



Network News

Newsletter of the Long-Term Ecological Research Network

Vol. 20 No. 1 Spring 2007

Unique LNO virtual training launches in cyberspace

An innovative new seminar titled “Cyberinfrastructure in Science” was taught this spring at the LTER Network Office (LNO) at the University of New Mexico (UNM). The virtual seminar was funded by the National Science Foundation’s Office of Cyberinfrastructure and taught at three institutions in New Mexico and Arizona using videoconferencing technologies. The three institutions—UNM and the Universities of Arizona (UA) and Northern Arizona (NAU)—offered the course for credit to graduate students, but a broader group of faculty and researchers also participated just to learn the information.



Photo: McOwiti O. Thomas

According to Deana Pennington, the organizer and Principal Investigator of the seminar, together with Mark Servilla and Barney Maccabe as Co-PIs, the project arose out of the realization within the scientific community that problems that need to be tackled in the coming decades cannot be tackled by one person or discipline. “Problems such as global change, environmental change, interactions between environments and society, and how people understand the environment are interdisciplinary. And they really require inputs from numbers of scientists to try to come up with good scientific explanations,” Deana says.

Deana says it is very difficult for scientists to work with their technology counterparts because the two groups have completely different perspectives that distract from their research problems and make it difficult for them to collaborate. “One of the things that became apparent early on was that there are social, cognitive, and technical

A subset of the participants attending the post-CI training seminar follow up workshop at UNM: **I to r**—James Palmer (Computer Science Dept., NAU), Deana Pennington (convenor, UNM/LNO), Tim Thomas (High Performance Computing Center, UNM), Aimee Stewart (Biodiversity Research Center, Kansas University), Gary Christopherson (Anthropology, UA), Neil Cobb (Biology, NAU), Lou Scuderi (Geoscience, UNM), Crystal Krause (Biogeography, UNM), Steve Yool (Geography, UA).

aspects to collaboration,” she says. “The technical problem is because the scientific data and understanding are spread out across different kinds of sciences around the globe; there are different data stores and ways of archiving information, so if we want to conduct collaborative science, we have to bring together their data and observations and that’s a technical problem. The social and cognitive problems are more difficult to address. We have to enable rapid learning about selected, relevant parts of our collaborators’ conceptual framework in order to associate those with our own knowledge and understanding.”

Deana came up with the idea for a model of collaborative learning that she submitted

See “Training,” p. 3

LTER site acronyms: AND=H.J. Andrews; ARC=Arctic; BES=Baltimore Ecosystem Study; BNZ=Bonanza Creek; CAP=Central Arizona-Phoenix; CCE=California Current Ecosystem; CDR=Cedar Creek; CWT=Coweeta; FCE=Florida Coastal Everglades; GCE=Georgia Coastal Ecosystem; HFR=Harvard Forest; HBR=Hubbard Brook; JRN=Jornada Basin; KBS=Kellogg Biological Station; KNZ=Konza; LNO=LTER Network Office; LUQ=Luquillo; MCM=McMurdoo Dry Valleys; MCR=Moorea Coral Reef; NWT=Niwot Ridge; NTL=North Temperate Lakes; PAL=Palmer Station; PIE=Plum Island Ecosystem; SBC=Santa Barbara Coastal; SEV=Seville; SGS=Shortgrass Steppe; VCR=Virginia Coast Reserve.

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The Network News

Vol 20 No 1 Spring 2007

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Please contact the LTER Network Office with your questions, comments, ideas, and requests for copies:
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In some cases articles are abridged to fit in the printed version of the Newsletter. A complete, color version is available on the LTER World Wide Web site:

www.lternet.edu

Post-ASM funding announced

Last September, the LTER Executive Board requested proposals for working groups to expand on ideas generated at the 2006 All Scientists Meeting (ASM) in Estes Park, CO. The purpose of this request was to encourage further development of new cross-site projects and research initiatives. The Executive Board requested short proposals for up to \$10,000 each whose focus was on specific products (publications, proposals, designs for cross-site experiments, development of software tools, creation of valued-added databases, etc).

The LTER Network Office and the LTER Planning Grant provided funds to support working groups to develop these products.

Thirty-five proposals were received and distributed to the Executive Board for review. The principal criterion for success was the degree to which the proposed activities advanced the goals of the LTER program, particularly with regard to the development of syntheses, cross-site and network-wide research. Funding was available for 21 of the 35 proposals; a list of the funded proposals and the principal investigators is given below.

Peters	Trends in Long Term Ecological Data Working Group
Cavender-Bares	Linking phylogenetic history, plant traits, and environmental gradients to understand community organization at local and continental scales
Shah/Fargione	Effects of N-fixing plants on diversity and species interactions
Rusak/Gragson/ Foster	Interactions between ecosystem function and human behavior: paleoecological and socioeconomic dynamics of altered ecosystems
Shah/Hurn	Metabolic Theory of Ecology and stream ecosystems
Henebry	Phenology across LTER
Schmidt	Catalyzing cross-site comparisons of microbial diversity and function
Sheldon/Henshaw/ Ramsey	Workshop to define quality management standards for data completeness in derived data products
Caldwell	Polyphenols across the LTER: assessing fractions, forms and functions
Christian/Johnson/ Waide	Characterizing the nature of the LTER network
Swinton	Ecosystem Services from Working Lands: Cross-site LTER Research
Valentine, et al	Land-use change and influences to LTER sites
Porter	Exploring the effect of scale-dependent processes on ecological systems using networked sensors
Bestelmeyer	Collaborative Research on Desertification between the Jornada Basin and Mongolian LTERs
Chapin/Carpenter/ Kinzing	Status and Trends of ecosystem services: A Cross-Site comparison of LTER Sites
Kaplan, et al	Grasslands Data Integration of aboveground net primary productivity across sites and time
Briggs/Knapp	Patterns and Consequences of Shrub Encroachment across North America
Boone/Grove	Ecology and Environmental Justice Research across the LTER Network: long-term and multi-scale understandings of past, present, and future
Kominoski, et al	The influence of changes in terrestrial plant community structure on aquatic ecosystem function across the LTER network.
Stapp	Toward a synthesis of LTER studies of small mammal populations and communities in arid and semiarid ecosystems
Swallow/Schnier	Dynamic amenity-based migration, land-use modeling and experimental market ecology: synthesizing the LTER Network with Social Science

Reports from each of these working groups will be posted on the LTER Intranet page (<http://intranet.lternet.edu>) and abbreviated versions will be published in future editions of the newsletter. Congratulations to the successful principal investigators.

By Bob Waide, LNO

(Training, continued from p. 1)

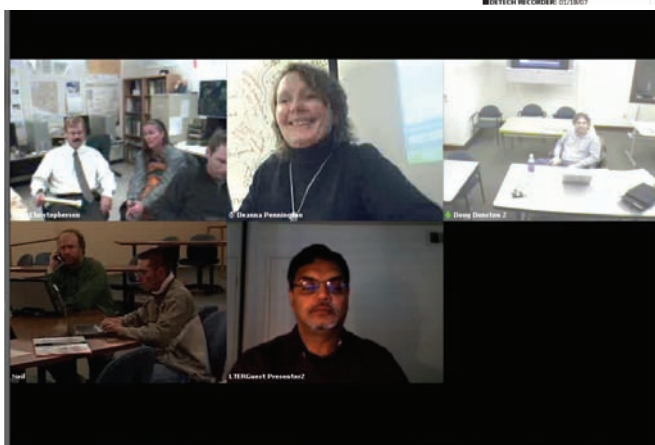
to NSF as a Cyberinfrastructure team (CI-TEAM) project. The project was approved and funded for one year to demonstrate proof-of-concept. She points out that the approach could be replicated by any group of scientists interested in incorporating advanced technology into their research, adding that the project's goal is to implement a process model of collaborative learning that solves both the social and cognitive aspects of conducting interdisciplinary science. "You can't just place a group of researchers from computer science and multiple other sciences in a room and expect them to collaborate and come up with something useful," she cautions. "There has to be prep work—a person has to be ready to collaborate."

According to Deana, the challenges include not only how to enable such collaboration, considering the diversity and spread of the disciplines

involved, but also how to develop methodologies that make collaboration easier. While calls for interdisciplinary science have been common for a while, she says doing that has turned out to be much more difficult than anybody anticipated. "There is a real need to understand collaboration processes and theories. How can we make this happen? How can we make it easier? Are there ways and approaches that we can use to try to enable this process?"

