Granite State Geologist

The Newsletter of the Geological Society of New Hampshire
Winter 2005 Issue No.51 **www.gsnhonline.org**

Results of October 2005 Election

Submitted By: Julie Spencer, GSNH Nominating Committee Chair

The 2006 Board of Directors was elected on October 13, 2005 at the Annual Fall Dinner Meeting held at Alan's Restaurant in Boscawen. Forty-three voting members were present at the meeting and the results are presented below. The winner is noted in **bold** and the term they are entering is noted after the vote count.

President
Mike Robinette – 41 (3rd term)
John Hagopian (write-in) – 1
Greg Kirby (write-in) – 1

Society Vice President
Dave Wyman – 43 (3rd term)

Council Vice President
Jutta Hager – 42 (1st term)
Mike Burke (write-in) – 1

Secretary:
Chip Crocetti – 43 (3rd term)

Treasurer:
Suzanne Wall – 43 (3rd term)

Members-at-Large
Ralph Wickson – 42 (2nd term)
Paul Hague (write-in) – 1

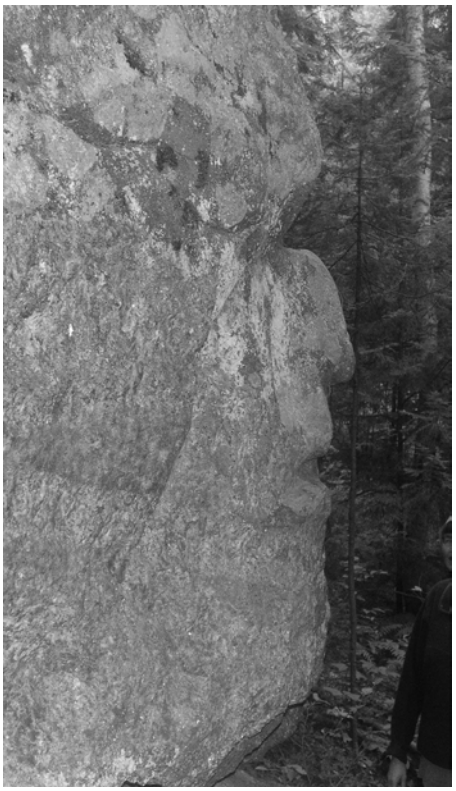
The second Member-at-Large is Rich Moore who will serve the second year of his current two-year term in 2006. Congratulations to the 2006 Board! Contact information for these individuals is in your membership directory and will be posted on our website. Please note that four board members have just been elected to their third and final terms in their current positions. If you have ever considered running for the board, 2007 may be your year. The nominating committee will be looking for interested individuals starting in summer 2006.

DES Waste Management Division –Technical Topics/Lunch Seminars – Fall 2005

Submitted by Amy Azeredo, NHDES

The New Hampshire Department of Environmental Services Waste Management Division will be hosting a series of special interest technical seminars for staff and all interested public, consultants, municipal officials, and all interested public, consultants, municipal officials,

regulated community and other stakeholders at our offices on 29 Hazen Drive in Concord, NH. The sign in will start at 11:45 a.m. while the seminars themselves will be held in our auditorium from noon to 1:00 p.m. The presentations will be structured like a Town Meeting so that everyone can ask questions and participate in the discussion in any way they feel comfortable. Experts from UNH, industry and consulting will be part of the presentations and bring us up to date on the latest in technical innovations in waste site cleanup, waste management and waste reuse. A number of people have expressed interest in these topics so each seminar will certainly benefit from such free and open discussion. Please contact Amy Azeredo at aazeredo@des.state.nh.us or phone 271-2905, if you plan to attend so that we can plan our accommodations. Please feel free to bring your lunch. The next meeting is on ***December 9, 2005 and is entitled "Remedial Technologies What's Been Working!":*** This seminar includes a joint presentation of those clean-up technologies that have been working effectively on both hazardous waste and petroleum sites. Design, construction and operational criteria will be presented and highlighted with the actual performance record.



Can you identify this famous (or perhaps not so famous) face?
The answer is on Page 5.

News from Geological Society of Maine

If you would like to catch up on news from the Geological Society of Maine, the October 2005 Newsletter is now on their website...check it out at: http://gsmmaine.org/newsletters.htm .

GSNH 2005 Annual Dinner Meeting

On Thursday evening, October 13, 2005, approximately 74 GSNH members and guests enjoyed a delicious buffet at Alan's Restaurant in Boscawen, NH. All enjoyed this chance to visit with other earth science enthusiasts and to cast their Ballot for officers to serve on the 2006 GSNH Board of Directors. Tania Coffin was presented with an interesting plant in appreciation of her diligent work producing the Society's quarterly newsletter. Tina Cotton won a copy of the recent publication *"Stepping-Stones Across New Hampshire"* written by Jay Long. Thanks to author Jay Long, for this donation. James Degnan won the first prize Silver "feather" Crystal, donated by GSNH member Greg Kirby. Following the buffet, Sam Bowring of the Department of Earth, Atmospheric and Planetary Sciences at MIT gave a very interesting talk entitled *"Animal Evolution and Climate Change: Proterozoic Evidence of a Frozen Earth."* Thanks to Sam for this "cutting-edge" information.

