Colorado State University
News Notes
Natural Resource Ecology Laboratory
Warner College of Natural Resources

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Colorado State scientists take trip to Antarctica, share experiences with children

Dr. Diana Wall, Biology/ NREL Senior Research Scientist

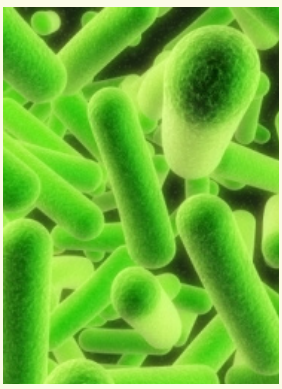
Diana Wall, a Colorado State University researcher, is currently conducting her 19th season of soil ecosystem research in Antarctica's ice-free McMurdo Dry Valleys. She and her team have been sharing their experiences with elementary-school children through a blog chronicling their two-month stay in the 24 hours of daylight at the bottom of the earth.

Scientists are describing what it is like to live in Antarctica and give school children glimpses into the life of a field researcher in the lab's blog *The World of Nematodes* (http://nemablog.wordpress.com). The blog was developed last year by Breana Simmons, a postdoctoral researcher at the Natural Resource Ecology Laboratory (NREL), Colorado State University.

Wall is a senior research scientist and biology professor at CSU and is the director of the university's new School of Global Environmental Sustainability. She and her lab have been working in Antarctica since 1989, and for the 2009 field season, she took a team of seven which included graduate students, postdoctoral students and a biologist. "It is fantastic to go to the ice with this team of young women and men for my nineteenth season, " Wall said.

Excerpts from Today @ Colorado State December 10, 2008

Study interprets role of soil microbes in global warming



Current models of global climate change predict that warmer temperatures will increase the rate at which bacteria and other microbes decompose soil organic matter, a scenario that pumps even more heat-trapping carbon into the atmosphere. However, a new study by a team of scientists, including NREL Research Scientist Matthew Wallenstein at the Natural Resource Ecology Laboratory, shows that while the rate of decomposition increases for a brief period in response to warmer temperatures, elevated levels of decomposition don't persist because of microbial acclimation to climate change.

Scientists have previously observed that the respiration of soil microbes returns to normal after a number of years under heated conditions, but offered competing explanations. Some argued that the microbes consumed so much of the available substrate under heated conditions that future levels of decomposition were reduced because of reduced substrate availability. Others argued that soil microbes adapted to the changed environment and reduced their respiration accordingly. In this study, there was support for both hypotheses as well as a previously unknown mechanism: The abundance of soil microbes decreased under warm conditions. This study was the first to show that microbes can acclimate to climate change and influence feedbacks between climate and carbon storage.

Study reveals nitrogen deposition causes highly acidic soil

A long history of human-influenced nitrogen deposition linked with industry and agriculture has left soils in the Western Tatra Mountains of Slovakia highly acidic. Results of a new study, coauthored by Jill Baron, NREL and USGS scientist, have been published online in Nature Geoscience. The research reveals that as levels of nitrogen deposition increase, soils will be pushed to toxic levels of acidification in which iron becomes more soluble and plant growth is reduced.

Baron, who participated in the data analysis and interpretation, has investigated the impacts of nitrogen deposition in Rocky Mountain National Park for 26 years. Her research supported establishment of nitrogen thresholds for the park in 2006, the nation's first critical load of a pollutant to protect a national park environment.

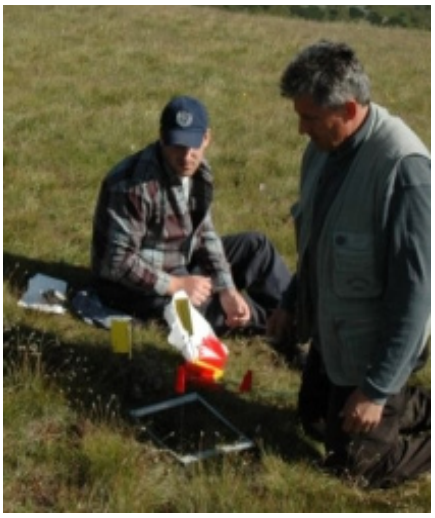


Image right: Researchers evaluate plant growth near Mount Salatin in the Western Tatra Mountains.

Leaf decay in temperate, tropical locations influenced by global warming

Diptera - BioTrack image from Diana Wall's GLIDE website

Diana Wall, Senior Research Scientst at NREL and director of CSU's School of Global Environmental Sustainability, spearheaded a global experiment to determine if unseen species found in soil are important on a global scale in increasing leaf decay and making a greater impact in warm regions' climate change. The findings: those species make a significant impact.