To better tackle this challenge, Deana had to do a little bit of learning herself. She enrolled in classes in UNM's College of Education that specifically target adult learning in group settings, focusing on teamwork, group processes, and learning on the job. Furthermore, she realized that the business arena was very actively involved in promoting adult learning, so she brought that perspective to bear on the problem at hand—getting scientists and computer scientists to work together collaboratively.

Her approach uses constructivist theory from the field of education, which holds that people construct mental models in their heads of what they know, and the way they learn is to add on to those mental models systematically. "That works really well as long as what you're trying to add on is fairly close to what you already know," she notes. "But when you are trying to add on something completely new, you're



A live online videoconference session featuring a presentation by Chaitan Baru at the San Diego Supercomputer Center (screen capture by Deana Pennington).

starting from scratch and there's a high cognitive load. There are certain things called intrinsic load that you really can't reduce—there is a certain amount of information load that you really can't do anything about. But you can assist the cognitive construction process by chunking information, creating conceptual blocks, and systematically adding that information."

The subject matter of the seminar emphasized conceptual understanding of what technical approaches are being developed, why, and how those will enable future science. Scientists, computer scientists, and software developers from around the country who are currently working on next generation technologies for biologists, ecologists and environmental scientists taught the seminar remotely. She says, "I was able to get some of the leaders in the cyberinfrastructure arena to do remote presentations because it only takes a few hours of their time. Flying them in to do a traditional seminar wouldn't be workable because most of them don't have the time to do that."

The classes included demonstrations of ongoing work, and some of the technologies under the hood were discussed at a high level, emphasizing important technical concepts rather than technical details. The seminar used Adobe's Breeze system, which allows a limited number of people

to connect to each other by live video and audio and for presenters to share their desktops with participants to demonstrate software off the desktop. While it might not be as good as having everyone in the same room,

Deana says it is the only way to do it if people are distributed. Participants got some experience just by being in the seminar, but ultimately, "you want to be able to do science, conduct analysis, run models

and engage in all sorts of activities in real time while people are distributed and at a distance," she adds.

Deana views it all as a series of nested experiments. "The first experiment is that I have hypothesized a model of what I think will make it easier for cross-disciplinary scientists to work together, but we don't really know...nobody knows how to do that as yet. Even deeper than that is an experiment of what technologies enable computer scientists to enable cross-disciplinary science. So there are many levels of testing that we're doing."

The seminar ended in late April 2007. Subsequently, the group held a working meeting to collectively decide how to proceed and try to come up with some unique and innovative science. Ultimately, Deana says, they will write a proposal for more funding to do the actual work. Meanwhile, recordings and pdfs from the sessions are posted online and can be downloaded at www.scidesign.org.

By McOwiti O. Thomas, LNO.

Shortgrass Steppe LTER scientist named fellow of the American Geophysical Union

FORT COLLINS — William Parton, a senior scientist with Colorado State University's (CSU) Natural Resource Ecology Laboratory and co-Principal Investigator of the Shortgrass Steppe (SGS) Long-Term Ecological Research site, who has spent the past 35 years working on the development of ecosystems models, was early this year elected Fellow of the American Geophysical Union (AGU). Parton's ecosystem computer models, Daycent and CENTURY, developed through his research at SGS, are used extensively around the world to determine the potential impact of future climatic changes on ecosystems at the local, regional and global scale. Additionally, these models are designed to evaluate the impact of land use changes on ecosystems.

AGU is a worldwide scientific community that advances, through unselfish cooperation in research, the understanding of Earth and space for the benefit of humanity. The number of Fellows elected each year is limited to no more than 0.1 percent of the total membership of the organization.

Parton's research is primarily involved with the biogeosciences branch of AGU. Within this branch, scientists study nutrient and carbon cycling, human impact on the environment and the development of computer modeling that simulates ecosystem dynamics.

Parton has published more than 150 papers and book chapters. Recent papers have documented climatic changes in Colorado during the last 100 years. He has served on numerous national and international committees concerned with the impact humans have on the environment. Parton was awarded his fellowship certificate during the Honors Ceremony May 24 at the Joint Assembly in Acapulco, Mexico.

Adapted from Kimberly Sorenson, CSU



William Parton

Santa Barbara Coastal's Stu Levenbach receives John A. Knauss Marine Policy Fellowship

January 2007 — California Sea Grant announced that Stu Levenbach, an SBC graduate student, is one of two new Knauss Fellows, who will join 42 other Knauss winners from other states for a yearlong mentoring program in federal marine policy in Washington, D.C. Levenbach has been placed with republican staff on the Senate's Commerce



Stu Levenbach

Committee, which includes Sen. Olympia Snowe of Maine and Sen. Ted Stevens of Alaska. "I have always been interested in policy," Levenbach says. "But I wanted to earn my stripes as a scientist before I ventured into policy. The fellowship allowed me to enter into the world of policy from a science background." Levenbach will work on all ocean and climate issues that come before the Commerce Committee. "I think there will be a lot of fisheries and aquaculture issues, as well as climate issues," he says. More information on the John A. Knauss Marine Policy Fellowships can be found at www.csge.ucsd.edu/EDUCATION/Knauss2007.html

Cedar Creek study fuels excitement in bioenergy

The **Cedar Creek (CDR) LTER** work on the use of low-input, high-diversity prairie restoration as a way to produce biofuels and provide a variety of environmental benefits has created a great deal of buzz and attention for the LTER site, but is also keeping the busy scientists at the site literally on their toes.

A new study led by David Tilman, the lead principal investigator at CDR and an ecologist at the University of Minnesota, shows that mixtures of native perennial grasses and other flowering plants provide more usable energy per acre than corn grain ethanol or soybean biodiesel and are far better for the environment. The study was featured prominently in the December 8, 2006 issue of the journal *Science*.

In December alone, Tilman and co-authors Jason Hill and Clarence Lehman (both from the University of Minnesota,) gave more than 50 radio, television, and newspaper interviews. It seems the excitement is not dying down any time soon: in the first two months of 2007 the authors have already presented more than 30 public talks and testimonies to legislative bodies locally and in Washington, DC.

Although it might look like a scientist's dream come true, Tilman confesses that the attention has been equally frustrating as it is gratifying because it has overwhelmed their schedules and made it nearly impossible for them to keep up with the demand for their time.

You can read the full report of the study online at www.sciencemag.org/cgi/content/full/314/5805/1598 or the National Science Foundation news release about the study at www.nsf.gov/news/news_summ.jsp?cntn_id=108206&org=NSF

Transition



Bruce Lee Haines, 1941-2007

Dr. Bruce Lee Haines, a valued colleague and friend, passed away on 16 February 2007 in Athens, Georgia. Bruce was a dedicated teacher and researcher in ecosystem ecology. His research interests in sulfur input-output budgets in watersheds and entire countries, as well as sustainable land use, took him to numerous tropical sites, including Costa Rica, Panama, Puerto Rico (Luquillo LTER), Venezuela, and the forests and watersheds of the Coweeta Hydrologic Laboratory (Coweeta LTER) in western North Carolina.

Bruce was born in Long Beach, California on 26 April 1941. He lived with his botanist parents Lee and Katherine Haines and sisters in Topanga Canyon, California. Bruce came

by his interests in the tropics very early. His parents took the family on several field trips down the Inter-American Highway, camping along the way and botanizing in several countries in Central and South America. A bromeliad discovered by Bruce and his father on one of these trips was named *Vriesea hainesiorum*.

Bruce attended high school in suburban Los Angeles, obtained his B.A. degree in 1964 and his M.A. in Botany with Cornelius Muller at the University of California, Santa Barbara in 1966, and went on to obtain a Ph.D. degree with Dwight Billings in the Botany Department at Duke University in 1970. After four years as a junior faculty member at Illinois State University, Bruce joined the Botany Department (now Plant Biology) at the University of Georgia as a Research Associate and worked on research projects at the Savannah River Ecology Laboratory and at the Coweeta Hydrologic Laboratory under the tutelage of Drs. Carl Monk and Dac Crossley. Bruce moved from Instructor to Associate Professor in Plant Biology during his tenure at the University of Georgia.

Bruce had an offbeat sense of humor. He was indefatigable in his research and his quest to find out how ecosystems work. He mentored generations of graduate students, over 23 at last count. He taught courses that were designed to make students question any and all concepts, particularly in his recent course on The Rise and Fall of Civilizations, in which he noted the effects of lack of renewable resources on their failures in sustainability. His Nutrient Cycling in Ecosystems course was a "must" for many students in the Institute of Ecology. Bruce's enthusiasm for ecology enthralled many students. His lunchtime discussions outside

the UGA Creamery were lively and attracted a diverse group of students and colleagues. He was exceedingly generous (with time, money, and attention) with graduate students whom he deemed worthy of encouraging. The research costs of several students were supported primarily on Bruce's checkbook rather than on any research grants.