Note: If you'd like to get your own copy of "Stepping Stones", please contact: Linda Jones at Enfield Publishing & Distribution, P.O. Box 699, Enfield, New Hampshire 03748, Tel: (603) 632-7377, Fax: (603) 632-5611 - www.enfieldbooks.com. The cost of the book is $19.95 plus shipping & handling.

News from Plymouth State University

Submitted by Warren Tomkiewicz, Plymouth State University

Kevin McGuire New Hydrologist for PSU and Hubbard Brook Experimental Forest – Shared Faculty Is an Ideal Partnership: Plymouth State University's Director of the Center for the Environment Steve Kahl has announced the appointment of Hydrologist Kevin McGuire in a newly developed position which will be shared with Hubbard Brook Experimental Forest. The position will be co-funded by the University and the Northeastern Research Station of the U.S. Forest Service (USFS) in Durham, and will be a core faculty position in the new PSU master's degree program in Environmental Science and Policy.

According to Kahl, the partnership is an example of a win-win University partnership with external agencies. "Hubbard Brook and PSU both benefit from this cost-effective partnership," Kahl said. "This is an example of how government and higher education ought to work together nationally."

Chris Eagar, project leader for Hubbard Brook and research ecologist for the USFS, said Kevin will represent Hubbard Brook for a National Science Foundation funded Long Term Ecological Research (LTER) project now under way with researchers from Cornell University, Syracuse University and Dartmouth College. Eagar said that co-funding with Plymouth State will give McGuire a lighter teaching load and allow time for his research. *"This is a great opportunity to help the region with issues of water quality and quantity and to study how human influence with the landscape can affect both water quality and quantity,"* Eagar said. *"We are pleased to have an energetic young scientist like Kevin in this position which will benefit Hubbard Brook and PSU, as well as the regional environment."*

Four New Master's Degree Programs In Science: The University System of New Hampshire board of trustees approved four new graduate degrees in science at Plymouth State University June 23: an M.A.T. degree in science and M.S. degrees in science education, applied meteorology and environmental science and policy. The first enrollments are expected in the fall 2005 semester. Two of the degrees, the M.S. in science education and the M.A.T. in science will allow current teachers and holders of undergraduate degrees in science who aspire to become teachers, to pursue specialized graduate study and are as follows:

> ***Master of Science in science education*** targets middle and high school teachers who already hold a bachelor's degree in science, elementary school teachers with a bachelor's degree and the equivalent of a minor in science, and teachers working toward state certification.
>
> ***Master of Arts in Teaching in science*** features advanced work in science along with courses and experiences required for teacher certification. The M.A.T. is a way for someone with a considerable undergraduate science background, but no previous course work in education, to become certified by the state of New Hampshire.

According to Dr. Warren Tomkiewicz, coordinator for these programs, "the programs promote science learning through innovative methods for the classroom, laboratory and field, and include authentic assessment strategies. Both degrees are based on the research, goals, vision and best practices derived from the science education community." The trustees also approved ***Master of Science degrees in applied meteorology and in environmental science and policy.*** Dr. James Koermer, professor of meteorology and director of the Judd Gregg Meteorology Institute at Plymouth State says, "The field of meteorology has experienced explosive growth in knowledge because of recent technological advances. Students in the M.S. program will receive much greater depth in specific areas of applied meteorology (such as satellite, radar, air quality, transportation). Employers are seeking meteorologists with a more advanced background than can be provided by an undergraduate program."

The M.S. in environmental science and policy will prepare future scientists and resource managers with the interdisciplinary competence for career opportunities in industry, government, non-profit organizations and

academia. The programs will focus on interrelated chemical, physical, biological and socio-cultural topics that drive environmental policy and management.

Dr. J. Stephen Kahl, director of the Center for the Environment at Plymouth State University says, "As part of the regional mission of PSU, the M.S. in environmental science and policy will focus on applied environmental problems of a regional nature. The program will be strongly field based, concentrating on applied environmental science, policy and science translation; preparing students for a broad range of careers. We anticipate that several graduate research fellowships will soon be available." For information about the new Master of Science degrees and other graduate programs at Plymouth State University, logon on towww.plymouth.edu/graded or call 1-800-FOR-GRAD.

