Dear Colleagues,

A global “climate” does seem to have changed in 2007: From Al Gore’s “An Inconvenient Truth–A Global Warning” to 2007 Nobel Peace Prize awarded to the IPCC and Gore; from Rachel Carson’s centennial anniversary and her legacy in America’s environmental movement to an unfolding global “sustainability movement;” from Time’s 2006 Year of the Person (YOU!) to our shared only home called Earth, we start to sense an urgency and responsibility in addressing a truly “global homeland security” issue (a different kind of homeland security. See forum on p. 11-12). If Carson’s Silent Spring sprout environmental movement in the America, perhaps Gore’s not-so-silent book(s) and movie will stir a global sustainability movement?! Such a global “climate change” also impacts how we may conduct hydropedology research, education, and outreach. As we know, water vapor accounts for 96% of greenhouse gases, and the main consequence of climate change is realized through the water cycle. Therefore, there are ample opportunities for hydrology. In the mean time, the emerging concept of the Critical Zone, the pivotal role soils play in carbon sequestration and in conserving increasingly scared water resource, and the growing demand on alternative bioenergy all have opened new doors to soil science to possibly enter into its golden age.

Below are some highlights of the news reported in this issue of the Hydropedology Newsletter:

• The 1st International conference on Hydropedology will be held in July 28-31, 2008 at Penn State Univ. The conference theme is “Water and Soil: Key to Sustaining the Earth’s Critical Zone.” More on p. 3.
• Hydropedology web site (http://hydropedology.psu.edu/) is up-running and will continue to grow. Because of this, less time was put in the Hydropedology Newsletter this year and only one issue is now in your hands.
• The Tri-Societies’ Hydropedology Working Group (ACS 837) held its 6th general meeting on Nov. 6 during the 2007 annual ASA-SSSA-CSSA international meetings in New Orleans. Dr. Phillip Owens of Purdue University was elected as the new chair of this working group. See his message on p. 2.
• A number of meetings held in 2007 are of hydropeds’ potential interests: Soil monitoring network workshop in the NE U.S. and Canada, EGU symposium on hydropedology, National Cooperative Soil Survey Conference, Hydropedology Workshop in China, and Katrina symposium, etc. More on p. 7-10.
• Exciting new development in extraterrestrial hydropedology: Phoenix Mars Lander blasted off to the red planet on Aug. 4, 2007 to explore “soil habitability” on the polar region of our “brother planet.” Onboard the Phoenix is Decagon’s TECP (thermal and electrical conductivity probe) that will measure temperature, thermal properties and electrical conductivity of the soil, providing the possibility to detect ice content and unfrozen water content. More news and stories of space exploration are on p. 15-16.

As always, I thank you for reading this newsletter. I hope you would find it interesting and informative. Please feel free to drop me a line at henrylin@psu.edu if you have any comments or suggestions.

Sincerely,
Henry Lin, Editor

INSIDE this issue …

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For those of you who do not know me, I would like to introduce myself. I am a native of Arkansas and earned a B.S. and M.S. at the University of Arkansas working with Dr. E. Moye Rutledge. My M.S. research focused on developing decision tools for sizing onsite wastewater systems in soils with seasonal water tables. I continued my education by earning a Ph.D. with Dr. Larry Wilding at Texas A&M University, where I conducted research on relationship of oxygen concentration in seasonally saturated soils with the goal of developing a simple field technique to infer oxygen status. In 2002, I took a diversion from science to the world of politics where I served as the ASA/CSSA/SSSA Congressional Science Fellow in the office of U.S. Senator Blanche Lincoln in Washington DC. This was a great opportunity to understand how policy is made and the role of science in the policy making decisions. From Washington DC, I took a position with USDA-ARS Waste Management and Forage Research Unit in Starkville, MS. I focused on nutrient movement and transport related to landscapes and hydrology. In 2005, I took a position as an assistant professor of pedology/geomorphology at Purdue University. My current research has continued to center on soil variability within landscapes, with a focus on water as the driver of pedogenesis.

With that introduction, I would like to say that I am honored to serve as the Chair of the Hydropedology Working Group. Henry Lin, with the help of many other soil scientists and hydrologists, have done an excellent job of developing, organizing, presenting and focusing the multi-disciplinary hydropedology core areas within the broader context of the geosciences community. Through the efforts of this group, the formerly disparate disciplines now are linked to address complex issues in a more holistic approach. The concept of Hydropedology is the integrator of our diverse viewpoints and blends our broad pool of expertise to achieve new insights and interpretations on relevant environmental and agricultural issues. I plan to continue and expand the efforts of Dr. Lin through facilitation, and team building approaches for the Hydropedology Working Group. This year, we hope to highlight Hydropedology issues and outline objectives that we can all contribute to and move this discipline forward within the context of the broader scientific community. This will be a group effort and I will need contributions from everyone interested in this direction. I am looking forward to interacting with various colleagues in 2008 and I am excited about the future. Please be sure to attend the First International Conference on Hydropedology at Pennsylvania State University in July 28-31, 2008. For detailed information about the conference, please visit http://hydropedology.psu.edu/.
Announcement for
The First International Conference on HYDROPEDOLOGY
hydropedology.psu.edu

July 28-31, 2008
Penn State Univ., University Park, USA

Conference Theme

Water and Soil: Key to Sustaining the Earth’s CRITICAL ZONE

Conference Goal and Objectives

To advance the emerging interdisciplinary field of hydropedology and to promote its synergistic collaborations across scientific disciplines. Specific objectives are:

• To take stock and analyze what has been accomplished so far in hydropedology and to identify where gaps are and how hydropedology can deliver unique contributions to soil & water sciences;
• To promote exciting breakthrough collaborations among soil science, hydrology, geomorphology, and other related bio- and geosciences, aiming at synergistic strategies for advancing one another;
• To charter a roadmap for international collaboration to advance the frontiers of hydropedology and its contribution to the Critical Zone science, including fundamental research, practical applications, and interdisciplinary education and outreach.