In 1990, Bruce introduced one of us (Coleman) to tropical ecology in a memorable 2-week transit across field sites in Costa Rica. We went from La Selva in the Atlantic Coast lowlands to the highland cloud forests and the dry forests of Guanacaste province on the Pacific side. Bruce was truly in his element out in the field, moving his tall 6 foot 5 inch frame across the landscape in all weather regimes, covering long distances along trails or on no trails at all, wherever his curiosity and interests took him. It was an education in itself to participate with Bruce in his massive measuring and sampling efforts during his long-term studies of leaf-cutting ants at La Selva Biological Station. More recently, he measured long-term recolonization of formerly agricultural fields in areas near the Las Cruces Biological Station near Coto Brus in southern Costa Rica, with his colleague Chris Peterson on an NSF-funded grant. Bruce published over 60 papers in refereed journals. Bruce will be greatly missed by his colleagues and students throughout the United States and the Neotropics.

By Dave Coleman, Ron Carroll, Dac Crossley, Alan Covich, Lisa Donovan, and Chris Peterson, University of Georgia, Athens, GA

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LNO staff changes

Coming...



Florence Wyman

Mexico and has 15 years' experience managing large computer systems.

Florence Wyman has joined the technical staff at the LTER Network Office and will be assuming Greg Shore's duties as System Administrator upon his expected retirement this summer. Florence got her degree in computer science at the University of New

LNO is also pleased to welcome **Celina Gomez** as Administrative Assistant II. She assists in coordinating and facilitating workshops and meetings throughout the US, preparing travel reimbursements, in post-workshop administrative duties, and in maintaining calendars and schedules. Celina received her Bachelor of Science in Biology degree in May 2007. Prior to joining LNO, she was a Recruitment Specialist for Student Services at UNM.

Going...

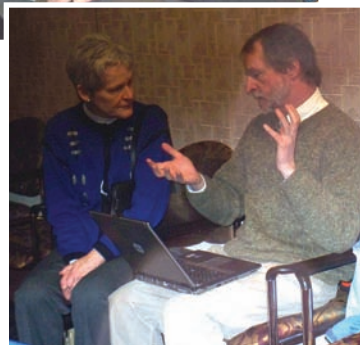
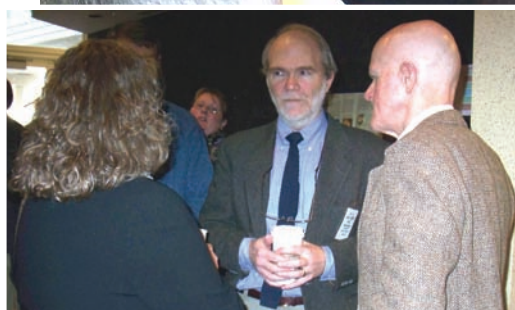
- 1) **Pamela Griego-Madrid** (Office Manager) has resigned her position as Supervisor of Administrative Support and LNO is actively recruiting a replacement. In the meantime requests for or questions about administrative support should be sent to office_support@lternet.edu.
- 2) **Jeanine McGann** (Web Designer) left to pursue other interests.
- 3) **David Farris** (User Support/Lab Manager) left to pursue other interests.
- 4) **Jianting Zhang** (Post Doctoral Fellow) left to pursue other interests.
- 5) **Samantha J. Katz** (Education, Outreach and Training, SEEK Project) left to pursue other interests.

NSF hosts successful LTER mini-symposium

Speakers at this year's Annual LTER Mini-Symposium at the National Science Foundation (NSF) found themselves presenting in front of a very packed room. Their talks focused on the interactions and feedbacks between society and ecological change, and how they relate to sustainability of the earth's ecosystems. This focus on interdisciplinary integration attracted a diversity of audience members, including employees from many NSF directorates, Congressional staffers, representatives from various federal agencies and non-governmental organizations in the DC area, and the attaché for Science and Technology from the Embassy of France.

After welcoming comments by Henry Gholz, the LTER Program Director at NSF, Jim Collins (NSF Assistant Director for Biological Sciences) opened the symposium by highlighting how the LTER Network exemplifies the importance of long term investments in research. Collins commended the LTER community for strides it has made in integrating the biological sciences and social sciences. Scott Collins (SEV), leader of the ongoing LTER strategic planning process, followed with an overview of the process and a discussion of how the LTER community had developed the theoretical framework for this approach over the past two years. He highlighted the inadequacies of previous attempts to understand changes in socio-ecological systems in the absence of such a framework.

Five presenters then illustrated how this framework provides critical integration of the natural and social sciences at their individual LTER sites. Steward Pickett (BES) led off this section discussing how standard ecological techniques can be used to understand urban ecosystems, in which humans and their behaviors must be regarded as inherent and integral parts of ecosystem functioning. Terry Chapin (BNZ) discussed the ecological and social implications of climate change and wildfire occurrences in Alaska, highlighting changes in the central role of fire to Native Alaskan communities. Steve Polasky (CDR) presented an economic analysis comparing high-diversity natural



Fullhouse at the LTER Mini-symposium: Clockwise from top left—Steve Polasky (CDR) discusses the merits and demerits of biofuels; an participant admires LTER publications; a section of the crowd, including some members of the LTER National Advisory Board, listening attentively to the presentations; Scott Collins stresses a point to Katherine McCarter (ESA); and Phil Robertson talks to Martyn Caldwell and an unidentified participant. (Photos by Jessica Corman, NSF.)

grasslands, as a potential source of biofuels as substitutes for fossil fuels, to intensively managed grass monocultures. Dan Reed (SBC) highlighted the importance of long-

term data for understanding the effectiveness of environmental policies, in this case the use of basic ecological information to develop and assess marine fishery reserves off the coast of California. Finally, David Foster (HFR) provided vivid examples of changes in key interactions between forests and people in northeastern United States over the past 200 years, illustrating why the services provided by ecological systems must be explicitly acknowledged in order to appropriately address conservation goals.

In a wrap-up talk, Debra Peters (JRN) synthesized the talks. She promoted the development of large, cross-network, interdisciplinary collaborations involving LTER and non-LTER sites in order to generate a new level of understanding of the dynamic interactions among ecological and social processes over time and space.

As in previous years, the 2007 Mini-Symposium showcased the unique role of LTER in advancing ecological science. This year's theme of integrating the social and ecological sciences in a long-term theoretical context, with highly diverse examples of new research, insights and collaborations, was especially well received.

To add your (or someone else's) name in the DC area to the invitation announcement list for next year's event, please send your name, organization, and email address to

Henry Gholz at hgholz@nsf.gov.

By Jessica R. Corman and Henry Gholz
NSF/BIO



Photo: Arthur Schwarzschild

Above: the Anheuser-Busch Coastal Research Center (ABCRC), the new home of the Virginia Coast Reserve LTER at the University of Virginia. **Inset:** the old “farmhouse” that served as the home of VCR for over 20 years.



Virginia Coast LTER project gets a new home

August 26, 2006 marked a major step forward for the Virginia Coast Reserve Long-Term Ecological Research (VCR LTER) project, with the opening of a new laboratory and housing facility. The Anheuser-Busch Coastal Research Center (ABCRC) of the University of Virginia was dedicated at a ceremony attended by 250 guests, with speeches by University of Virginia President John T. Casteen III and Anheuser-Busch representative John L. Nau III, as well VCR LTER researchers Karen J. McGlathery, Jay C. Zieman and David E. Smith.

The ABCRC replaces a rented 1927 farmhouse, retrofitted as a laboratory and housing facility, which had served as the field home for VCR researchers since 1986. Although the house served the program well, it had numerous deficiencies, such as poor climate control, lack of space designed for laboratories, and a limited number of rooms for housing visitors, often requiring five or more people to share a room. The new facility is a dramatic improvement, with separate buildings for laboratory and housing functions, full climate control, and apartments that can be configured with 1-5 bedrooms to accommodate groups of different sizes.

The ABCRC is located on 17 ha at the harbor at Oyster, Virginia. The laboratory building includes 9,369 square feet of dry and wet lab space, divided into eight wet laboratories, two dry laboratories, three offices and a conference room capable of hosting meetings of up to 50 individuals. Labora-

tory amenities include fume hoods, deionized water, vacuum, standard and ultracold (-80°C) freezers, drying ovens, muffle furnaces, microscopes, and freeze-drying facilities. The ABCRC operates several boats in the 18-24 foot size range for transporting researchers and samples. The ABCRC dock has room for up to 10 boats and is adjacent to a county boat ramp. A 5,767 sq. ft. housing unit has 11 bedrooms, most equipped with three beds, three fully-equipped kitchens with laundry facilities, and five bathrooms.