Association of Environmental & Engineering Geologists 2006 National Meeting in Boston - First Announcement

Submitted by Erik Bankey, Massport

The Association of Environmental & Engineering Geologists (AEG) will be having its 2006 National Meeting in Boston from Monday, October 30 to Saturday, November 4, 2006. The event will be at the Boston Park Plaza Hotel, located in Boston's Back Bay. The theme of the 2006 AEG Meeting will be *New England Engineering Geology: From Till to Fill".* Meeting Highlights include: 3 days of Technical sessions to include talks, exhibits, and symposiums, 4 AEG sponsored field trips in the general area, Four Short Courses, with 3 for PG and LSP/LEP Continuing Education Credits, Teachers' Workshop - 1 day, Classroom/Field, Tour of Plymouth Plantation and New England Clambake. The event will have many great technical programs, which may be eligible for Continuing Education Credits (CEUs). Please reserve these dates and for more information and to RSVP go to AEG's website at www.aegweb.org.

NHGS Groundwater Level Monitoring for September 2005

Submitted by Genevieve Al-Egaily, NH Geologic Survey

Groundwater level measurements for September 2005 were collected by NHGS staff member Genevieve Al-Egaily on September 26th – 28^{th,} 2005. The statewide average showed a 0.42 foot decrease in groundwater levels from last month. The monitoring well in Enfield showed the greatest change with a decrease of 1.96 feet. Groundwater levels were down 0.45 feet compared with September 2004 levels.

Natural Disasters Around the World

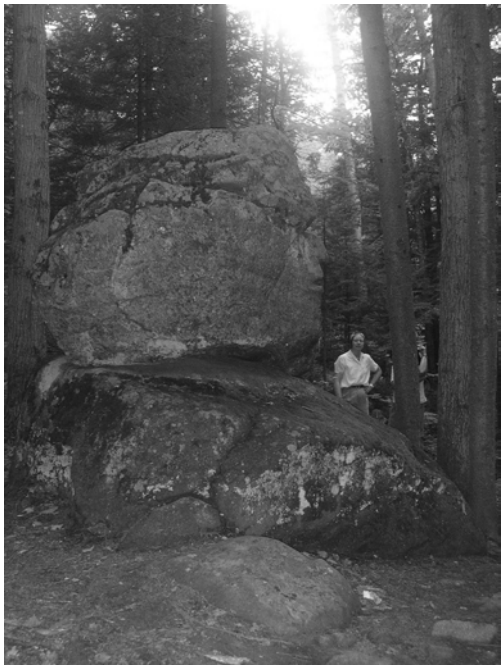
Submitted by Bettina Eames

Indian Ocean Earthquake and Tsunami, December 26, 2004. This was the worst tsunami ever recorded in terms of lives lost. For more information on geological aspects of this disaster go to: http://walrus.wr.usgs.gov/tsunami/indianocean.html.

Hurricane Katrina - August 29, 2005 and Hurricane Rita – September 24, 2005: United States Gulf Coast. For more information on impact studies go to: www.http://coastal.er.usgs.gov/hurricanes.

Pakistan Earthquake - October 8, 2005. For more information go to the USGS's website at: http://neic.usgs.gov/neis/world/pakistan or go to Geological Survey of Pakistan's (GSP's) website at http://www.gsp.com.pk/online/earthquake.htm.

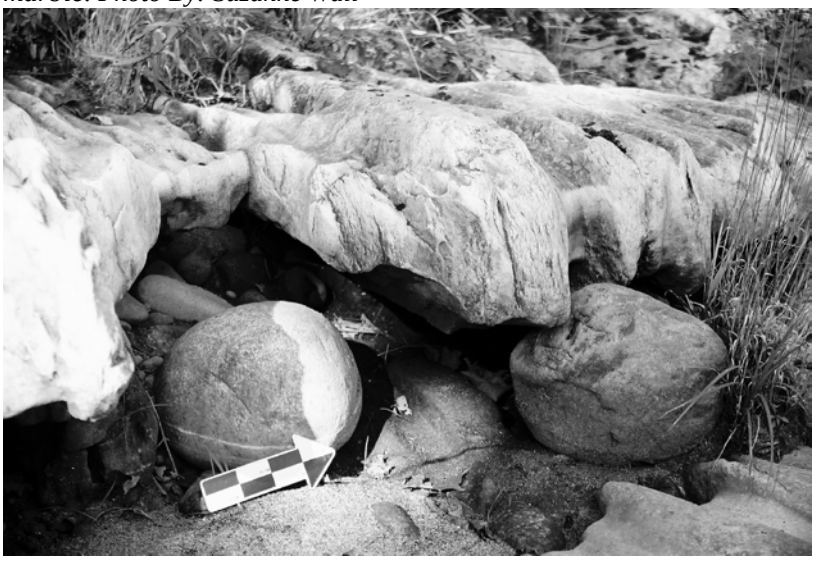
GSNH Field Trip Memories – Photos From The Past and Other Pictures