Important Dates

• March 1, 2008: Abstract deadline
• April 15, 2008: Notification of abstract acceptance and final program
• May 1, 2008: Early registration deadline

Broad Topics

• Emerging theories and concepts in soil science, hydrology, and the Critical Zone science
• Fundamental scientific issues of hydropedology and current knowledge gaps
• Frontiers of integrated and multiscale hydropedologic models
• Soil architecture/structure: Its formation, evolution, and functional manifestations across scales
• Advanced monitoring and mapping techniques, instrumentation, and visualization
• Functional assessment of soil and landscape patterns with respect to hydrology
• Coupling/integrating pedology, soil physics, hydrology, biogeochemistry, ecohydrology, and others
• Role of hydropedology in spatial land-use planning, water quality protection, stormwater management, climate change, space exploration, and environmental policy and regulations
• Education of the next generation of soil scientists, hydrologists, and geoscientists

Organizing Committee

The International Union of Soil Sciences’ Working Group on Hydropedology, consisting of:

Henry Lin, Penn State Univ., USA (henrylin@psu.edu)
David Chittleborough, Univ. of Adelaide, Australia (david.chittleborough@adelelaide.edu.au)
Kamini Singha, Penn State Univ., USA (ksingha@geosc.psu.edu)
Hans-Joerg Vogel, UFZ – Helmholtz Center for Environ. Res., Germany (hans-joerg.vogel@ufz.de)
Sacha Mooney, Univ. of Nottingham, UK (Sacha.Mooney@nottingham.ac.uk)

Sponsors (To Date)

For More Information: Henry Lin (henrylin@psu.edu) or Melissa Maurer (mll198@psu.edu)
The National Science Foundation (NSF) has selected sites for three critical zone observatories (CZO). The observatories are designed to provide scientists with an understanding of what has come to be called the critical zone--the region between the top of the forest canopy and the base of unweathered rock: our living environment--and its response to climate and land use changes. The CZOs represent the first set of systems-based observatories dedicated to Earth surface processes.

Scientists at each CZO will investigate the integration and coupling of Earth surface processes and how they are affected by the presence and flux of fresh water. The CZOs will use field and analytical research methods, space-based remote sensing and theoretical techniques.

The three CZOs are located in watersheds in the Sierra Nevada, the Front Range of the Colorado Rockies, and the Appalachian Uplands. The respective awardees are the University of California at Merced, the University of Colorado at Boulder, and Pennsylvania State University.

These projects add to the environmental sensor networks in place and planned by NSF, including EarthScope, the National Ecological Observatory Network, and the Ocean Observatories Network.

"Scientists have known for a long time that the critical zone is a complex system in which the different components interact at various space and time scales and in which the rates of processes depend on the nature of the interactions," said Art Goldstein, director of NSF's division of earth sciences, which funded the CZOs. "Until now, we have looked at these components individually, particularly in the field. The CZOs are a very exciting development that will allow for investigation of the critical zone as a holistic system, rather than as isolated parts of a system."

The water cycle, the break-down of rocks and formation of soil, the geochemical and physical erosion of that soil, evolution of rivers and valleys, patterns of vegetation, and the form and function of the Earth that we see are products of multiple, highly interactive processes in the critical zone.

"The water, vegetation and geochemistry are all interrelated, with feedbacks from each influencing the others," said scientist Roger Bales of UC Merced/the Sierra Nevada CZO.

Society has long recognized the importance of water, soil, land forms and rivers to human welfare, but has only recently begun to holistically probe the workings of these coupled systems, he and other researchers believe.

Suzanne Anderson of the Colorado CZO said that "the observatories will benefit our comprehension of the entire Earth surface by spurring more connection of individual research to larger questions. The CZOs mark a significant change in the way we study the surface of the Earth."

Chris Duffy of Pennsylvania State University-led Susquehanna/Shale Hills CZO said that the research "will lead to a predictive understanding of how changing climate and human activities impact the evolution and function of the critical zone, especially as it relates to sustainable water resources."

How hydrologic, physical, geochemical, and biological processes interact to break-down rocks, to form soil and to shape the landscape are significant questions in many earth science--and societal--problems, said Goldstein.

Scientists at NSF's new CZOs are working to find answers to these questions:
• How do landscapes evolve over both human generational time scales and over multi-millennia, and how is this process affected by the presence and flow of water?
• How do soil and weathered bedrock move down hillslopes, and how are they coupled to the evolution of the channel that usually surrounds the base of the hillslopes?
• How do biological processes impact physical processes?
• Are there signals in the landscape that can tell us about past climates, about how these landscapes have responded--and might in the future--to climate change?

NSF Awards Grants for Three Critical Zone Observatories
New "holistic" Earth surface observatories to focus on the science of watershed evolution

Editor’s Note: In the last issue of this newsletter, we reported that the U.S. National Science Foundation released its first-ever RFP for funding the first set of "Critical Zone Observatories" (solicitation 06-588). After a vigorous peer-review process, three proposals have been selected for funding, as reported in the following NSF Press Release 07-178. The following text is taken directly from the NSF Press Release 07-178 in its entirety, viewable at http://www.nsf.gov/news/news_summ.jsp?cntn_id=110586&org=EAR&from=news.
### Publications of Interest

- **A special section of Geophysical Research Letters on “Bridging Hydrology, Soil Science, and Ecology: Hydropedology and Ecohydrology”**: This special section of Geophysical Research Letters, based on selected papers presented at the AGU 2006 fall meeting, presents the results of interdisciplinary research related to two emerging and related disciplines that are focused on better understanding the interactions of soil, water and biological systems at the near-surface — hydropedology and ecohydrology. The results highlight the important linkages and feedback mechanisms between soil development, water movement, and the response of ecosystems at different spatio-temporal scales, through the use of field investigations and innovative methods of analyses. A deeper understanding of these linkages will inevitably improve our ability to address the complex environmental challenges of the 21st century.