All ABCRC buildings and grounds are fully networked via a 100 Mbs intranet with an internal 11-54 Mbs wireless network. Wireless networks at major ABCRC research sites up to 30 plus kilometres (about 19 miles) away (e.g., Hog Island) provide real-time access to field monitoring equipment at speeds between 3 and 54 Mbs. The landscape, with subtle topographic gradients and large areas of low vegetation, are ideal for using spread-

spectrum wireless networking in the field.

Funding for the ABCRC came primarily from private sources. The Anheuser-Busch Foundation provided \$1.2 million, Paul Tudor Jones provided an additional \$1 million and the National Science Foundation provided an additional \$305,000. This is the first phase of building the ABCRC; site preparation work is complete for three additional buildings, including additional laboratory and housing facilities and a conference center.

Photos of the construction can be viewed online at: www.vcr.lter.virginia.edu/gallery/view_album.php?set_albumName=ABCRC_Construction

By John Porter, VCR

McMurdo hosts NSF director, New Zealand PM

The McMurdo Dry Valleys site hosted National Science Foundation director, Dr. Arden Bement, who was in Antarctica in January 2007 to celebrate the 50th anniversary of Scott Base, the New Zealand station in Antarctica. McMurdo Station, the main US logistical hub in Antarctica, and Scott Base are within a few miles of each other and the two programs have collaborated on logistics since the 1950s. Dr. Bement enjoyed a helicopter tour of the LTER site and visited the main camp and the field lab facilities. A New Zealand group led by Prime Minister Hon. Helen Clark and Sir Edmund Hillary, the first person to climb Mt. Everest, also visited the LTER site.

By Andrew G. Fountain, MCM



Photo: Hassan Basagic



Photo: Peter Rejcek

L-R: Andrew G. Fountain, co-PI MCM LTER; Hon. Helen Clark Prime Minister New Zealand; Lou Sanson, Chief Executive, Antarctica New Zealand; Paul Hargreaves, Chair Antarctica New Zealand Board.



Photo: Anonymous

Dr. Arden Bement (second from right), Director, National Science Foundation discusses the McMurdo Dry Valley LTER site with Dr. Andrew G. Fountain (second from left), MCM co-PI, Technician Hassan Basagic (Portland State University—third from left), Ph.D. student Lee Stanish (University of Colorado- far right).

From left, top row, Hassan Basagic (Portland State University), Andrew Fountain (MCM co-PI, Portland State University), Sir Edmund Hillary; second row from center Lee Stanish, PhD Student, University of Colorado; Emily Gercke, University of Colorado; Sandra Liu, Raytheon Inc.; Rae Spain, Raytheon Inc

Collaborative Research in Coral Reef Biology

Developing ties between the Moorea Coral Reef LTER and the Kenting Coral Reef ILTER in Taiwan

As part of the MCR-LTER project, now in its third year, we are developing international collaborations with other projects that also are focused on time-series analyses of tropical coral reef communities. Our goal is to use cross-site comparisons to test for generality in our conclusions, to shed light through the use of contrasting communities on the processes driving reef dynamics in Moorea, and to interact in mutually beneficial ways with colleagues having diverse and complementary skills to our own. As a means to this end, we have started working with the team of scientists associated with the Kenting Coral Reef ILTER project in southern Taiwan.

The Kenting Coral Reef (KCR) ILTER is located within the Kenting National Park, and many of its scientists work through the National Museum of Marine Biology and Aquarium (NMMBA) (<http://eng.nmmba.gov.tw/>). In October 2006, funds awarded by the NSF-OISE program were used to support a fact-finding mission to Taiwan by the four Principal Investigators and the Deputy Program Director of the MCR LTER project. Our goal was to meet the key scientists working on the KCR ILTER project, to evaluate the potential for collaborative research based on the research infrastructure and accessible coral reef habitats, and further, to continue with the early-stage planning for the application of streaming data technology to coral reefs through the Coral Reef Environmental Observation (CREON) initiative (www.coralreefeon.org/). The trip also included a joint MCR LTER and KCR ILTER Symposium "Recent Advances in Long-Term Research on Coral Reefs" held at the National

Chung Hsing University (NCHU) in Taichung, Taiwan. In short, this first trip was extremely successful, and we were much impressed with the potential for exciting and highly rewarding collaborative research. In February 2007, we sent a second delegation to Taiwan, this time with the objective of completing small-scale research projects as a means to demonstrate the ability to work collaboratively to further our science objectives.



Photo courtesy of MCR LTER

The 2nd MCR-LTER exchange to the KRC ILTER. MCR-LTER participants include Ms. Hollie Putnam (4th from left), Mr. Gerick Bergsma (above sign), Ms. Nichole Price (6th from left), and Dr. Peter Edmunds (7th from left); our key colleague from Taiwan, Dr. Tung-Yung Fan, is in the center (next to Dr. Edmunds).



Photo courtesy of MCR LTER

Group photograph from our first MCR-LTER exchange to the KRC ILTER, for this picture on the occasion of the joint meeting of the Great Lakes EON and Coral Reef EON groups at the National Chung Hsing University.

Our most recent trip provided nine days on-site in Taiwan, and the group consisted of Peter Edmunds, a co-PI on the MCR LTER project, and graduate students from UC Santa Barbara (Gerick Bergsma and Nichole Price) and CSU Northridge (Hollie Putnam), which are the lead institutions for the MCR LTER. Our visit was hosted by Dr. Tung-Yung Fan, an Associate Research Fellow at NMMBA, who is responsible for the coral reef time-series analysis for the KCR ILTER, and has extensive experience

in the reproductive biology of corals. With Dr. Fan's advice, we scheduled our visit to correspond with the full moon when several coral species in culture at the NMMBA release large numbers of coral larvae. This was important to create opportunities for three members of the team to conduct ecophysiological research on the early life stages of corals. Peter Edmunds and his student, Hollie Putnam tested the effects of elevated temperature on the settlement and photophysiology of coral larvae, and Nichole Price explored the settlement preference of coral larvae for different types of coralline algae. The fourth member of our team, Gerick Bergsma, conducted field surveys on the shallow reefs to document of the abundance of amphipod-coral symbioses.

Our second trip to Taiwan brought sharply into focus the potential for collaborative research between the KCR ILTER and the MCR LTER, and of great importance, it also identified key areas for synergistic activity.

See "Coral Reefs," p. 14

HJ Andrews LTER offers research experience for teachers, students and artists

Research Experience for Teachers (RET)

Larry Byman, a Biology and Environmental Field Studies teacher in Longview, Washington, worked with Andrews Forest scientists during the 2006 field season to learn about long-term data collection and data management techniques. Based on what he learned at the Andrews Forest, Byman developed an environmental curriculum for use at the Longview District's Wake Robin Outdoor Learning Center. "This ranks as one of the absolute best learning experiences I've had during my teaching career," said Byman. His lessons cover topics such as litter decomposition, moth diversity, soil seed bank, stream cross sections, and tree growth rates. Byman's lessons are available through the Wake Robin Outdoor Learning Center's website, www.longview.k12.wa.us/wr/LTER.

Kurt Cox, a junior high science teacher from the McKenzie School District,



Photo: Kari O'Connell

Kurt Cox (center, pointing) works with junior high school students at the Andrews Forest.

developed a set of research activities on the McKenzie High School grounds which is based upon research being conducted at the Andrews Forest. The seventh and eighth-graders will visit the Andrews LTER site in the fall and spring to conduct vegetation surveys, examine log decomposition, and measure stream structure.

More information on educational activities of the Andrews Forest program is available at www.fs.l.orst.edu/lter/edu/schoolyard/ret.cfm?topnav=156.

SMILE Teachers workshop

The Science and Mathematics Investigative Learning Experiences (SMILE) Program of Oregon State University provides science, technology, engineering, and mathematics enrichment and mentoring to historically underserved student populations, providing support for them to pursue higher education. Through the National Science Foundation supported Schoolyard LTER program, the Andrews Forest LTER



Photo: Lina DiGregorio

Teachers at The SMILE teachers workshop at Oregon State University in Corvallis, Oregon.

Research Experience for Undergraduates (REU)



Photo: Dave Shaw

REU student Allie Luftig at the Andrews Forest.