(Left Photo) Suzanne Wall (GSNH Treasurer) admires the Old Man of the Valley during the 2003 GSNH/GSM Joint Summer Field Trip. Photo By: Bettina Eames

(Bottom Photo) Having fun atop Mt. Washington GSNH/GSM 2003 Joint Summer Field Trip –. Photo By: Bettina Eames

(Photo Below)
Fitch formation, bands of white calcite marble and buff calcite-dolomite-pyrrhotite marble. Photo By: Suzanne Wall

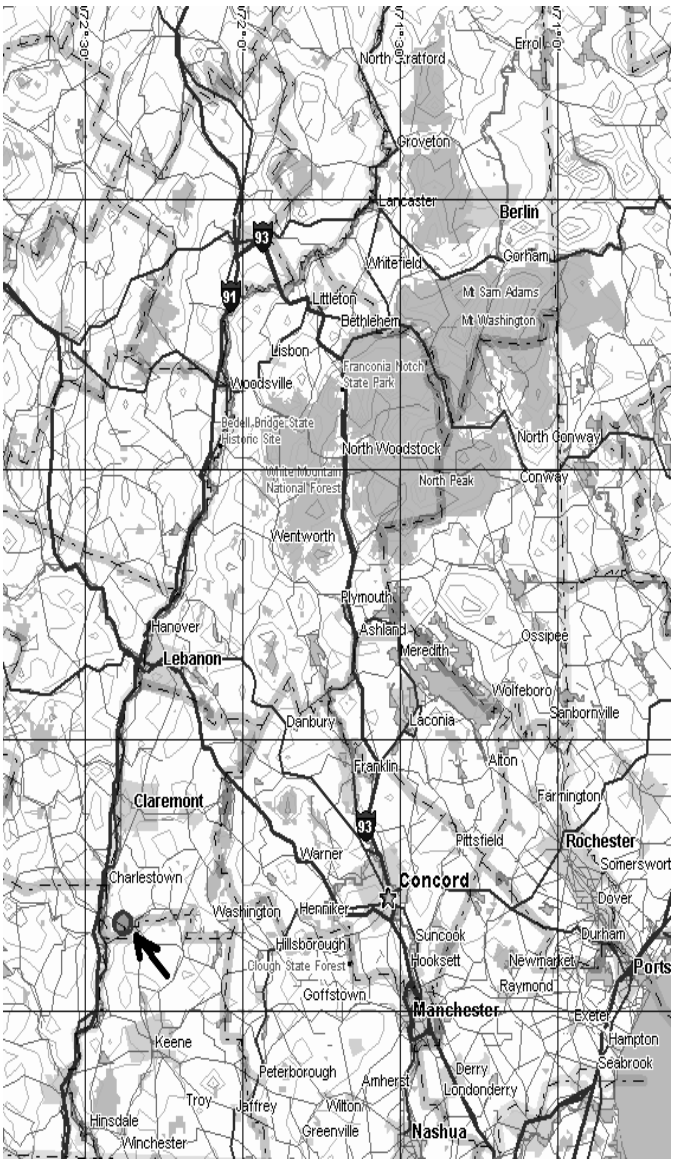


Geologic Hazard – New Hampshire Flood 2005

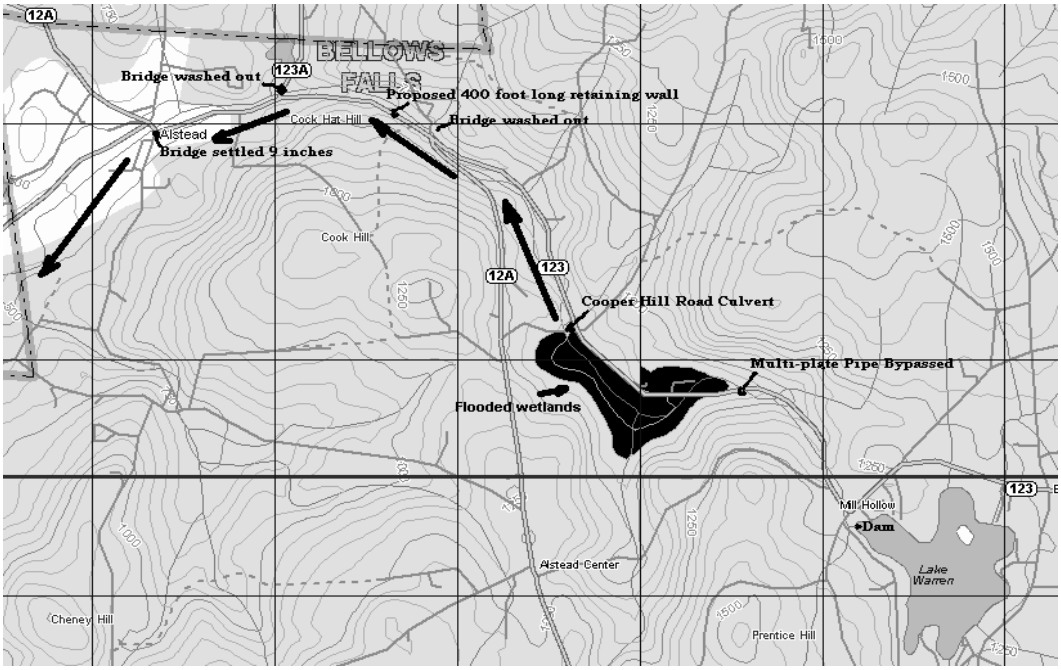
Submitted by Richard Lane, PG, CPG

Flooding is one of the most common and destructive geological hazards. Water-related events account for over three-quarters of the federal disaster declarations in the United States. Recently, severe flooding in New Hampshire resulted in the Governor declaring a State of Emergency in five counties. These devastating events allow a glimpse at some of the geological forces that shape our planet and continually change the environment. Stream erosion and deposition are ongoing geological processes that can be greatly accelerated during periods of flooding. A flood event is like watching geology on fast forward. What may normally take tens to thousands of years to occur can take place in a few minutes.

The New Hampshire flood of 2005 resulted in loss of life, damage to private property, destruction of homes and businesses, severe damage to public infrastructure (roads, bridges, drainage structures, government facilities, etc.), damage to communication lines, extensive erosion, contamination of drinking water, loss of agricultural productivity and psychological trauma. The storm event also triggered mudslides in several areas across New Hampshire. Storm damage resulted in 57 miles of state roads being closed on October 9, 2005. One day later, 43 miles of road were re-opened for emergency vehicles and local traffic, while 14 miles remained closed. On October 19th, only 4.5 miles were closed, 29 miles were open and 23.5 miles were open for emergency vehicles/local traffic. Due to safety concerns and access difficulties, seven NHDOT bridge inspection teams were mobilized to inspect over 170 bridge structures across the state. Other NHDOT teams were mobilized to inspect roads, drainage structures and slopes throughout the state. The most severe and widespread damage occurred in the village of Alstead NH, along Routes 123 and 12-A. (See Map #1.) During a 30-hour period, the Alstead area received approximately 12 inches of rainfall. The U.S. Geological Survey reported a peak flow of 150 times normal for