Results show that soil animal impacts are climate dependent; they increase leaf decay in temperate and wet tropical locations and have neutral effects in other regions. This suggests that in ecosystems where climates are projected to be warmer and wetter, the effects could be faster decomposition rates and higher releases of carbon dioxide. Alternatively, global changes affecting soils such as land-use change, which alter soil animal diversity or biomass, may negatively impact decomposition rates in warm, wet climatic regions.

Wall organized a volunteer scientific network around the world to see if soil animals matter beyond local scales. The study's findings further support the need to include soil animal data in global climate change models, particularly when predicting how fast dying vegetation will decay and release carbon dioxide to the air.

The study was published in the latest issue of "Global Change Biology."

Excerpts from
Today @ Colorado State
December 5, 2008

NREL scientists, collaborators continue research efforts across African continent

Scientists Bill Parton, Lara Prihodko and Niall Hanan, with graduate student Gabriela Bucini and collaborators in the USA and Africa, are continuing field and model-based research on vegetation dynamics and carbon cycling across the African continent. The African Carbon Exchange (ACE) project has renewed funding from NASA to develop new methods for measuring and modeling vegetation dynamics in Africa and assimilating satellite remote sensing measurements in response to climate variability and human management practices, including agriculture, deforestation, fire, and grazing. Associated with the NASA-funded ACE project, Hanan was invited to serve on the advisory panel of the European-funded CarboAfrica project and attended their annual science meeting in Accra, Ghana in November 2008.

Awards and Appointments

● Rich Conant and Paul Evangelista were recipients of the 2008 Warner Distinguished Administrative Professional Scientific Research/Engagement Award.

~Rich was awarded for his research focusing on understanding the feedbacks between human activities and ecosystem biogeochemistry. Specifically, he is interested in how land use and land management practices impact carbon and nitrogen cycling in agricultural and grassland ecosystems. He believes that knowledge about the relationship between human activities and ecosystem ecology can empower policymakers to make wise decisions with respect to biogeochemistry and ecosystem services.

~Paul was awarded for his conservation work in Ethiopia through a non-profit organization called The Murulle Foundation. Paul, with other CSU alumni, created the volunteer-based foundation in 2000 and has relied on the participation of dozens of students, faculty, and scientists from the CSU community to initiate research, resource management, education, and social equality. The Murulle Foundation's current projects include: a reforestation program in Bale Mountains National Park, research of several endemic wildlife species, GIS training for resource managers, micro-finance program for women in rural communities, and educational support from primary schools to universities.

● Alycia Crall was awarded for her "Outstanding Achievements in Citizen-based Monitoring" at the Wisconsin Citizen Based Monitoring (CBM) conference in October 2008-http://cbm.wiatri.net/Conference/2008/awards.cfm.

NREL Outreach

NREL was an exhibitor at STEMapalooza on October 24 & 25th at the Colorado Convention Center. The goals of STEMapalooza were to:

•Create urgency and enthusiasm about the need for continuous and rigorous STEM education focused on the needs of the economy
•Develop awareness of STEM education opportunities in Colorado
•Engage policy makers and the media in the STEM conversation
•Develop networks and partnerships among STEM providers
•Connect employers and job seekers with the thousands of available jobs/internships/externships that utilize STEM education and skills
•Highlight successes and generate a forum for sharing STEM practices across stakeholder groups
•Take responsibility for improving competitiveness in the international arena of STEM education

Special thanks to those who helped staff the booth: Jessica Ernakovich, Andrew Tredennick, Sunil Kumar and Kim Melville-Smith.

Greg Newman and colleagues conducted an online analysis survey to discover the needs of naturalist volunteers and volunteer coordinators. Survey results will be used to develop potential online analysis features on the NREL website, built in support of citizen science programs (www.citsci.org). We have received 36 respondents thus far, and the survey is still available for those interested in participating. If you or anyone you know volunteers as a naturalist and would like to participate, please contact Greg Newman at (970) 491-0410.

Meetings and Presentations

John Moore is hosting the NREL Spring 2009 Seminar Series: "Culturally Relevant Ecology, Learning Progressions, and Environmental Literacy," with most talks held at 11 a.m on Friday.

Tom Stohlgren presented a seminar entitled "Species Invasions from Coast to Coast" for the series "University of California, Davis: Global Leader in Environmental Sciences-Integrating Biophysical Sciences with Ecology and Policy" on February 4, 2009.

Sara Simonson presented results from her graduate research on snow avalanche ecology at the International Snow Science Workshop (ISSW), held September 21-27, 2008 in Whistler, BC.