Allie Luftig, a senior at the University of Oregon, Honors College, was a Research Experience for Undergraduates (REU) student at the Andrews Forest in the summer of 2006. Ms. Luftig worked with Drs. Dave Shaw and Judy

Li from Oregon State University. She studied the vertical distribution of arthropods in the forest canopy to examine patterns that would help understand the forest canopy ecosystem. Her work showed that there was no significance in proportion of arthropods at different levels of the canopy, suggesting that no vertical stratification occurred when the data from all sample weeks were examined together. The strongest pattern of arthropod distribution was found among arthropods 2mm or less in size. Significantly more arthropods of this size class were found during the day than the night; however larger arthropods were not significantly different in proportion from the day to the night. Allie has applied to Teach for America and hopes to teach science to high school students in New Orleans next year.

Andrews Forest featured on "The Natural World" radio show

The Andrews Lookout Old-growth Trail was featured on John Cooney's weekly radio show, The Natural World. The show aired on Oregon Public Broadcasting's KLCC on November 9, 2006, and is still available for listening online. To hear the program and the sounds of the Andrews Forest, click on the "A Hike Through Old Growth at H.J. Andrews Experimental Forest 11/9/06" link at www.klcc.org/listen/NaturalWorld.html

See "Andrews," p. 14

Report from the annual Shortgrass Steppe symposium 2007

The Shortgrass Steppe (SGS) LTER held its most recent biennial meeting on January 11 to discuss research and other issues of interest to the shortgrass steppe community. This year the symposium was structured around the theme “A Town Hall Meeting: Where is the Prairie Growing?” Presentations, discussions, and posters focused on changing land use on the grasslands and the impacts of shifting urban/rural boundaries.

Mike Antolin, co-PI of the SGS, welcomed the almost 200 participants on a very cold Colorado morning. Representatives from several educational institutions; private, commercial and non-government organizations; state and federal government agencies attended the symposium. Dave Theobald from the Department of Natural Resource Recreation and Tourism (NRRT) at Colorado State University gave the keynote talk on “Land Use Changes and the Urban/Rural Interface.” Troy Florian and Larry Rogstad (Colorado Division of Wildlife) followed with a presentation on “Wind Farms, Wildlife and the Shortgrass Steppe.” Peter Newman and George Wallace (NRRT), brought the morning session to a close with a joint presentation on their research on “Recreational Uses of the Pawnee National Grassland.”

The afternoon session began with a presentation by Chris Pague (Nature Conservancy) on “Establishing Grassland Conservation

Success,” and closed with Dana Hoag and Catherine Keske (Department of Agricultural and Resource Economics, CSU) discussing “The Economics of Working Lands: Finding Harmony Between Humans and Nature on the Shortgrass Steppe Prairie.” Their presentation included the results of a short survey that asked the symposium participants for feedback on the material presented during the day.

Each presentation was followed by lively question and answer periods moderated by members of the SGS LTER community. In true town hall meeting style the participants asked questions freely and provided input on the various topics under discussion. Some of the presentations are available on the SGS LTER website: http://sgs.cnr.colostate.edu/News/sgs_symposium_07/sgs_sym_agenda.htm.

Twenty-nine posters were presented in two sessions before and after an excellent southwest buffet lunch. Titles, authors, and most of the abstracts for the posters

can be found on the SGS LTER website: http://sgs.cnr.colostate.edu/News/sgs_symposium_07/sgs_sym_07-poster_abstracts.html. Graduate student work was well represented in the poster sessions as was one REU (Research Experience for Undergraduates) project from the summer of 2006.

Gene Kelly, lead PI of SGS LTER, wrapped up the day's activities and invited everyone to a social hour for further discussions. After the symposium, SGS received many positive comments about all aspects of this year's program. One participant commented:

Two years ago, there were some good conversations about how the semi-annual meetings were attracting an increasing number of people interested in day to day management of grasslands. There was a feeling expressed that sometimes it is difficult to translate the results from some of the work by the LTER scientists into management practices. There was an honest response by the LTER staff that they had no immediate ideas how to better bridge the gap between science and practice (to the degree it exists), but a clear commitment to try. Well, you folks rounded up the right people to provide some insights into the practice of grassland conservation. I can't think of a better slate of speakers. The attendance this year was a reflection of the excitement the agenda generated. I thought back to my first visit to the workshop six (or was it eight?) years ago! What a difference. So thank you for responding to the feedback and request from folks who came two years ago.

By Sallie Sprague, SGS



Photo: Sallie Sprague

Graduate student John Norman discusses his poster at the 2007 Shortgrass Steppe Symposium.

Update on Graduate Student work in the LTER Network

In December 2006, Chelsea Crenshaw (SEV) completed her 2-year tenure as a LTER graduate student co-chair and John Kominoski (CWT) was elected to replace her. During her tenure, Chelsea helped organize the First LTER Collaborative Graduate Student Symposium (held in April 2005 at AND). She also co-chaired a second student symposium with Amy Burgin (KBS) at the September 2006 All-Scientists Meeting (ASM) at Estes Park, CO. We thank Chelsea for the hard work, dedication, and energy she put in promoting the graduate student community.

To keep the LTER community up to date with the diversity and quality of graduate student work, we provide a few highlights from various LTER sites.

At the second annual Grad Student Symposium held during the ASM in 2006, graduate students held eight workshops covering a variety of topics. One session led by John Kominoski (CWT) and Becky Ball (CWT) and comprising graduate students from eight LTER sites, received funding for a subsequent workshop to examine network-wide trends pertaining to the effects of changes in terrestrial plant communities on ecosystem functions of aquatic ecosystems. Graduate students Heather Adams (ARC), Amy Burgin (KBS), Hongyu Guo (GCE), Stuart Jones (NTL), Evan Kane (BNZ), Terry Loecke (KBS), Wendy Mahaney (KBS), Chelse Prather (LUQ), Todd Robinson (KBS), Dan Sobota (AND), Chris Solomon (NTL) attended the the workshop held from April 19-22, 2007, at KBS.

Ketil Koop-Jakobsen (PIE) has found that anammox is occurring, but at very low rates compared to denitrification, in coastal marshes and that denitrification rates are significantly higher under fertilized conditions.

Joe Thouin (PIE) is studying the influence of dissolved organic carbon and oxygen levels on nitrate dynamics in headwater streams of the Ipswich and Parker Rivers. His data suggest that within these systems oxygen concentrations dominate net ecosystem response (nitrate production vs. uptake), while dissolved organic carbon concentrations influence the magnitude of this response.

Becki Witherow (MCM) received a research grant from the Geological Society of America to study trace element behavior in Taylor Valley lakes and streams.

Karen Cozetto (MCM) received an outreach grant from the University of Colorado-Boulder to work with a non-profit group on stream restoration monitoring activities.



Photo: Becky Engel

John Kominoski, new Graduate Students Committee co-chair.

Stu Levenbach (SBC) is one of two new Knauss Fellows from California (California Sea Grant) who joined 42 other winners in Washington, D.C. for a year-long mentoring program in federal marine policy. Stu has been placed with Republican staff on the Senate's Commerce Committee, which includes Olympia Snowe (Maine) and Ted Stevens (Alaska).



Photo: McOWiti O. Thomas

Graduate Student co-chair Amy Burgin and former co-chair Chelsea Crenshaw.

Courtney Meier (NWT) attended a post-ASM polyphenol workshop in Corvallis, Oregon, where a group of ecologists and chemists hashed out analytical challenges and experimental goals relevant to questions dealing with the ecological roles of phenolics. The workshop was relevant to his research investigating how low molecular weight and tannin phenolics from leaf litter and roots influence soil carbon and nitrogen turnover in alpine plant communities.

By John Kominoski, CWT



Photo: Kurt Smemo

Graduate students at a post-ASM workshops at the Kellogg Biological Station (KBS) LTER in April. Standing, *l-r*—Todd Robinson (KBS), Wendy Mahaney (KBS), Heather Adams (ARC), Jason Martina (KBS), Hongyu Guo (GCE), Becky Ball (CWT), Dan Sobota (AND), John Kominoski (CWT), Amy Burgin (KBS), Stuart Jones (NTL), Evan Kane (BNZ). *Kneeling*: Chelse Prather (LUQ), Terry Loecke (KBS), and dog.

GK-12 graduate student fellowships at Kellogg Biological Station

The Kellogg Biological Station (KBS) has recently joined the ranks of other LTER sites (notably CAP, JRN, NTL, SEV, and SGS) with successful GK-12 Graduate Fellowship Programs funded by the National Science Foundation. The 3-year award provides funding and training for KBS graduate students and allows for the continuation of the KBS K-12 Partnership for Science Literacy that began in 1999 with Schoolyard LTER funding. Through the GK-12 grant, eight GK-12 fellows are paired with eight participating school districts. The fellows spend 10-15 hours per week in partner teachers' classrooms observing, co-teaching, and developing classroom lessons and schoolyard ecology projects. Graduate fellows provide teachers additional resources to enrich the K-12 science curriculum while improving their own teaching abilities.