Cold River, just a short distance down stream from Alstead village. Most engineered structures, embankments and drainage systems are designed for a 100-year flood. The heavy rainfall and related events that occurred during October 2005 exceeded the established limits for normal engineering design. Warren Brook flowed through a 12-foot diameter culvert that extended underneath a 30-foot high embankment fill at Cooper Hill Road, approximately 2 miles upstream from Alstead village. Damage from the floodwater extended from Cooper Hill Road to where the Cold River empties into the Connecticut River, a distance of approximately 7.5 miles. (See black arrows on Map #2.)



(Left) Map #1. Location of Alstead and October 2005 flooding along Warren Brook.



Map #2. Topographic Map of flooded reach of Warren Brook, Alstead, NH.(Dick Lane, NHDOT)

A total of 36 buildings were completely destroyed and 71 homes sustained varying degrees of damage. A combination of heavy rainfall, runoff and overflow from the Warren Lake Dam resulted in a large volume of water becoming impounded behind the roadway embankment at Cooper Hill Road. (Note that it was impounded water…more water than the 12 foot culvert could pass, that filled the meadow upstream from the culvert. It currently appears as though the culvert was NOT plugged…it just couldn't take all the water coming down Warren brook.).

During the early morning hours of October 9, 2005, the water breached the Cooper Hill Road embankment, sweeping away the culvert and a large section of the 30 foot high road embankment. A 30 to 40 foot high wall of water and debris surged down the valley of Warren Brook, along the side NH 123 and on through the village of Alstead. The raging floodwater carved a gorge estimated to be 55 feet deep and 110 feet wide at the Cooper Hill Road brook crossing. (See Photo #1.)

Photo #1. Route 123 washed out by floodwater at the intersection of Cooper Hill Road. (Photo by Dick Lane – NHDOT.)

At the culvert location, the floodwater had cut into the underlying basal till, lowering the brook channel an additional 8 to 10 feet. The basal till, a highly compacted glacial deposit, has a density equivalent to concrete. (See Photo #2.) The till has a low-permeability and under normal conditions would erode very slowly. Along both sides of Warren Brook and the Cold River, acres of farmland were completely stripped of topsoil and/or covered with all types of flood debris. Cars were carried thousands of feet down stream, some perched in trees and others crushed like aluminum cans. (See Photo#3.)