Sara Simonson presented results from her graduate research on avalanches and vegetation at the American Geophysical Union Fall Meeting, December 15-19, 2008.

Steve Del Grosso presented an invited talk entitled "Impacts of Current and Previous Land Use on Greenhouse Gas Fluxes for Biofuel Cropping Systems" at the 2008 AGU meeting in San Francisco, CA on December 17, 2008.

Matthew Wallenstein delivered an invited lecture at the University of Vienna, Austria on October 23, 2008 entitled "Soil Microbial Physiology: Microbial Responses to Stress and Environmental Change Affect Soil Functioning." A news story was also published on several science news sites and Today@Colorado State describing his recent co-authored work showing that soil microbes adapt to long-term experimental climate warming by reducing the temperature sensitivity of respiration. These findings suggest that we cannot simply extrapolate from the short-term responses of soil microbes to climate change, since they may adapt over the longer-term.

Sunil Kumar participated in an American Museum of Natural History workshop: Species Distribution Modeling, held October 13-17, 2008.

Kathy Galvin (NREL and Anthropology Department) and Joana Pinho presented a poster at the Joint German-US Conference, "Tough Choices: Land Use Under a Changing Climate," held in Berlin, Germany October 2-3, 2008. The event was sponsored by NSF and the German Research Foundation. Their poster was entitled "God (rain) is not coming: climate change and challenges to pastoralist weather forecast knowledge in Kenya Maasailand. Authors: Joana Roque de Pinho, Kathy A. Galvin, Randall B. Boone, Sammy Zahran and Gabriela Bucini.

Extra! Extra! Read All About It...

You've heard it before, but we'll say it again! One of the main objectives of NREL's News Notes is to make sure that everyone who works here has a voice. After all, this is your publication but we need your help to make it happen. We'd like to cover the vast array of research news and activities that occur daily in this wonderful research environment at NREL. Do you have great stories and photos of a reserach trip, workshop, or discovery? Maybe you achieved a milestone that makes people say "WOW?" Wouldn't you like to share those accomplishments with the rest of the group?

Please submit your "stuff" to us and we will do our best to include it in the next publication. We appreciate your efforts. Thank you!

Funding Updates

Niall Hanan was selected to lead a strategic planning activity to develop recommendations for a new field experiment for NASA's Terrestrial Ecology Program. The one-year planning grant will focus on challenges and opportunities in remote sensing of mixed woody-herbaceous biomes. It will include review of current and future remote sensing capabilities and consultation with field-based scientists, managers, modelers and remote sensing scientists to determine how and where a new NASA field campaign can contribute to improved measurement, modeling and management of grasslands, shrublands and savannas worldwide.

Congratulations to all that submitted and to those awarded WCNR Mini Grants. NREL had a great showing in the pool of applications and the results (4 of 14 total funded; $33,429.00 of $114,291 awarded).

- Kampf; Klein; Baron-Spatial sensor network for monitoring snowmelt, vegetation, and soil moisture dynamics $10,280.00
- Melville-Smith; Spencer; Graham; Newman; Warnock-Project-Based Ecological Research: Phenology Observations & Invasive Species Monitoring to Understand Changes in Local Environment $7,389.00
- Paustian; Conant; Ogle; Paul-Support for participation by WCNR & GDPE grad students at the International Conference on Soil Organic Matter Dynamics: Land Use $5,830.00
- Reid; Galvin; Boone; Hanan; Coughenour; and Africa/US collaborators-Development of a long-term research, education and outreach program in coupled human-natural systems in Africa CCC / NREL / & outside collab. $9,930.00

John Moore, Director of the Natural Resource Ecology Laboratory, is the lead PI of a $12.5 million collaborative NSF grant in the Mathematics and Science Partnership program.

The purpose of this project is to develop a program of teacher professional development in science and mathematics driven by an environmental science literacy framework around the learning progressions of core science and mathematics concepts complemented with citizenship. The program will connect the research prowess in the environmental sciences and education of the partner universities and sites within the NSF-funded Long Term Ecological Research (LTER) Network with K-12 teacher professional development in science and mathematics of the partner schools. The focus of the project will be on coupled human-ecosystem interactions in the context of socio-ecological systems as a framework to develop a culturally relevant ecology from both a scientific and educational perspective

Program elements include a teacher-in-residence program, research internships for teachers, placement of graduate students into K-12 classrooms, professional development workshops leading to graduate credit and/or graduate degrees, and professional learning communities.