GK-12 fellows. In conjunction with the workshop, the GK-12 program will be sponsoring a climate change poster contest for K-12 students.

In an effort to "leave no child indoors," district teams have created areas for schoolyard ecology projects in their districts. GK-12 fellow Brook Wilke and students from Martin Public Schools are creating a historic agriculture garden and a successional field adjacent to their classroom. Fellow Justin Kunkle and students at Harper Creek High School are learning chemistry by studying the effects of impervious surfaces on streams near their school. GK-12 fellows Edi Sonntag (Olivet Middle School) and Katie Lander (Lawton Middle School) have been working with their students to create rain gardens on their school grounds.

Photo: Rob Robrahn



Photo: Justin Kunkle

By all accounts the program is off to a great start. Collectively, fellows have spent over 1500 hours in partner schools and created over 30 ecology lessons (see details at www.kbs.msu.edu/k12/). Fellow-teacher teams have written three successful grant proposals to fund field trips and school projects. Teams have also presented information about their district activities at local School Board meetings and at the 2007 Michigan State Science Teachers Association Meeting.

A summer workshop helped to kick off the program last year and so far this year KBS has hosted three 1-day workshops for teachers on the themes "Using Data Sets in Classroom Inquiry," "Animal Behavior," and "Local Ecological Issues." A final school-year workshop on "Climate Change" will include highlights from KBS research, a presentation about local climate change from the Michigan State climatologist, and classroom inquiry activities developed by



Photo: Chris Quist

Clockwise from top right: Harper Creek H.S. students study the impact of impervious surfaces (parking lots, roads and buildings) on a nearby stream; Fifth graders from Mrs. Quist's science classes in Gobles perform experiments studying the behavior of brine shrimp (so-called 'sea monkeys') with environmental changes; and Colleen Vader's 5th grade class (Brandon Elementary in Martin) poses with Brook Wilke in front of a neighbor's (Mr. MacVean's) corn field after using the field and USDA data to calculate that 1.7 trillion ears of corn were grown in the U.S. in 2002.

Fellows described their recent experiences with K-12 education as "fun," "challenging," "rewarding," "exhausting," and "wild." For the rest of the school year, teachers and fellows will continue to work together to promote ecological literacy in K-12 schools in rural southwest Michigan. This summer, KBS will host another week-long workshop focused on providing inquiry-based approaches for K-12 science instruction, and meetings to develop a children's book for the Schoolyard LTER book series.

Finally, KBS researchers are excited to have one of the GK-12 teachers, Russ Stolberg, join the LTER team as part of the Research Experiences for Teachers program.

For further information please contact KBS GK-12 Coordinator Laurel Hartley (lhartley@kbs.msu.edu).

By Laurel Hartley
GK-12 Project Manager, KBS

FCE's RESSt program gives students chance to shine

The Florida Coastal Everglades' (FCE) novel Research Experience for Secondary Students (RESSt) program, which pairs high school students in research internships with FCE scientists, is proving quite a hit with Florida students and scientists alike. In 2005 FCE's first intern, Juan Gallo, worked with Greg Juzli and placed first out of 852 students in the State Science and Engineering Fair of Florida, winning over \$17,000 in prizes and scholarships in the process. Since then REEST has grown rapidly and currently includes 10 high school students working with FCE scientists.

Current REEST interns, Nia Brisbane and Sebastian Diaz from Felix Varela Senior High in Miami, have been working with Dr. Colin Saunders at FCE for the last two years studying seed morphology in soil profiles along the Everglades estuarine ecotone. In February 2007, Brisbane and Diaz presented their results at the South Florida Regional Science and Engineering Fair held in Miami. Brisbane's poster, *Tiny seeds present the big picture in Everglades restoration*, earned a superior rating and several awards: the Frey Scientific Award (worth \$25); Ricoh Sustainable Development

Award; Sierra Club's Outstanding Project; US Army Award; Beckman-Coulter, Inc Award; and a Runner-up for Best Biological Sciences Award (\$250). She advanced to the Intel International Science and Engineering Fair that was held May 13-19, 2007, in Albuquerque, NM. Nia also competed at the 53rd State Science and Engineering Fair of Florida in April 2007 in Naples, FL.

Diaz's poster, *"The use of Cladium jamaicense seeds as indicators of historical changes in the Everglades estuarine ecotone,"* also earned a superior rating as one of the top scoring posters in the Environmental Division at the regional fair. He also won awards for Outstanding Project from the Sierra Club and from the US Army, and advanced to the State Fair alongside Brisbane.

FCE's third-year intern, Magaly Dacosta, has been working with Dr. Jeff Wozniak and jointly presented their poster, *"Isotopic values for southern Everglades marshes: C and N natural abundance study,"* at the 2006 FCE Annual Science Meeting. At the 2007 FCE-ASM on March 19 and 20, Dacosta read her essay, *"Our Responsibility to the Natural World,"* for which she won First Place in Prepared Public Speaking at the Future Farmers

of America (FFA) District Convention and advanced to compete at the FFA State Convention. Dacosta also led a team from her high school in winning a \$500 award as the Grand Champion in Native Plant Landscape Design at the 2007 Miami-Dade County Fair and Exposition.

First year intern, Ben Giraldo, has been working with Dr. Tiffany Troxler-Gann. In a joint presentation of their poster, *"Bacterial diversity, enzymatic activities, and soil CO₂ flux along a soil P gradient in a coastal peatland, Panama,"* Ben received First Place and a \$100 book award at the 2007 FCE-ASM.

All 10 RESSt participants attended the 2007 FCE LTER ASM and gave short presentations of their research and interacted with other FCE researchers. In an informal presentation at the meeting, 16-year-old Oscar Marti, reflecting on his research experience with Dr. Serge Thomas, proclaimed, "Wow! Scientists are way cooler than I thought!"

By Nicholas J. Oehm, Jr. and Susan K. Dailey
FCE-LTER

Coral Reefs (continued from p. 9)

Notably, it now is clear that contrasting research infrastructures in Moorea—which has unrivalled access to near-pristine ecosystems but modest capacity for laboratory analyses—and Taiwan—which has access only to a physically disturbed environment but has world-class laboratory and microcosm facilities – creates rich opportunities to advance scientific discovery in the area of coral reef community dynamics. Currently we are working with our colleagues in Taiwan to secure funding to realize our vision of future collaborative research, including visits by Taiwanese students and researchers to our universities in California and the MCR LTER site in Moorea.

By P.J. Edmunds, S. Holbrook, R. Schmitt, R. Carpenter, G. Bergsma, N. Price, H. Putnam,
MCR

Andrews (continued from p. 10)

Long Term Ecological Reflections

The Long-Term Ecological Reflections program continues to grow, as the 12th writer in residence arrives in Spring 2007. In Fall 2006 writers from across the Northwest gathered at Andrews Forest for sharing of ideas and energy in what is planned to be a biennial event.

Here is an excerpt from the poem "The Web," published in *Orion* (2007), by recent writer-in-residence Alison Hawthorne Deming (see the Andrews Forest webpage for more of Deming's writings, www.fsl.orst.edu/lter/research/related/writers.cfm?topnav=167):

*Is it possible there is a certain
kind of beauty as large as the trees
that survive the five-hundred-year fire
the fifty-year flood, trees we can't
comprehend even standing
beside them with outstretched arms
to gauge their span,
a certain kind of beauty
so strong, so deeply concealed*

*in relationship—black truffle
to red-backed vole to spotted owl
to Douglas fir, bats and gnats,
beetles and moss, flying squirrel
and the high-rise of a snag,
each needing and feeding the other—
a conversation so quiet
the human world can vanish into it.*

By Lina DiGregorio, Education Coordinator
AND

Hurricane disturbance effects

FCE study on carbon sequestration by mangrove forests in the southwest Florida Everglades

In October 2005, hurricane Wilma severely disrupted the Florida Everglades ecosystem. Fringing mangrove forests exposed to hurricane-level winds were effectively destroyed, while more sheltered forests were severely damaged. At the FCE-LTER flux tower site (SRS-6), about a third of the trees were destroyed and roughly 3 cm of carbonate mud added on the mangrove forest floor. All instruments on the flux tower were also destroyed (Figure 1) and the tower itself damaged beyond repair and had to be replaced. The boardwalks and supporting structures also had to be re-built.