Portions of foundations and concrete slabs were under cut, leaving buildings precariously overhanging eroded stream banks. Several buildings were ripped from their foundations, large trees uprooted, roads washed out, bridges carried away, and at some locations the overlying soil was stripped to bedrock. Concrete foundations

were all that remained of several houses. In some instances, the current was so strong it removed the upper layer of fractured bedrock. Segments of paved roadway, hundreds of feet in length, were swept away.

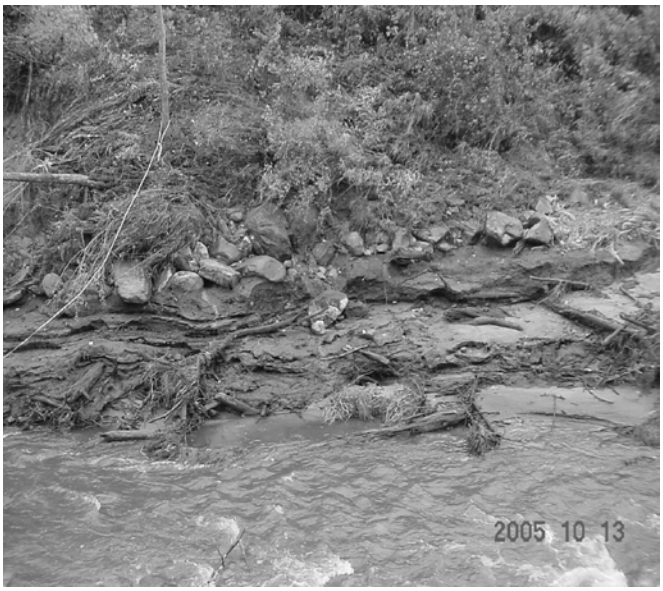


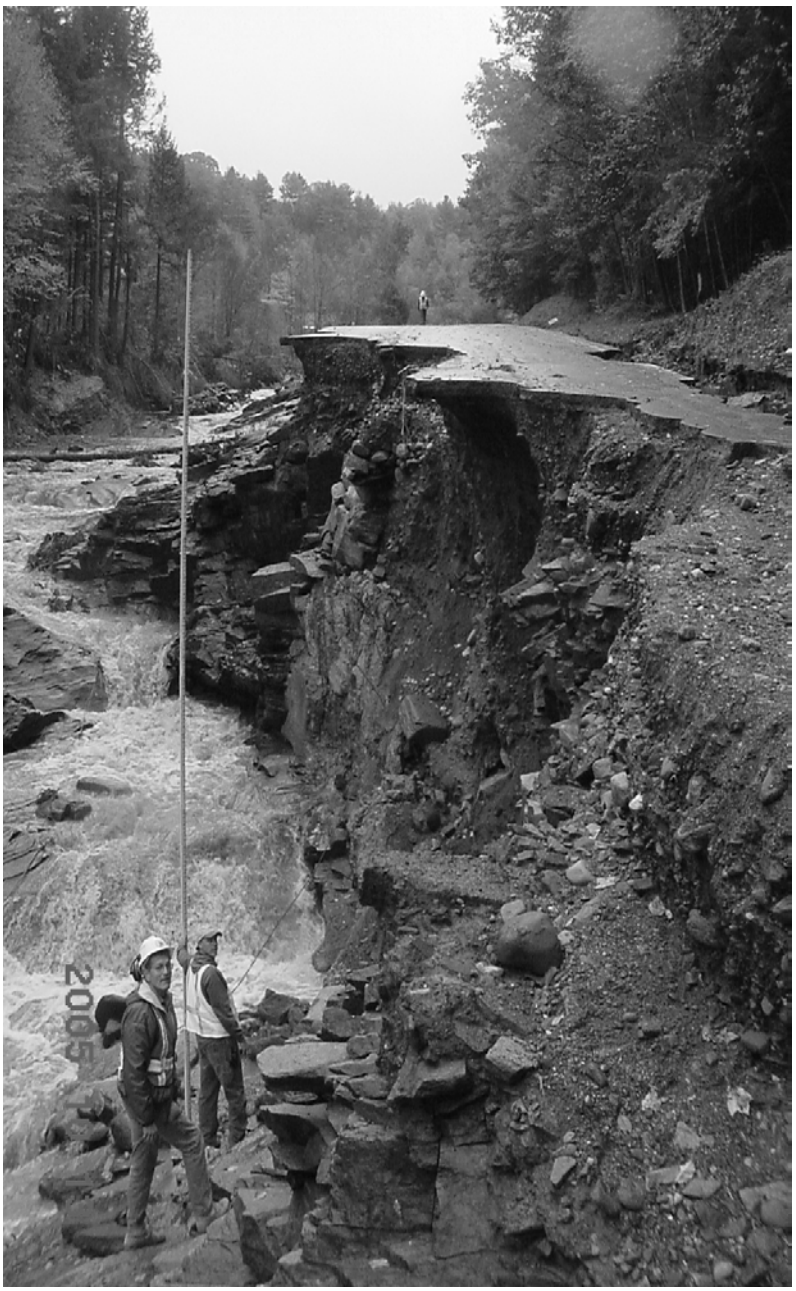
Photo #2 (Left). Floodwater cut deep into dense, basal till. (Photo by Dick Lane - NHDOT.)

