LTER
Network News
Newsletter of the Long–Term Ecological Research Network
Vol. 18 No. 2 Fall 2005

Jim Gosz Resigns as Chair of LTER Coordinating Committee

After 10 years at the helm of the LTER Coordinating Committee (CC), James R. Gosz has resigned his position effective December 1, 2005, to take up a two-year position at the National Science Foundation (NSF). Gosz, who is also director of the New Mexico Experimental Program to Stimulate Competitive Research (EPSCoR), will take up the new position as senior advisor for the NSF's national EPSCoR program starting December 16, 2005.

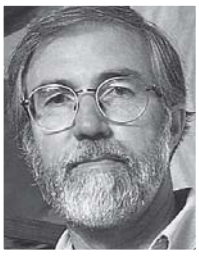
"I have discussed this at length with my family and all are convinced that this position is valuable and I should take advantage of it," Gosz said, adding that he was convinced he could be of help in the NSF's restructuring of the national EPSCoR program.

In accordance with NSF regulations, Gosz could not continue to chair the LTER CC, nor as principal investigator (PI) for the LTER Planning Grant. Following the bylaws of the LTER Network, John Magnuson of the University of Wisconsin and the North Temperate Lakes LTER site was selected by the Executive Committee and has agreed to serve as chair beginning on December 1, 2005. Magnuson (see full bio at *http://limnology.wisc.edu/personnel/magnuson/magnuson.html*) will serve until a new chair is elected at the spring 2006 CC meeting at Cedar Creek. Magnuson is a distinguished scientist with a long history with LTER , and the Executive Committee is grateful that he has accepted this challenge.

Scott Collins, director of the Sevilleta LTER and biology professor at the University of New Mexico, will become the new PI on the Planning Grant. Collins and the other members of the Science Task Force (Barbara Benson, Dan Childers, and Ali Whitmer) are moving forward with planned activities in association with the Planning Grant Conference Committee. This group will meet in November to undertake the next phase of planning.

McOwiti O. Thomas and Bob Waide, LNO

Clutter Retires, Collins Takes Over as Head of Biological Sciences at NSF



The National Science Foundation this Fall appointed James Collins, formerly Ullman Professor at Arizona State University (see full bio at *http://sols.asu.edu/faculty/jcollins.php*), as head of Biological Sciences following the retirement of Dr Mary E. Clutter.

"We are extremely pleased to welcome Jim Collins," said NSF Director Arden L. Bement Jr. "Not only is he a scientist of extraordinary distinction, his longstanding interest in the broad cultural, institutional and educational aspects of biology will serve our mission to integrate research and education."

Collins, who took over as Assistant Director for Biological Sciences beginning in October, will oversee NSF's nearly $580 million annual investment in fundamental biological research and serve on the Foundation's senior management team.

Collins has substantial prior experience with NSF in his roles as program director, a research awardee, and as chairman of the external Advisory Committee for the biological sciences directorate (BIO AC). He also represented BIO AC on NSF's Advisory Committee for Environmental Research and Education.

As an investigator, Collins has focused on how subgroups within a species physically change in response to ecological and evolutionary pressures, and, most recently, the role of pathogens in the global decline of amphibians. He chairs the task force of the International Union for the Conservation of Nature's Declining Amphibian Populations.

In addition, he has concentrated on the intellectual history of ecology and taken an active role in ASU's successful curriculum-enhancement and mentoring programs for undergraduates.

Story courtesy of NSF

In This Issue

Editorial

The Network News

Vol 18 No 2 Fall 2005

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www.lternet.edu

The National Science Foundation (NSF) conducted a midterm site review of the LTER Network Office (LNO) from October 10-11, 2005. Members of the site review team included Steve Carpenter (NTL), Chris Jones (University of California, Santa Barbara), Debra Peters (JRN), Dwayne Porter (University of South Carolina), Brenda Shears (CAP), Wade Sheldon (GCE), and Russ Schmitt (MCR). The principal outcome of the site review was a strong recommendation that the NSF invite a renewal proposal from the Network Office at the University of New Mexico (UNM).

The site review team was "impressed by the high quality of work being performed by the LNO in support of the Network." The report from the site review, which is available in the LTER document archive (*http://intranet.lternet.edu/*), highlighted key accomplishments of the LNO and evaluated the performance of the office in four broad categories: (1) performance in key areas dictated by the statement of work, (2) role of the LNO in a changing Network, (3) role of the LNO in information technology and associated fields, and (4) communication among the LNO, site information managers, project managers, staff, and LTER scientists.