The reconstruction of the flux tower was completed in October 2006 (Figure 2) and comparisons between pre- and post-hurricane ecosystem response and function are now possible. Despite its destruction, hurricane Wilma and the “fortuitous” location of the tower provided us a rare opportunity to investigate the responses of mangrove forests to disturbances. For example, we can now quantify changes in the carbon dioxide (CO_2) exchanges between the mangrove forest canopy and the atmosphere before and after the hurricane. Figure 3 illustrates the results of analyses with pre- and post-hurricane data. It is evident from the results that during the day the mangrove forest assimilates CO_2 at much lower rates than before the hurricane. The reduced CO_2 assimilation is likely linked to the decrease in active biomass within the forest canopy. The respiration rates before and after the hurricane are currently similar but are expected to increase in the future as the biomass introduced by hurricane Wilma decomposes.

In addition to re-starting the carbon flux measurements, after Wilma additional projects were initiated to study transpiration rates, soil water content, and other components of the local hydrologic cycle. These field investigations are adding new knowledge to develop an improved understanding of disturbance effects on ecosystem responses and functioning along the interface between water and land. The studies are contributing to our basic understanding of how coastal ecosystems function while recovering from large-scale disturbances. They may also shed

[See “Disturbance,” p. 16](#)

Figure 1: The triangular tower used for instrumentation mounting at FCE-LTER SRS-6 site just after the passage of hurricane Wilma. Destruction to the tree canopy is highlighted by the absence of foliage and a fallen tree on a tower guy-wire (lower right).

Disturbance (continued from p. 15)

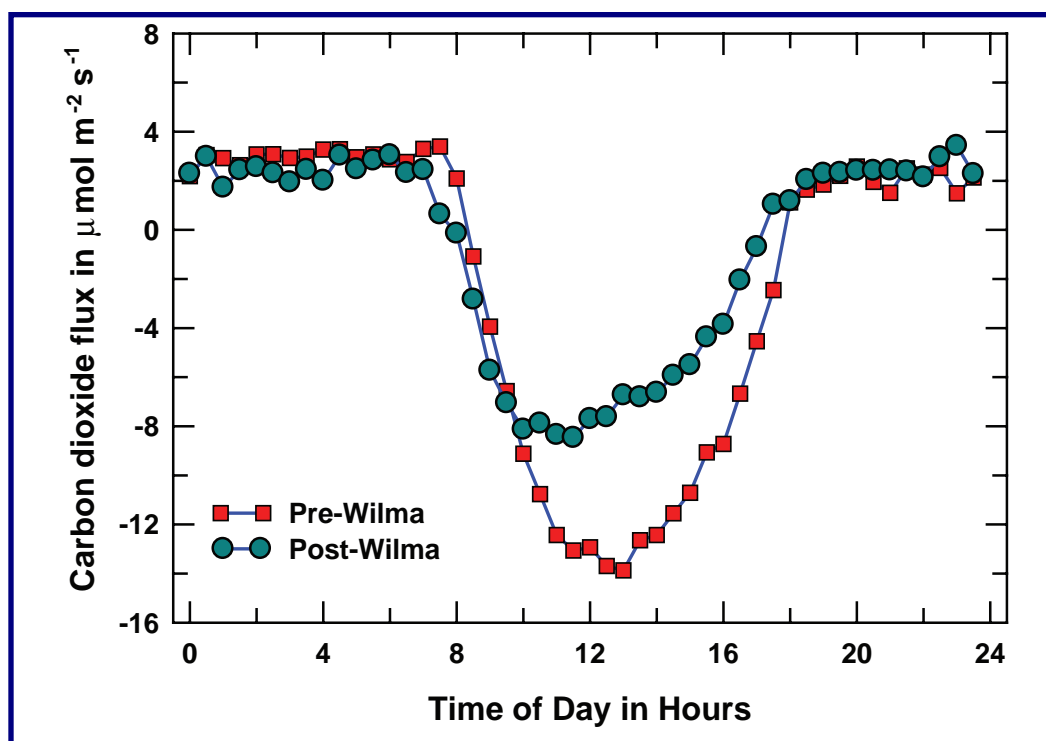
light on the effects of similar large-scale anthropogenic influences, such as global climate change and sea level rise. This research will also provide information needed for the development of process-based numerical models to help predict ecosystem functioning under the influences of regional and global environmental changes.

By K.K. Dowell, M.P. Tymchak,
James Kathilankal, J.D. Fuentes, V. Engel,
J.C. Zieman, D.L. Childers, FCE

Figure 2. The flux tower at FCE-LTER SRS-6 site was reconstructed in the fall 2006. The 90-foot tower is equipped with sonic anemometers to measure atmospheric turbulence and infrared gas analyzers to measure water vapor and carbon dioxide. A second eddy covariance system is deployed just above the forest canopy to determine soil respiration rates and carbon assimilation by seedlings. These instruments allow for continuous calculations of carbon and water vapor exchanges between the mangrove forest canopy to the overlying atmosphere. This tower also serves as a platform for a series of temperature/humidity probes, a net radiometer, soil heat flux plates, and TDP sap-flow sensors.



Figure 3. Average diurnal carbon dioxide fluxes for 30 days during a period preceding hurricane Wilma (November, 2004) and a period following hurricane Wilma (November 2006). Respiration rates (flat areas of each curve) are similar between these two years, but a greater rate of carbon assimilation during daytime hours occurred in the year preceding hurricane Wilma (2004).



LTER to meet metadata standardization milestone this summer

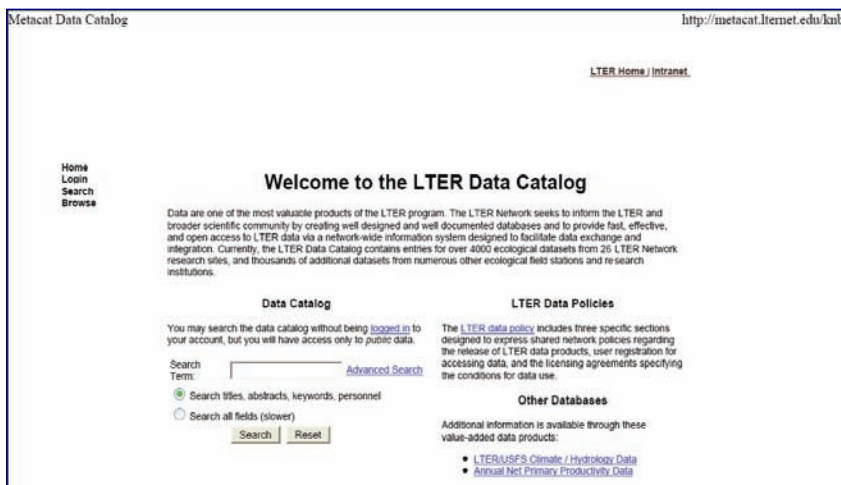
The LTER network will reach an important milestone with regard to data documentation this summer: All LTER sites will be contributing metadata standardized in Ecological Metadata Language (EML) to the LTER Network Data Catalog. Standardization of data documentation is a critical step in the development of information systems to support ecological synthesis. Currently the LTER Data catalog hosts over 5,500 documents searchable at <http://metacat.lternet.edu>. The latest contributors to the catalog are the newer LTER sites—Moorea Coral Reef (MCR) and the California Current Ecosystem (CCE).

Implementing the LTER data access policy

Access and use of LTER data outside the Network is governed by the LTER Data Access Policy (www.lternet.edu/data/netpolicy.html). These policies and agreements were motivated by the need to measure the flow of data from the LTER Network to the community, thence documenting one of the broader impacts of the LTER program. The LTER Network Office's (LNO) NIS development team recently sent out a Request for Comments (RFC) about the Network-level implementation of this policy (<http://intranet.lternet.edu/modules.php?name=UpDownload&req=getit&lid=544>). The RFC seeks to solicit input on a proposed implementation of this policy in NIS. The policy requires end user registration along with electronic acknowledgment and acceptance of data use agreements applied to the data set, and a statement of the intended use of the data set, before any data is released.

LTER Cyberinfrastructure Strategic Plan released for comments

The LTER Cyberinfrastructure Strategic Plan (CSP) developed under a supplement to the LTER Planning Grant has been released for comments from LTER members and the broader scientific community (<http://intranet.lternet.edu/modules.php?name=UpDownload&req=getit&lid=543>). The document is a critical component of a suite of documents that will be provided to NSF as the result of the three-year planning process. This CSP will guide LTER and its cyberinfrastructure development partners in addressing proposed long-term, trans-disciplinary, multi-site science projects that result from the LTER planning process.