Photo #3 (Right). Car demolished and crushed by floodwater. (Photo by Dick Lane – NHDOT.)

In some areas, the stream channel had been rerouted to where the road originally existed. Other areas were buried under assorted debris and soil deposits with boulders (3 to 4 feet in diameter). A river bottom current velocity of at least 38 feet per second is needed to move boulder size material. Clear water with little suspended matter has a limited capacity for abrasive action. When running water transports sand to pebble size particles, it becomes a powerful agent of erosion. A combination of sheet runoff and stream erosion were responsible for roadway washouts, loss of homes, damage to drainage structures and severe erosion just down stream from the Warren Lake Dam. Hundreds of feet of buried under drain pipe, installed at a depth of 6 feet along the edge of the road, and were plucked from the ground. The rushing water had cut narrow trenches with nearly vertical walls into the underlying dense glacial till. The trenches were eroded four feet below the pipe elevation for a total depth of 10 feet. At a brook crossing southeast of the Alstead town garage, Warren Brook bypassed a large multi-plate pipe, wiped out a section of Route 123, cut a new channel at the roadway location and completely filled the existing 60-foot long cross pipe with gravel and cobbles.

The damage to state roads and bridges across the state is estimated to be in excess of $25 million. Some locations were repaired within hours or days, while other sites are expected to take weeks to months. In addition to repairing the highway infrastructure, a massive cleanup operation has been underway to remove debris from the stream and adjacent flood plain. The parade field in Alstead is being utilized as a temporary storage area for flood debris. (See Photo #4.).

Photo #4. Piles of scrap metal and cars at Alstead parade field. (Photo by Dick Lane – NHDOT.)



Materials are being sorted into separate piles of tires, wood, cars, metal, trees, etc. Trees are being shredded into wood chips and topsoil recovered by screening some of the woody debris. The cleanup activities have been ongoing from sunrise to sunset, 7 days a week. The cost for pickup and disposal are estimated at $120,000 per day. The most difficult roadway sites to repair in the Alstead area are a 400-foot long segment of Route 123 along Warren Brook, just west of its intersection with Route 12-A and portions of Route 123 at the Cooper Hill Road intersection. (See Photo #5.)

A segment of Route 123 at the Cooper Hill Road intersection is being temporarily rerouted while permanent repairs are designed and constructed. Until then Cooper Hill Road has been dead-ended. Temporary repairs at the site downstream from the Route 12-A intersection will involve the placement of stone fill in areas where the road has been washed out. Anchorage may be needed for large rocks placed along the toe of the embankment. A geotextile will be installed between the existing soil and the stone fill. Two alternative designs are being considered for the permanent repairs at this location. The first alternative involves the construction of a 400± foot long retaining wall along Warren Brook.

Photo #5. Route 123 washed out – roadway embankment fill, underlying soil and fractured rock stripped to bedrock at location west of Route 12-A intersection. (Photo by Dick Lane – NHDOT.)

The wall would reach a maximum height of approximately 25 feet. The second alternative would be to cut into the steep hillside on the opposite side of the road and move Route 123 away from the brook. The geologic conditions, feasibility of construction and cost for both alternatives will be compared. Several stream crossings have been spanned with temporary Bailey bridges, while plans are underway to build new replacement structures (See Photos #6A and 6B.)

The bridge over Cold River in the village of Alstead has settled approximately 9 inches at the south end. Borings are planned to determine if voids exist beneath the southern abutment. The scope of repairs for this structure will depend on the subsurface conditions. It was reported that floodwater washed over the bridge at a height of four feet above the deck. An eyewitness stated that a wrecker truck carried by the floodwater, crashed into the bridge, flipped over the bridge and then was swept further downstream.

Photo #6A (Left) Culvert by-passed and a section of route 123 washed out and Warren Brook rerouted. (Photo by Dick Lane – NHDOT.)

Photo #6B (Right) Temporary Bailey Bridge installed at Warren Brook culvert pipe crossing. (Photo by Dick Lane – NHDOT.)

Accounts describing the devastation in Alstead provide some insight into the awesome power of flooding as a geologic process. These events are also a frightening reminder that even a small brook, under the right conditions, can become a destructive force as well as a powerful erosional agent.

