 Friends of the Pleistocene Field Trip*** will be start in Portland, Maine. Itinerary includes coastal deposits and the deglaciation of the Sebago Basin. Contact Woody Thompson, Maine Geological Survey at (207) 287-7178 or e-mail at *thompson@mgs1.doc.stste.me.us.*
- **May 21-24, 1995:** ***Opening the Toolbox: Strategies for Successful Watershed Management*** is the theme of the **Fourth National Watershed Conference,** Charleston, West Virginia. Sponsored by the National Watershed Coalition.
- **May 20, 1995:** ***Mud School***, Maine Ground Water Association and Goodwin Well Drilling, Inc., Turner, Maine. Contact Jim Ashley, VT DEC, (802) 241-3400.
- **June 5, 1995:** ***Protecting Your Home Water Supply - Part 1***, A Vermont Interactive Television Program. 7:00 - 10:00 PM, Contact UVM Extension Service.
- **June 15:** ***A Seminar on Recent Changes in Federal and State Environmental Laws.*** At the Center of New Hampshire in Manchester. Contact Sally Perry at (603) 627-8183.
- **June 23 & 24, 1995:** ***Focus 2000: Wind, Ice, and Fog; Trends in Meteorological Instrumentation, Severe Weather Testing, and Observations*** and ***The World of Weather.*** The Mount Washington Observatory's 1995 symposium at the Sheraton White Mountain Inn, North Conway, NH. Contact Mount Washington Observatory at (603) 356-8345.
- **July 9-14, 1995:** ***Short Course: The Environmental Geology Institute: Mountains, Glaciers, and Water.*** Offered by Bates College and the New England Section of the National Association of Geology Teachers - $300.00, inclusive. Contact Office of Special Projects, Bates College, Lewiston, ME 04240; (207) 786-6077.
- **August 6, 1995:** ***Annual Field Trip,*** New Hampshire Geological Society, ***"Geology of Mount Monadnock"*** with Peter Thompson.

GUEST VIEWPOINT

Reprinted in its entirety with permission,the following opinion appeared in the April, 1995 edition of U.S. Water News. Thomas C. Bell is the newspaper's president and publisher.

U.S. Geological Survey is Indispensable to Nation's Water Resources

By Thomas C. Bell

The U.S. Geological Survey is facing one of its most serious challenges in its history. The agency had been targetted for complete elimination as a part of the Republican's *Contract With America*. Although many programs would be reduced, restructured, or frozen, under the *Contract* proposals, the USGS is among a handful of organizations that would be abolished. Elimination of the U.S. Geological Survey makes absolutely no sense at all and would strike at the very core of our water resources database and research in this country.

The U.S. Geological Survey (USGS) is probably one of the few federal agencies where taxpayers are getting their money's worth. The Survey is made up of hard-working, non-political earth scientists who are dedicated to collecting and analyzing all kinds of natural data in this country, not to mention the vast amount of historical water information they have gathered. It makes little sense to eliminate an agency that is doing its job so efficiently and so well in order to save money at all costs.

It is ironic that Congress is considering abolishing the USGS at a time when the United States is beginning to recognize its increasing vulnerability to natural processes such as floods, droughts, and earthquakes. More than ever, our growing society depends on having excellent data when planning future water use, considering floodplain management, or establishing engineering codes in earthquake-prone areas.

Congressional staff members indicate that abolishing the USGS might be accomplished by transferring some of its functions to other organizations and agencies. They suggest some programs in the water resources division might be transferred to the Environmental Protection Agency. On the contrary, the USGS needs to be at arms length from the political ebbs and flows of the environmental arena. Placing the water resources data responsibilities inside EPA would jeopardize the apolitical nature of scientific data collection.

"If you think earth-science information is expensive, wait until you see the cost of earth-science ignorance."

Shifting these responsibilities would not save money, and closing the agency would cost this nation more than it would ever save in the loss of the natural resource data the agency is so proficient at collecting. As Samuel Adams, president of the American Geological Society put it, "If you think earth-science information is expensive, wait until you see the cost of earth-science ignorance."

With an annual budget of $580 million, the USGS dedicates more than half its efforts to analyzing the country's water resources. It is also the largest map-making agency in the United States with about 80,000 maps available to fill the more than 1 million requests from hikers to engineers. In addition, the agency collects data on and monitors earthquakes, floods, droughts, water pollution, volcanic eruptions, global environmental change, contamination from waste disposal, and our reliance on unstable sources of foreign oil and minerals.

(Continued on Page 21)

(Guest Viewpoint, Continued from page 20)

It is the water data, of course, that we are interested in here. The information that has been collected by the Survey provides tremendous insight into the history of our water resources and how they have behaved on their own with little disturbance from mankind. It is only by having this historical data that we have been able to estimate how man is impacting both surface and groundwaters in this country.

"Those people were far-sighted individuals and we owe a debt of thanks to them for starting the collections of water resources information we have today."

The USGS has a number of excellent programs for analyzing our nation's water resources. The National Water Quality Assessment program is designed to assess historical, current, and future water quality conditions in representative river basins and aquifers nationwide.

The Survey's National Water Use program works in cooperation with local, state, and federal environmental agencies to collect and compile water use information for the country. Every five years the data are compiled into a national water use data system and are published in a national circular.

The Survey also publishes a National Water Summary every two years that provides details about specific water quality and water use data for the nation. This is in addition to all the research and investigations made by the Survey regarding water use, water quality, and groundwater levels throughout the country.

It is amazing that so long ago in the history of this country, men and women felt it important enough to begin collecting water resources data. Those people were far-sighted individuals and we owe a debt of thanks to them for starting the collections of water resources information we have today. Because the USGS has accumulated such a vast amount of information, we can now study and investigate the effects man and his created environment are having on both the quantity and quality of water in this country.

The USGS is an agency that is running efficiently and well. Congress and this nation would be wise to let the agency do its job in its usual and efficient manner. No money will be saved or interests served by abolishing the USGS.

STATE HAPPENINGS

Chalk this one up: The movement to exempt pre-existing slate quarries in Vermont from the Act 250 review process is still alive in the state legislature. Although the House Natural Resources and Energy Committee denied the granite industry a similar request, the House felt that the slate industry merited the exemption. Slate quarries are frequently flooded with water to protect the cut face during periods of inactivity that may last for years. New quarry operations would still be subject to Act 250 review.

Brierly confirmed as DEC Commissioner: Acting Commissioner of the DEC, William Brierly, has been officially named Commissioner to succeed Jack Long. Brierly has been filling the role since Long stepped down in December. **State Geologist, Dianne Conrad,** will replace Brierly as DEC's Chief of Operations. **Lawrence Becker** will serve as **Acting State Geologist**.

A Privileged Audit Program may be up for consideration within the next year at the state level. DEC commissioner William Brierly has indicated that the state is open to the concept of providing leiniency towards companies that discover a violation or non-compliance issue of their own accord. Providing the companies were to rectify the violation(s) in a timely manner, protection from prosecution and/or penalties could be extended.

Order your VGS

VERMONT GEOLOGY, VOLUME 7
"FIELD TRIP GUIDEBOOK NUMBER 3"

Editor: Stephen F. Wright

Contents

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