- **A Catena special issue on Hydropedology**: This special issue is being published based on selected papers from the Hydropedology Symposium held at the 18th World Congress of Soil Science in July 9-15, 2006 in Philadelphia, PA, USA. This symposium, entitled “Hydropedology: Fundamental Issues and Practical Applications,” recognized growing professional interests and publication activities related to hydropedology. All articles in this special issue are now available online in Catena’s Articles in Press and should be out in a bound print volume soon.

- **Soils: Basic Concepts and Future Challenges.** This 2006 book, edited by Riccardo Scalenghe and Giacomo Certini, is an international tribute to Prof. Fiorenzo C. Ugolini, an outstanding soil scientist who recently retired from Università di Firenze, Firenze, Italy. The book is an up-to-date synthesis of the present knowledge of soils, their genesis, functions, and management, and includes contributions from leading soil scientists. The book also discusses the increasingly important role of soils in enabling the preservation of life and considers the possible existence of extraterrestrial soils based on the findings from the latest space missions. This volume will be a valuable resource for researchers and students of soil science, soil conservation, geography, and landscape ecology, according to the publisher.

- **Soil in the Environment – Crucible of Terrestrial Life** (Daniel Hillel, 2008, Academic Press). Like many other books written by Hillel, this is yet another elegantly written and beautifully illustrated text that is of significant value to anyone interested in understanding the broad and fundamental impacts of soils on the environment. This book offers an encompassing perspective regarding the soil as a central link in the chain of domains and processes comprising the terrestrial environment, a topic that must be an essential component of every curriculum in the environmental sciences. This book provides a nice introduction to the emerging concept of the Critical Zone, although no such a term is used in this book. The book begins nicely with the 1st chapter on “Soil as a living body” and the 2nd chapter on “Soil in the history of civilization,” and ends with two valuable appendices, especially the Appendix A on “The role of soil in the mitigation of global warming” that is timely and relevant to the overall theme of this issue of the Hydropedology News.

- **Principles of Environmental Physics** (3rd edition, John Monteith and Mike Unsworth, 2008, Academic Press). This new edition of the classical text introduces contemporary issues such as the ability of human activity to modify atmospheric properties and change weather and climate. This coincides with the growing concerns about global warming and connects well to the overall theme of this issue of the Hydropedology News. Environmental Physics, as the authors choose to define it, concerns the measurement and analysis of interactions between organisms and their environment, including mass and energy exchanges and physical processes that establish the conditions in which all species of life survive and reproduce. The subject involves a synthesis of mathematical relations that quantify the physical nature of the environment and the many biological responses that environments evoke. This new edition contains further material on causes of global warming, applications of remote sensing, and the carbon and water cycles of crops and forests.
Meetings and News Flashes

• **Soil Monitoring Workshop held in March 6-7, 2007 in Troy, New York:** The first workshop on soil monitoring in the Northeastern U.S. and Eastern Canada was held to organize interested individuals and institutions into a cooperative network. The workshop was organized by Gregory Lawrence of USGS, and was sponsored by the Northeastern States Research Cooperative and the New York State Research and Development Authority. Representatives from 9 federal and state agencies from the U.S. and Canada participated, along with faculty and students from 8 academic institutions. The workshop began with invited talks on the possibilities and pitfalls of soil re-sampling by Arthur Johnson, Univ. of Pennsylvania, Daniel Richter, Duke Univ., and Scott Bailey, U.S. Forest Service. The remainder of the workshop was devoted to a discussion of the potential and scope of a monitoring cooperative, and to planning a review article on soil change detection. The 2nd workshop is planned for March 12-13, 2008 in Troy, NY.

• **National Cooperative Soil Survey Conference 2007 held in June 3-8 in Madison, Wisconsin:** The theme of this bi-annual meeting was “Soil Survey–Future Directions in Soil Health and Supporting Productive Lands.” Three standing committees (Research Agenda, NCSS Standards, New Technology) and four in-conference committees (Future of Soil Survey, NCSS Interpretations, Ecological Principles in Soil Survey, and Water Movement and Water Table Monitoring in Soil Survey) had active discussions and made recommendations. Follow-up to the committee recommendations from Regional Conferences as well as the National are critical to institutionalizing change and progress in the NRCS Soil Survey Program, according to Maxine Levin, NCSS Coordinator in Washington, DC.

• **Soil Geomorphology Institute:** The USDA NRCS has launched this Institute in March 2007 to train NRCS soil scientists to use an integrated earth science approach to soils and geomorphology. The purpose is to expand the field skills and conceptual knowledge needed to generate and deliver scientifically accurate soil inventory products. The course provides a comprehensive treatment of key soil geomorphic principles and processes including 1) soil geomorphology, 2) stratigraphy, 3) hydrology, and 4) pedology and using appropriate tools to apply these principles and processes. This Institute will continue until at least 2010, with two sessions each year to be hosted by various universities around the country.

• **UIUC Hydrology Synthesis Activity:** The kick-off meeting was held in September 12-14, 2007 in Allerton Park and Retreat Center of University of Illinois at Urbana-Champaign (UIUC) in Monticello, Illinois. This is one of the two NSF-funded CUAHSI hydrology synthesis pilot projects. The goals of the kick-off meeting included 1) problem definition/scoping: identify grand challenges, opportunities, including avenues for innovations and breakthroughs; and 2) setting targets (short term, long term) and strategies: plan activities, identify data needs, logistics & timeline, form teams (SAGs), identify gaps and niche opportunities to further strengthen teams. Siva Sivapalan presented a CUAHSI cyberseminar on this synthesis activity in Nov. 16, 2007. A follow-up meeting was held as a pre-AGU meeting on Dec. 7, 2007. For more info, visit [http://cwaces.geog.uiuc.edu/synthesis/index.html](http://cwaces.geog.uiuc.edu/synthesis/index.html).