Upcoming Mount Washington Observatory EduTrips – Second Announcement

Several of the EduTrips for the 2005-2006 academic year are to be run by GSNH members . A list and description of the trips is as follows:

January 12-13, 2006, (Thursday-Friday): A Special Mount Washington EduTrip for New Hampshire Teachers. Lee Wilder, of the New Hampshire Science Teachers Association, will lead this trip, which will introduce participants to several Earth Science topics for which Mount Washington is such an important natural laboratory. These topics will include meteorology, geology, astronomy and climatology. Teachers will learn several lab/classroom activities for use in their classes. This experience will qualify for up to 16 staff development hours.

January 14-15, 2006 (Saturday-Sunday): Implications of Global Climate Change. The earth's climate has often changed, but how do we know the details? Join scientists Michelle Day and Kim McCracken in this exploration of an increasingly important topic. What evidence do we have of past alterations in our planet's climate? What can we learn about possible climate change today - and its causes? What are the hints of past changes to regional and global ecosystems that can help us understand the implications for our future?

January 21-22, 2006 (Saturday-Sunday) Global Climate Change: A View from the Rockpile. Join geologists Mark Van Baalen, of Harvard University, and Tim Allen, of Keene State College, in this investigation of the interplay between geology and climate. Current climate fluctuations are relatively small compared to those of the past. The White Mountain landscape records a subtle, occasionally violent, geologic history, culminating in a period of extensive glaciation. What can the study of glaciers, including the glacial history of the White Mountains, tell us about changes in the earth's climate through geologic time?

March 18-19, 2006 (Saturday-Sunday) The Glacial Landscape: Then and Now. Join geologist and former Observatory researcher Michelle Day on this trip devoted to glaciers and their impact. We'll consider how ice sheets and local glaciers shaped the Presidential Range - and how the Antarctic ice sheet today is an evolving force, harboring clues of the past and provoking questions about the future. Michelle will share also her

reflections on living and working in the Antarctic and the similarities and differences to life and work on Mount Washington.

April 1-2, 2006 (Saturday-Sunday) Glacial Geology of the Presidential Range. Thom Davis of Bentley College, will serve as leader for this trip, which will investigate the impact that glaciers, both continental and alpine, had on the White Mountain landscape. Learn what glacial features we can visit today, and discover how the study of today's glaciers elsewhere on earth gives us hints about the glaciers that once covered northern New Hampshire.

For all trips, the Observatory member Rate is $439/non-member rate is $479. More information on these trips and the complete listing for 2005-2006 can be found at http://www.mountwashington.org/education/edutrips/index.php .

Congratulations to the 2005 Annual Fall 2005 Dinner Meeting Raffle Winners!

James Degnan won the *Silver Crystal "Feather"* (Donated by Greg Kirby)
Tina Cotton won the new book *"Stepping Stones Across New Hampshire: A Geological Story of the Belknap Mountains" (Donated by Jay Long)*

GSNH WANTS YOU!

The GSNH would love to hear from its members about problems that arise in the work place that involve geologic issues and interpretation. Consider writing and submitting a short (or long) article for our newsletter about the topic, explaining how geology played a role!

Geological Society of New Hampshire

January 12, 2006

Speaker: Dr. Jeff Johnson

Department of Earth Sciences
University of New Hampshire

Topic: "The Forgotten 2005 Eruptions of Reventador Volcano"

When: Thursday, January 12, 2006

*******Where: Cat n'Fiddle Restaurant*******
Manchester Street, Concord, NH

6:00 pm Social Hour
7:00 pm Buffet Dinner
7:45 pm Speaker

GSNH January Meeting, Thursday January 12, 2006

Reservations: _____members @ $20.00 _____ non-members @ $22.00 (in advance)
Half-price for students (must show student ID card)
Reservations will be taken until Wednesday afternoon January 4, 2006
There will be a $2.00 surcharge for those paying at the door without reservations

Make checks payable to: Geological Society of New Hampshire
Mail to: Lee Wilder, 477 Putney Hill Road, Hopkinton, NH 03229
Reply via e-mail to: boslwne@aol.com.

Name:_____

Address:_____

Phone and/or Email:_____

Half the cost of the dinner may be tax-deductible as a business expense.

The lecture part of the program counts as 1.5 hours of CEU contact hour credit.

Dates to Remember!

- **Granite State Geologist Newsletter submission deadlines (March 1, June 1, September 1, December 1)**
- **Earth Science Week October 8-14, 2006**
- **GSNH January Meeting on January 12, 2006 at 6:00 PM at the Cat n'Fiddle Restaurant, Concord, NH.**
- **New Hampshire Science Teachers Spring 2006 Conference at Philips Exeter Academy PEA, Exeter, New Hampshire, Tuesday, March 21, 2006.**

Geological Society of NH
PMB 133, 26 South Main Street
Concord, NH 03301