Gateway to the LTER Data Catalog at <http://metacat.lternet.edu>

LTER Data Catalog Use Statistics

To understand better how the LTER Data Catalog is being used by the community, the NIS team performed a cursory analysis of the Metacat "access_log" table, which captures information about who is accessing what document(s) when. The "who" component is simply the logged-in user, while the "document" is identified by the document id (e.g., knb-lterlno. 23). Interestingly the biggest metadata fan is the National Biological Information Infrastructure's (NBII)

automated harvesting process, followed by commercial search engine bots. From July 2005 through March 2007, for example, 339,487 document access events were logged by 14,157 unique users, of which 491 were logged in as registered users. Importantly, the overall access to metadata documents continues to increase. A full discussion can be found in the Spring 2007 issue of Databits at <http://intranet.lternet.edu/archives/documents/Newsletters/DataBits/07spring/#8ja>.

By Mark Servilla, LNO

Don't forget to read **DataBits**, the Information Managers' newsletter, online at www.lternet.edu.

LTER intensifies IM interactions with Taiwan

A gathering of giant green snakes? A huge spider towering over us? Not really, just a tangled mass of roots and stems, each enshrouded in a thick layer of green moss, that surrounded us as we hiked down to Yuan Yang Lake (YYL) in north central Taiwan (see the July 2005 BioScience cover for more photos). Surrounded by ancient cypress (some thousands of years old) and fed by cloud water and typhoons, the thick, verdant forest seems an odd place for a US LTER Information Manger to be! However, YYL is the site of one of an increasing network of wirelessly-connected buoys studying lake metabolism (www.lakemetabolism.org; <http://gleon.org>), and my visit there was part of a growing collaboration between individual LTER sites and the Taiwan Ecological Research Network (TERN).

At the 2003 LTER All Scientists Meeting (ASM), several U.S. LTER sites were asked to host a day trip by Taiwanese researchers to discuss information management. In February 2004 they made a whirlwind tour of LTER sites (including CAP, NTL, SEV, VCR and the LTER Network Office). It was clear that this was a group that was actually interested in developing information management systems and not just talking about them. As a follow-up to that trip, TERN information managers Sheng-Shan Lu, Meei-ru Jeng, Chien-Wen Chen, Chi-Win Hsaio, and Chau-Chin Lin

each spent three months working at either NTL or VCR between the fall of 2004 and spring of 2007 learning the detailed practice of information management as conducted at these sites and collaborating on the development of new tools.

For example, Sheng-Shan Lu spent three months during the fall of 2004 at NTL. His primary focus was to learn as much as possible about Ecological Metadata Language (EML) and the various methods and tools a site could use to implement EML. He input metadata from one of his projects from Taiwan into the NTL database in order to ex-



Photo: : Anonymous

Meei-ru Jeng, Yunyin Yeh, John Porter, Fu-Ching Yang and Patrice Porter visit Monticello, the home of Thomas Jefferson

plore and understand the relational database model NTL uses for its metadata and how the

metadata are used to drive dynamic database access on the NTL website. Thus, Sheng-Shan participated in the creation and population of the EML taxonomic module for NTL datasets—a major undertaking. While at NTL, he learned other ways of managing EML, including Morpho, Metacat, and the Florida Coastal Everglades Excel-template system. In addition, he took advantage of the opportunity to learn about the many other aspects of the NTL information management system.

An important aspect of these extended visits was that it allowed time for real collaborations to develop. For example, while visiting VCR, Chi-Win Hsiao developed online tools that take an EML document and the associated data as input, performs quality assurance analyses, and provides an online statistical interface (<http://eml.twecoinformatics.org/>). These tools can be used at any LTER site because they use standardized EML metadata as input.



Photo: : Patrice Porter

Local and international participants at an information management workshop in Taiwan.

See "ILTER," p. 19

ILTER (continued from p. 18)

TERN has subsequently used the tools to cross check all their metadata against the underlying data. These interactions were supported in part by Bill Chang of the NSF's International Programs office, who provided a supplement to the VCR-LTER grant.

U.S. Information Managers Barbara Benson (NTL), Don Henshaw (AND), Peter McCartney (CAP) and John Porter (VCR) have all participated in workshops with the TERN "IM Team" focusing on the use and development of metadata and LTER information management (IM) systems, and in IM workshops involving participants from the entire East Asia Pacific (EAP) region of the ILTER network.

Prior to the 2006 LTER IM and All-Scientists Meeting, Taiwan information managers Meer-ru Jeng, Fu-Ching Yang, and Yunyin Yeh made brief visits to several LTER sites in the northeast. They met with information manager Jonathan Walsh at BES and toured meteorological stations at the Institute for Ecosystem Ecology. They then traveled to HFR to meet with information managers Emery Boose and Julie Pallant and on to Hubbard Brook to meet with information manager John Campbell. At each site they learned about the methods each site was using for managing its data, and more importantly, the philosophies that underlie each system. The team then traveled to Estes Park, CO to attend the 2006 ASM.

ILTER chair Hen-biau King of the Taiwan Forestry Research Institute (TRFI) has been a strong supporter of our information management efforts. Taking the lead for TERN is Chau-Chin Lin, who has assembled a strong IM team, including specialists in web, PHP programming, spatial, databases, and relational databases. The TERN team was the first group worldwide to get Metacat software to operate on Windows-based server and have devoted substantial efforts to resolving language and character-set issues in MORPHO and EML. TERN has also held over 20 workshops to teach researchers how to develop and use EML documents.

The TERN group is currently working on several collaborations with U.S. and regional ILTER sites, including lake ecology with NTL, agroecosystem ecology with KBS,



Photo: : Patrice Porter



Photo: John Porter

Top: Sheng-Shan Lu, Chau-Chin Lin, Chin-Yin Huang, Meei-ru Jeng and Fu-Jing Yang (left to right) from the Taiwan Forestry Research Institute guide VCR/LTER IM John Porter (rear) to remote Yuan Yang Lake. **Center:** Don Henshaw inspects a prospective station in Taiwan for inclusion in the CLIMDB database.

Bottom: Jonathan Walsh shows visitors from Taiwan features of his information management system.



Photo: : John Porter

developing links to the CLIMDB system with AND, and wireless sensor networks with the VCR. Additional workshops in Taiwan and Korea are being planned for 2007.

An important outcome of these interactions is that several ILTER groups are developing world-class expertise in ecological information management. Although the US LTER program had a head start, the TERN group and others are developing at a rapid

pace. Just as the U.S. network has benefited from intersite interactions, we are now at a point where we can similarly benefit from international collaborations. Many hands truly do make "light work!"

*By John Porter, VCR
(with help from Barbara Benson
and Chau-Chin Lin).*

Calendar

Coming Events of Interest to the LTER Community

JUNE 2007

June 6 – 8: Post-ASM Working Group on the Grasslands Data Integration Project is meeting in Olympia, WA. Contact Judy Cushing, (judy@evergreen.edu) for more details.

June 6 – 10: 87th Meeting of the American Society of Mammalogists, Museum of Southwestern Biology, Department of Biology, The University of New Mexico.

June 23 – 27: United States Society for Ecological Economics (USSEE). Theme: “Creating Sustainability Within Our Midst: Challenge for the 21st Century,” Pace University’s downtown campus. See website (www.ussee.org/conference.htm) for details.

JULY 2007

July 9 – 11: US-Taiwan Second Information Management Workshop and First East Asia & Pacific-ILTER Information Management Committee Meeting (location not yet announced at time of going to press).

July 12, 2007: Joint Symposium on Long Term Ecological Research Programs in New Mexico, Jornada Basin LTER at the New Mexico State University (NMSU)/ USDA-ARS Jornada Experimental Range and Sevilleta LTER at the University of New Mexico/Sevilleta National Wildlife Refuge, Wooton Hall, NMSU Campus.

AUGUST 2007

August 5 – 10: Ecological Society of America (ESA)/Society for Ecological Restoration (SER) International Joint Meeting, San Jose McEnery Convention Center, San Jose, CA. See website (www.esa.org/sanjose/) for details.

August 20 – 21: International Conference on Long-Term Ecological Research. Theme: “Long-term Ecological Research: Meeting the Challenges of Sustainable Ecosystem Management from Local to Global Scales,” Institute of Geographic Sciences and Natural Resources Research (IGSNRR), Chinese Academy of Sciences, Beijing, China. See website (www.cern.ac.cn:8080/newsView.jsp?id=1914) for details.

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