• **CZEN Data and Information Systems Workshop held in Sept. 17-18, 2007 at Penn State:** Workshop attendees represented the CZOs recommended for funding by NSF, eight CZEN seed sites, the CZEN steering committee, NSF, CI specialists, and students who had received funding for CZ work abroad. The workshop’s purpose was to address the question, “What measurements should be made at all CZ sites to allow cross-site comparison and better understanding of the CZ?” For more info, visit [http://www.czen.org/](http://www.czen.org/).

• **The Critical Zone seminar series at Penn State:** Co-sponsored by the Penn State’s Dept. of Crop and Soil Sciences, the Environment and Natural Resources Institute, and the Earth and Environmental Systems Institute, this seminar series speakers have so far included 1) Gail Ashley of Rutgers Univ. in fall 2006; 2) Oliver Chadwick of UC-Santa Barbara in spring 2007, and 3) Larry Wilding of Texas A&M in fall 2007. The 4th speaker is Roger Bales of UC-Merced in spring 2008.
Following the initiative of Prof. Nunzio Romano of Naples University, a symposium on Hydropedology was organized at the yearly congress of the European Geosciences Union (EGU) in Vienna in April 2007. Henry Lin and I also functioned as convenors. This is a very big meeting covering all earth sciences and soil sciences are only part of this since three years ago. Available time slots for symposia were 1.5 hours and there were six presentations at this Symposium. In addition, a poster session was held with four presented posters. The title of the symposium was: “Hydropedology: A synergistic tool to shape EU guidelines for soil and water.” These are exciting times for soil science and hydrology in Europe. Guidelines by the European Union (EU) on water and soil have been introduced recently. They are legally binding and even though national governments have some flexibility in implementing them, applying these guidelines requires soil and water expertise. Hydropedology appears to be particularly attractive because soil survey interpretations are too qualitative to be very helpful while simulation models of hydrological regimes are often too schematicized in terms of representing real soil conditions in the field to adequately represent field soil hydrology. Combining the two areas of expertise appears very attractive in this particular context. The keynote address was presented by Prof. Mike Vepraskas from North Carolina State University, who demonstrated that soil morphological features together with hydrological simulation modelling can provide excellent data for environmental rules and regulations related to wetlands. Dr. Adhikari explained the EU Soil Protection Framework and Johan Bouma and Bram de Vos from the Netherlands showed how efforts are made in the Netherlands to make hydropedology part of an overall framework of environmental characterization, required by the EU guidelines for soil and water. Dr. Schneider covered a hydrological classification of European soils and Henry Lin shared experiences in Pennsylvania when working with regulatory agencies. Posters covered were: (i) measurements of near-saturated hydraulic properties, where soil structure plays an important role (Smettem); (ii) parameterization of models predicting pesticide movement (Jarvis); (iii) using Belgian soil series classification to predict soil hydraulic properties (Weynants); and (iv) low-cost water content measurement (Cobos). The session was well attended and offered the opportunity to exchange experiences and introduce the new concept of hydropedology to a new audience. The possible link of hydropedology with environmental regulations was particularly emphasized here and this was well received. Considering all interactions, we feel that this symposium was quite successful.

Johan Bouma
Wageningen University
The Netherlands

A strategy to keep Europe’s soils robust and healthy
http://ec.europa.eu/environment/soil/index.htm

The EU Water Framework Directive – integrated river basin management for Europe
http://ec.europa.eu/environment/water/water-framework/
Upon the invitation by the Soil Science Society of China and the Chinese Academy of Sciences, a national workshop on “Frontiers of Hydropedology Research and Applications” was held in Nanjing, China, from Oct. 9-10, 2007. The purpose was to introduce hydropedology to the Chinese scientific communities and practitioners who were interested in integrating soil science, hydrology, geomorphology, and other related bio- and geosciences for holistic studies of soil-water interactions and landscape-soil-hydrology relationships across space and time. A total of over 45 scientists and graduate students from all over China participated in this workshop. These participants came from diverse backgrounds such as soil science, hydrology, geosciences, geography, agronomy, plant nutrition, forestry, ecology, biogeochemistry, environmental science, and natural resource science. The two-day workshop consisted of two parts: 1) A series of lectures on the fundamentals and applications of hydropedology, given by Henry Lin of Penn State Univ., and 2) A hands-on training on the fundamentals and measurements of soil and plant water relations, given by Drs. Gaylon Campbell, Colin Campbell, and Douglas Cobos of Decagon Devices, Inc. The participants had opportunity to apply fundamental concepts of soil and plant physics to solve research problems using the latest techniques for measuring soil and plant water relations. The feedbacks from the participants were overwhelmingly positive, and follow-up plans were initiated to give such workshops elsewhere in China. (H. Lin)
Katrina Disaster and Sustainable Coastal Development: An Integrated Perspective and the Role of Land and Water Sciences

Wednesday, November 7, 2007: 1:45 PM

Convention Center, Room R02, Second Floor

234: Symposium--Katrina Disaster and Sustainable Coastal Development: An Integrated Perspective and the Role of Land and Water Sciences, I

Sponsor: Z04 Katrina Disaster and Sustainable Coastal Development
Cosponsors: A05 Environmental Quality; A07 Agricultural Research Station Management; S01 Soil Physics; S05 Pedology; S06 Soil & Water Management & Conservation; S07 Forest, Range & Wildland Soils; S11 Soils & Environmental Quality

Presidings: Henry Lin, The Pennsylvania State University
Richard Keim, Louisiana State Univ.
Steven Hamburg, Brown University

1:45 PM Introductory Remarks
1:50 PM 234-1 Hurricane Katrina and New Orleans: Science and Restoration Policy
Charles "Chip" Groat, Jackson School of Geosciences, Univ. of Texas at Austin