Core partners on the NSF-funded grant include Greeley-Evans School District No. 6; Poudre School District; Michigan State Univ.; Plainwell Community Schools; Univ. of California, Santa Barbara; Santa Barbara School District; Cary Institute of Ecosystem Studies; Towson Univ.; Baltimore City and County Public Schools; Univ. of Northern Colorado; Univ. of Wyoming; and the LTER Network Office at the University of New Mexico.

Student and Staff News

Tom and Cindy Stohlgren
celebrated their 30th anniversary on December 2, 2008.
http://www.coloradoan.com/apps/pbcs.dll/article?AID=200881128019

Publications

•A paper authored by Steve Del Grosso, et al. appeared in the Dec. 16, 2008 issue of EOS, the weekly newsletter of the American Geophysical Union (DelGrosso, S.J., T. Wirth, S.M. Ogle, and W.J. Parton. 2009. Estimating Agricultural Nitrous Oxide Emissions. EOS 89:529) showing that different methods used to estimate nitrous oxide gas emissions from agriculture agree as scale increases. Field scale emissions of greenhouse gases such as nitrous oxide are highly variable and difficult to quantify. At national and global scales, simple bottom up models based on nitrogen additions to cropped and grazed systems show remarkable agreement with top down estimates based on changes in atmospheric nitrous oxide concentration. To quantify greenhouse gas emissions for smaller spatial scales, such as a field used for corn ethanol cropping, more complex bottom up models (e.g., DAYCENT) are required.

•Sunil Kumar is lead author on a new research communication entitled "Potential habitat distribution for the freshwater diatom Didymosphenia geminata in the continental US," Frontiers in Ecology and the Environment 2009; 7, doi: 10.1890/080054.

•Sunil Kumar, Sara Simonson, and Thomas Stohlgren published a manuscript entitled "Effects of spatial heterogeneity on butterfly species richness in Rocky Mountain National Park, CO, USA," Biodiversity and Conservation, available through Online First: 10.1007/s10531-008-9536-8.

•Sunil Kumar is lead author on an upcoming research communication on "Potential habitat distribution for the freshwater diatom Didymosphenia geminata in the continental US," Frontiers in Ecology and the Environment 2009; 7, doi: 10.1890/080054.

•Paul Evangelista and colleagues published a manuscript on "Predicting habitat suitability for the endemic mountain nyala (Tragelaphus buxtoni) in Ethiopia," Wildlife Research (CSIRO), 2008, 35, 409-416.

•Sinsabaugh, Robert, Christian, L. Lauber, Michael N. Weintraub, Bony Ahmed, Steven D. Allison, Chelsea Crenshaw, Alexandra R. Contosta, Daniela Cusack, Serita Frey, Marcy E. Gallo, Tracy B. Gartner, Sarah E. Hobbie, Keri Holland, Bonnie L. Keeler, Jennifer S. Powers, Martina Stursova, Cristina Takacs-Vesbach, Mark P. Waldrop, Matthew D. Wallenstein, Donald R. Zak and Lydia H. Zeglin. Stochiometry of soil enzyme activity at the global scale. Ecology Letters. doi: 10.1111/j.1461-0248.2008.01245.x

•Hanson, C., S. Allison, M. Bradford, M. Wallenstein, K. Treseder. Taxa target different carbon sources in field soil. Ecosystems. DOI: 10.1007/s10021-008-9186-4

•Bradford, M. A., Davies, C. A., Frey, S. D., Maddox, T. R., Melillo, J. M., Mohan, J. E., Reynolds, J. F., Treseder, K. K., Wallenstein, M. D., 2008. Thermal adaptation of soil microbial respiration to elevated temperature. Ecology Letters 11, 1316-1327

•Steinweg JM, Fisk MC, McAlexander B, Groffman PM, and Hardy JP. (2008) Experimental snowpack reduction alters organic matter and net N mineralization potential of soil macroaggregates in a northern hardwood forest. Biology and Fertility of Soils 45: 1-10.

•Steinweg JM, Plante AF, Conant RT, Paul EA, and Tanaka DL. (2008) Patterns of substrate utilization during long-term incubations at different temperatures. Soil Biology & Biochemistry 40: 2722-2728.

•Bill Parton and Dennis Ojima co-authored a letter in Science magazine on October 2, 2008 entitled "Sustainable Biofuels Redux." The paper stems from a workshop organized by ESA and Bill Parton. Dennis Ojima was on the organization committee. http://www.sciencemag.org/cgi/reprint/322/5898/49.pdf.

•Paul Evangelista recently submitted a 33-page status report to the IUCN Antelope Specialist Group that outlines the range and habitat of the mountain nyala, a highly endangered antelope endemic to Ethiopia.