2:15 PM 234-2 The Sociopolitical-Scientific Process in Coastal Wetland Restoration
William L. Jenkins, Louisiana State Univ. System

2:35 PM 234-3 Anatomy of a Disaster: What We Learn from Katrina
Ed Link, Univ. of Maryland

2:55 PM 234-4 Drawing Louisiana’s New Map: Addressing Land Loss in Coastal Louisiana and Related Knowledge Gaps
Robert Dean, Civil and Coastal Engineering

3:15 PM 234-5 Hurricane Disaster Response Maps of NRCS and the Role of Soil Science in the Politics of Natural Resources Conservation
William Puckett, Natural Resources Conservation Service, Christopher Smith, Natural Resources Conservation Service, Karl Hippie, USDA-NRCS

3:35 PM Discussion
3:45 PM Adjourn

Thursday, November 8, 2007: 8:00 AM

Convention Center, Room 207, Second Floor

336: Symposium--Katrina Disaster and Sustainable Coastal Development: An Integrated Perspective and the Role of Land and Water Sciences, II

Sponsor: Z04 Katrina Disaster and Sustainable Coastal Development
Cosponsors: A05 Environmental Quality; A07 Agricultural Research Station Management; S01 Soil Physics; S05 Pedology; S06 Soil & Water Management & Conservation; S07 Forest, Range & Wildland Soils; S11 Soils & Environmental Quality

Presidings: Richard Keim, Louisiana State Univ.
Henry Lin, The Pennsylvania State University
Steven Hamburg, Brown University

8:00 AM Introductory Remarks
8:05 AM 336-1 Aftermath of Disaster: New Orleans since Katrina
John Logan, Brown University

8:25 AM 336-2 More Frequent and Intense Hurricanes Cause Less Destruction: A Global Perspective of Hurricanes
Steven Hamburg, Brown University

8:45 AM 336-3 Global Climate Change and Soil Carbon Sequestration
Rattan Lal, Ohio State University

9:05 AM 336-4 Hydrodynamic Modeling of a Coastal Wetland Restoration River Diversion
Bob Jacobsen, URS Corporation

9:20 AM 336-5 Organizing Louisiana's Future: Coastal Restoration Science and Policy from the NGO-Perspective
G. Paul Kemp, National Audubon Society

9:35 AM 336-6 Integrated Natural Resources Management Is Integrated Disaster Management: Developing the Watershed Community Resilience Index
Chris S. Renschler, University at Buffalo (SUNY)

9:50 AM Discussion
10:00 AM Adjourn

Recorded presentation
“Homeland security” is generally used to refer to a concerted national effort to protect the territory of a nation, chiefly the prevention of terrorist attacks and the minimization of possible damages. This term became prominent, especially in the U.S., following the 9/11 attacks. Here, the term is used in a different sense – but a common sense – and maybe called “global homeland security.” This common sense is indeed global in scale without national boundaries (i.e., to protect our home planet), and would impact the future of our civilization and the sustainability of human species. Sounds like too big an idea, too ambitious an attempt, or too remote a concept? Well, it is becoming real and even urgent — as vividly articulated by Al Gore’s “An Inconvenient Truth – A Global Warning,” and grimly warned by numerous recent man-accelerated natural hazards such as the Katrina in the America and the Tsunami in the Pacific. Both Gore’s Oskar-winning movie and Monster natural disasters like the Katrina are wake-up calls to the earthling community — no more myths and misconceptions but facts and warnings that we ought to take seriously. With a chance to digest the detailed IPCC’s latest reports (now available online at http://www.ipcc.ch/ or in hard copy at amazon.com), many scientists are more convinced than ever that immediate and forceful actions are required to curb largely man-made global warming (Kerr, 2007). Otherwise, the consequence is a relentless avalanche of change: dramatic sea level rise flooding major coastal cities, increased hydrologic extremes, increased drought in vulnerable areas, increased water stress placed on billions of people, corals bleached and mortality, decreased crop productivity, and many other unimaginable consequences.

The latest IPCC reports put the likelihood that human activity has been a key contributor to global warming in recent decades at 90%, up from its 2001 estimate of 66% (Guinnessy, 2007). Evidence mounts that human activity has been accelerating global warming, which has fueled Monster hurricanes like Katrina. This storm that changed America was less an isolated episode than a cruel salvo in a continuing environmental and sociopolitical challenge for the U.S. and around the globe.

Cautions of man’s efforts that could end up hurting ourselves are not new, as illustrated in the following quotations. What is new though, this time around, is the reality, urgency, and magnitude that it may bring.

- Albert Schweitzer (French philosopher, physician, and musician who won the 1952 Nobel Peace Prize): “Man has lost the capacity to foresee and to forestall. He will end by destroying the earth.”
- E. B. White (American writer, famous for his essays and children's literature): “I’m pessimistic about the human race because it is too ingenious for its own good. Our approach to nature is to beat it into submission. We would stand a better chance of survival if we accommodated ourselves to this planet and viewed it appreciatively instead of skeptically and dictatorially.”
- Rachel Carson (American marine biologist and nature writer whose writings spurred the launch of American environmental movement): “No witchcraft, no enemy action had silenced the rebirth of new life in this stricken world. The people had done it themselves.” (From her 1962 book, Silent Spring. p. 3)
- Al Gore (former U.S. vice president, a passionate defender of the environment for more than 35 years): “In one sense, civilization itself has been on a journey from its foundations in the world of nature to an ever more contrived, controlled, and manufactured world of our own imitative and sometimes arrogant design. … At some point during this journey we lost our feeling of connectedness to the rest of nature. We now dare to wonder: Are we so unique and powerful as to be essentially separate from the earth?” (From his 1992 book, Earth in the Balance – Ecology and the Human Spirit. p. 1)
- Chief Seathl of the Suquamish Tribe (A native American): “The Earth does not belong to man; man belongs to the Earth … Man did not weave the web of life, he is merely a strand in it. Whatever he does to the web, he does to himself.”
Among the choices of prevention, adaptation, and suffering in the face of abrupt climate change (Thompson, 2007), the first choice is obviously preferred. Much like taking care of our own health, preventive measures to keep ourselves stay healthy are always much preferred and lot more economic than curing the illness or suffering the pain and other consequences. In achieving a desirable prevention to reduce global warming, both governments and individuals around the globe have the responsibility, as the global climate system does not recognize national boundaries, nor does it recognize any individual property boundaries. Indeed, we are all part of one world, one moral universe, sharing one oxygen tank.

For governments, those in power ought to “serve the people” and be cooperative players in the globalized community. Like Guinnessey (2007) pointed out, the award of the 2007 Nobel Peace Prize delighted scientists and the public but underscored the current US government’s lack of action to reduce global warming. At recent UN Climate Change Conference in Bali, Gore spoke of the “inconvenient truth” again. In a U-turn, the U.S. government first rejected (the only developed country that did it) and then accepted a compromise to set the stage for more intense negotiations in the next two years aimed at reducing carbon dioxide emissions worldwide, according to CNN News. The White House, however, said in a statement that it still has "serious concerns" about the agreement. Hopefully the highly-anticipated new U.S. president will be a world leader in combating global warming. So, watch carefully whom you vote for in 2008!

At individual level, each and every one of us can make changes in the way in which we live and work, and should become part of the solution rather than part of the problem. So, what hydropedons can do to help reduce global warming? Well, as a starting point for discussion, some are suggested below for consideration:

- Promoting the concept of the Earth’s Critical Zone (as it determines the availability of nearly every life-sustaining resource and provides the foundation for all human activities), and advocating the sustainability of soil and water resources as yet another true “global homeland security” issue (as soil and water are the foundation of the Critical Zone, and provide the basis for food, fiber, feed, and fuel, as well as water, air, and habitat that we depend on everyday).
- Conserving water resources and sequestrating carbon through innovative and precision land management, and considering water and soil as significant (bio)energy sources. Interestingly, Gore talks about the importance of soil moisture in his movie of “An Inconvenient Truth – A Global Warning.”
- Combining traditional “hard” engineering approaches with “soft,” ecological engineering to prepare for and minimize possible damages from natural hazards through balancing man-made structures and natural ecosystems. Hydropedology can contribute important knowledge in this regard, but communications with engineers and the sociopolitical process are critical for realizing these goals.
- Watch for your diet! In a recent UN FAO report — Livestock’s Long Shadow, warnings have been issued that farm animals have surpassed transport as the leading source of greenhouse gas emissions, accounting for 18% of the global total (vs. 13.5%). Increasingly large herds of cattle have been singled out as the world’s leading cause of environmental problems, including climate change, deforestation, land degradation, water and air pollution, water shortage, and loss of biodiversity. This report calls for strong and immediate political commitment in stopping the environmental spiral caused by the continued increase in demand for meat and milk. So, exercise your individual will to eat more healthy vegetables and keep up with your consumer’s right and pressure to push the livestock sector into more sustainable forms.
- Watch the movie of “An Inconvenient Truth – A Global Warning” if you haven’t had a chance to do so – You will get inspirations and learn more about what you personally can do to help solve the climate crisis. Also, it is worth of reading Gore’s 1992 book of “Earth in the Balance” – an urgent call to action to save our seriously threatened climate, our water, our soil, our biodiversity, and indeed our entire living space.

I would like to end this essay by quoting Aldo Leopold’s 1949 writing: “We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect.”

References Cited
Editor’s Note: “Soil-landscape” relationship is the paradigm of pedology. We now reverse that order and add water into the picture to form “landscape-soil-water” relationship for hydropedology. Any difference? You be the judge. From 2006 on, a showcase watershed is selected from around the world to illustrate. In addition, integrated studies of the Earth’s Critical Zone, including mapping, monitoring, and modeling of coupled hydropedological and biogeochemical processes across scales, will be in demand.

The Hubbard Brook Watershed

The Hubbard Brook Experimental Forest (HBEF) was established by the USDA Forest Service in 1955 as a major center for hydrologic research in New England (www.hubbardbrook.org). The site is located within the White Mountain National Forest (WMNF), in West Thornton and North Woodstock, NH (43°56′N, 71°45′W; the geographic center of the HBEF). The 3,138-ha, bowl-shaped valley has hilly terrain, ranging from 222 to 1,015 m in altitude and is drained by a 5th order stream (Hubbard Brook). A class-A weather station, 25 additional weather stations and 9 gauged small watersheds are distributed throughout the Experimental Forest. Beginning in October 2006, a natural cross-section gauging station was established on the main branch of the Hubbard Brook draining the entire Experimental Forest. The basin is entirely forested, mainly with deciduous northern hardwoods on the lower and middle slopes with spruce/fir at higher elevations. The forest was partially logged in the 1880’s and the 1910’s and during several paired watershed experiments in 1960’s, 70’s, and 80’s.

When the HBEF was established in 1955, the major emphasis of research was to determine the impact of forest land management on water yield and quality, and flood flow. In 1960, the Hubbard Brook Ecosystem Study (HBES) began with the idea of the small watershed approach to study element flux and cycling (Bormann and Likens, 1967). The site has been part of the NSF Long-Term Ecological Research (LTER) program since 1988. On-going cooperative efforts among diverse educational institutions, private organizations, government agencies, foundations and corporations have resulted in one of the most extensive and longest continuous databases on the hydrology, biology, geology and chemistry of natural ecosystems (Likens, 2004).

The HBEF is an ideal site to study the effects of changing hydrology, streamwater chemistry, and hydropedology because: (i) soils and drainage waters are base poor and sensitive to atmospheric inputs; (ii) the landscape is representative of the northeastern U.S.; (iii) diverse hydrogeochemical research is done at...
the site providing long-term data on hydrology and geochemistry; and (iv) relatively impermeable bedrock allows construction of quantitative element budgets at a watershed scale (Likens and Bormann, 1995). Hydrometeorology has been monitored since 1955 and precipitation and stream chemistry have been measured since 1963. Additional long-term measurements of forest floor and vegetation biomass, atmospheric chemistry, throughfall chemistry, litterfall, mineral soil, and soil solution chemistry have been made.

Soils are moderate to well-drained Spodosols (Haplorthods) derived from glacial till, with sandy loam textures. There are no residual soils. These soils are acidic (pH about 4.5 or less) and relatively infertile (base saturation of mineral soil ~ 10%). A 20- to 200-mm thick forest floor layer is present, except where the soil surface has been disturbed by fallen trees. Soil depths, including unweathered till, average about 2.0 m from the surface to bedrock, although this is highly variable. Soil on the ridgetops may consist of a thin accumulation of organic matter, resting directly on bedrock. The separation between the pedogenic zone and the virtually unweathered till and bedrock below is distinct. Depth to the C horizon averages about 0.6 m. At various places in the HBEF, the C horizon exists as an impermeable pan. Rocks of all sizes are scattered throughout the soil profile. In many locations boulder fields are prominent features. Bedrock underlying the eastern part of the Valley is Devonian and Silurian schists and granulites, and in the western portion, Devonian granodiorite.

Hubbard Brook was recently proposed in the NSF Critical Zone Observatory competition as one of three sites in the New England Critical Zone Observatory (www.ne-czo.org). Long-term mass balance studies indicate ecosystem Ca depletion, yet quantification is limited by uncertainty in weathering flux estimates (Likens et al., 1998). A major goal for this observatory is to evaluate dominant processes of Critical Zone development and their role in determining the sustainability of productive forests and clean water for the New England region.

For more information on the Hubbard Brook, visit www.hubbardbrook.org.

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References Cited:
On August 4, 2007, NASA launched a robotic spacecraft that will land on the frigid northern plains of Mars on May 25, 2008 to dig into the soil to check for conditions favorable to microbial life now or in the planet's past (a test called "soil habitability"). NASA is eyeing a landing site devoid of boulders at a latitude equivalent to northern Alaska on Earth. Assuming it survives a risky descent and landing, the lander will wield a robotic arm 7.7 feet long to dig up to 3 feet deep to get at soil and frozen water thought to be lurking just under the surface. The robot also will investigate how the water may change the chemistry and mineralogy of the soil.

Unlike the still-going Spirit and Opportunity rovers that survived the descent to the Martian surface with the help of air bags to cushion the landing, NASA will attempt the first "soft landing" on Mars in three decades with the Phoenix Mars Lander. It will use a heat shield to slow its entry from space, and then a parachute will further slow its descent to about 135 mph. The lander will then free itself from the parachute and fire rocket engines to slow to about 5.5 mph before landing on three legs, according to NASA.

This is the latest mission by the NASA to seek a deeper understanding of Earth's next-door neighbor in the solar system, including whether Mars has ever harbored life. Its mission is part of what the NASA calls a "follow the water" strategy for exploring Mars. Water is considered a key ingredient for life. Many scientists believe dry and desolate Mars was once far wetter, with evidence of bygone oceans, hot springs and other bodies of water.

The Phoenix Mars Mission is the first in NASA's Scout Program. Phoenix is designed to study the history of water and habitability potential in the Martian arctic's ice-rich soil. The Phoenix Mars Lander, with its solar panels unfurled, measures about 18 feet wide and 5 feet long. The Phoenix will monitor the atmosphere overhead and reach out to the soil below using a small backhoe-like scooper. The lander's Robotic Arm (RA) will hoist soil and water samples to two instruments (MECA and TEGA).

Microscopy, Electrochemistry, and Conductivity Analyzer (MECA) is a combination of a wet chemistry laboratory, optical and atomic force microscopes, and a thermal and electrical conductivity probe (TECP). The TECP, made by Decagon Devices, Inc., consists of three small spikes that will be inserted into the ends of an excavated trench. In addition to measuring temperature, the probe will measure thermal properties of the soil that affect how heat is transferred, providing scientists with better understanding of surface and atmospheric interactions. Using the same spikes, the electrical conductivity will be measured to indicate any transient wetness that might result from the excavation. Most likely, the thermal measurement will reflect ice content and the electrical, unfrozen water content.

Thermal and Evolved Gas Analyzer (TEGA) is a combination high-temperature furnace and mass spectrometer that will be used to heat up Martian ice and soil samples to check for things like carbon-based chemicals seen as crucial building blocks for life. Peter Smith of the Univ. of Arizona, principal investigator for the mission, said the equipment can detect organic materials. “We can't tell whether it's DNA or proteins, but we can tell they're complex organics,” Smith said.

For more info about the Phoenix Mars Mission, visit the mission home page: [http://phoenix.lpl.arizona.edu/](http://phoenix.lpl.arizona.edu/).
This image covers an impact crater ~4 km (2.5 miles) in dia. on Mars. The sub-image below shows just a small segment of the crater rim. The surface outside the crater (top) is relatively dark, while the interior wall of the crater has a lighter tone. The light-toned material making up the crater wall is finely layered and fractured in places. The layers may be part of a sedimentary or volcanic ash deposit that became indurated prior to the impact that formed the crater. Just 30 km (20 miles) to the east of this crater lies Mawrth Vallis. The orbiting spectrometers OMEGA (on Mars Express) and CRISM (on MRO) have detected clay minerals in layered deposits in and around Mawrth Vallis. These minerals, which require water to form, are likely present in the layered bedrock exposed in this crater wall. The crater may thus provide a glimpse into an intriguing period of Martian history, when liquid water may have been more abundant at or near the Martian surface than it is today.

Image Credit: NASA/JPL/UA
Faculty

Assistant Professor in Soil Physics at Univ. of Idaho. A 12-month, tenure-track position: 75% research, 15% teaching, 5% advising, and 5% service, in the Department of Plant, Soil and Entomological Sciences. Develop an externally funded, internationally recognized research program in soil physics related to environmental and agricultural problems, e.g. solute transport, water management, and waste disposal. Address significant basic and applied issues related to soil and water quality. Teach one course per year, including an undergraduate course in Soil and Environmental Physics and a graduate course TBD. Closing date: February 15, 2008, or until a suitable candidate is identified. Anticipated date of appointment is August 2008.

Assistant Professor in Soil Physics at Auburn Univ. Department of Agronomy and Soils (www.ag.auburn.edu/agrn/) is accepting applications and nominations for the position of Assistant Professor in the area of soil physics. A detailed position announcement, including application instructions and requirements can be obtained by contacting Kay Holloway, email: hollokm@auburn.edu; phone: 334-844-3899.

Chair of Soil Science at University of Berne (Switzerland). The section of Physical Geography at the Institute of Geography. Full professor with an orientation preferably towards fluxes of energy and matter in soils and between soils and the adjacent geosystems, and/or in chemistry and mineralogy of soils. Teaching at all levels includes general soil science. The position starts 1 August 2009. Closing date 31 December 2007.

Graduate Assistantships

Ph.D. Assistantship in Hydropedology and Hillslope/Catchment Hydrology at Penn State. A highly motivated student is sought to conduct an interdisciplinary research funded by the National Science Foundation, with an emphasis on the mapping, monitoring, and modeling (3M) of subsurface preferential flow network and soil moisture spatial-temporal patterns across scales using an integrated approach of soil-landscape modeling, advanced hydrometry, hydrogeophysical investigations, and tracer studies. Contact Dr. Henry Lin at henrylin@psu.edu for more info, or visit http://cropsoil.psu.edu/pdf/lin_phd_assistantship.pdf.

Seven (7) Ph.D. Opportunity in Critical Zone Science at Penn State. Penn State Univ. invites applications to pursue research working with an interdisciplinary team within the NSF-funded Susquehanna/Shale Hills Critical Zone Observatory. The 7 areas are: Geomorphology, Geochemistry, Stable Isotope Hydrology, Computational Hydrology, Ecohydrology/Physiological Ecology, Hydropedology, and Hydrogeophysics. Detailed ad will soon be out in EOS and other professional outlets, and will be posted in hydropedology web site.

Ph.D. Fellowships in Interdisciplinary Environmental Science and Critical Zone Science at Univ. of Delaware. A highly motivated Ph.D. student is sought, who is interested in studying the interactions among organic molecules, metals, and minerals and scaling these processes to soils, watersheds, regional and global-scale carbon sequestration. Qualifications include a BS and/or MS that provides a strong background both in a field of earth, environmental, or ecological science and in chemistry, geochemistry or biogeochemistry. Under the overall theme of carbon-metal-mineral interactions, several dissertation projects are available for a selected applicant, including (1) erosion-driven watershed-scale carbon sequestration, (2) anthropogenic acceleration of mineral (sediment) production and weathering, and (3) effects of invasive soil organisms to carbon-mineral interactions and dynamics. The admitted Ph.D. student will be co-advised by Anthony Aufdenkampe at Stroud Water Research Center and Kyungsoo Yoo at Univ. of Delaware (alphabetical order). Our combined expertise includes terrestrial to aquatic carbon cycle, organic geochemistry, stable isotope biogeochemistry, soil formation, hillslope geomorphology, and modeling. More info at http://www.dbi.udel.edu/career.html.
What is the difference between …

• A “wet” hydrologist vs. a “dry” hydrologist? – A wet hydrologist put his/her feet in the field, while a dry hydrologist puts his/her hands on the computer keyboard
• A soil scientist vs. a soil engineer? – A soil scientist makes land use to fit soils, while a soil engineer makes soils to fit land use
• A soil scientist vs. a geologist? – A soil scientist concerns mostly with current land use and recognizes geology as one of the soil-forming factors, while a geologist cares mostly about past land use/environment and considers soil as something that obscures the rock
• A civil engineer vs. a mechanical engineer? – A civil engineer builds targets, while a mechanical engineer builds to shot targets
• A scientist vs. an engineer? – A scientist is someone who seeks truth endlessly, lays the foundation, often invisibly or appeared with uncertainties, and thus less appreciated by politicians and the general public; while an engineer gets things done in time and within budget, generally not iceable for what he/she accomplishes, and thus more favored by politicians and funding agencies, and thus gets higher pay! (H. Lin)

The Forces of the Yellowstone and the Yellow Mountain

This year, I have the opportunity to visit both the Yellowstone National Park in Wyoming, USA and the Yellow Mountain (Mt. Huangshan) in Anhui, China. Their unparalleled natural beauties, astonishing geologies and ecosystems, and amazing forces that shaped them have stirred millions of visitors each year a long-lasting appreciation of the beauty and power of nature that is unmatchable by any human effort.

While drastically different environments, both places are well connected to the Critical Zone that has nurtured life of all forms (this is what makes these places “live”!). Where there is soil and water, there is always life of some sort, even in high altitudes or hot springs. The Yellowstone’s wonders – geysers, wildlife, water, canyons, and wildfire – are continuously being shaped by volcanic and earthquake activities. The Yellow Mountain’s specials – rare pines (奇松), queer rocks (怪石), magnificent sea of clouds (云雾), and hot spring (温泉) (i.e., the four components of the Critical Zone – biosphere, lithosphere, atmosphere, and hydrosphere) – have been shaped by weathering and glaciers since ~100 million years ago. (H. Lin)