The three LNO Associate Directors (James Brunt, John Vande Castle, and William Michener) coordinated a series of presentations and demonstrations highlighting the accomplishments of the LNO during the last three years. Topics discussed included the successful move of the LNO from the UNM Research Park to the main campus in 2004, capabilities of the new Informatics Training and Software Usability Testing Lab, use of the Request Tracker software, demonstration of the web content management system, improvements to the document archive, implementation of metadata standards, progress on the Network Information System, status of remote sensing resources at LNO, implementation of new technologies, revisions to Network publications, development of partnerships with other networks and agencies, and meeting coordination. Interesting and fruitful discussions with the Site Review Team focused on the strengths and weaknesses inherent in our approaches to these and other topics.

Several very constructive suggestions were put forth by the Site Review Team. One such recommendation focused on the development of new metrics of performance that focus on the impact of the LNO on the LTER Network and the broader ecological community. These new metrics would simplify and focus reporting of LNO accomplishments and provide indices that are more relevant to the success of the LTER Network as a whole. Henry Gholz pointed out in the letter accompanying the report that the National Center for Ecological Analysis and Synthesis (NCEAS) faces a similar challenge and that a joint discussion of this issue might be useful. The review report also suggested that the LNO take a proactive role during this period of transition for the LTER Network. The Network is facing changes in leadership, scientific goals, diversity of disciplines, and governance, and the LNO should play a key role in facilitating a smooth transition to a new LTER vision. More specifically, the LNO should develop a strategy to capitalize on existing and new resources to meet scientific goals arising from the Network Planning process.

The LNO welcomes these recommendations, and we will work with the Executive and Coordinating Committees to implement them for the benefit of the Network. We are grateful to the members of the Site Review Team and to Henry Gholz for an exciting a stimulating visit.

Robert B. Waide, Executive Director, LNO

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=McMurdo 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=Sevilleta; SGS=Shortgrass Steppe; VCR=Virginia Coast Reserve.

LTER and OBFS Hail Benefits of Partnership

At a recent annual meeting of the Organization of Biological Field Stations (OBFS) co-hosted by Coweeta Hydrologic Laboratory and Highlands Biological Station in western North Carolina (see photo), several participants noted the benefits of collaboration, and urged additional representation in OBFS of LTER sites that conduct research and educational activities at field stations. OBFS is an energetic and growing network of field stations that was founded in 1967. Its 162 field stations and 28 individual members cover most parts of the United States, in addition to 23 international field station members.

Photo: Kathy Flowers

The 2005 Organization of Biological Field Stations annual meeting was co-hosted by Coweeta Hydrologic Laboratory and Highlands Biological Station in western North Carolina.

The OBFS mission is "to serve the member stations in ways that increase their effectiveness in research, education, and outreach." The organization's recently completed strategic plan, funded by the National Science Foundation, identified seven goals to serve this mission, and created seven task forces to achieve these goals. For more information about OBFS, its strategic plan, and online maps showing the location of member field stations, please visit the OBFS website, *www.obfs.org*.

A number of LTER sites are long-standing members of OBFS and actively support the mission of the organization through research, education, and the proposal review process. These sites also benefit from improved infrastructure through the use of funding from the National Science Foundation Field Station and Marine Laboratories (FSML) program (*http://www.nsf.gov/pubs/2005/nsf05550/nsf05550.htm*).

After the September 2005 OBFS meeting, we compiled Table 1 showing the current LTER site membership in OBFS. We found that 10 of the 26 LTER sites are current members and that five of those members routinely send representatives to the OBFS annual meeting. Several LTER field stations have also hosted recent OBFS annual meetings including Andrews LTER in 2000, Kellogg LTER in 2002, and Coweeta LTER in 2005.

LTER sites that are members of OBFS enjoy several benefits: 1) direct access to NEON representatives at the OBFS annual meeting; 2) increased collaboration and linkages with other field stations conducting similar research and education programs; 3) new ideas and approaches to the administrative challenges that many field stations face as a result of insufficient funding, increased usage, and distant locations from their parent institutions; 4) direct access to and presentations from NSF representatives from the FSML program and other NSF programs represented at the annual meeting; and 5) participation in Congressional Visits Day organized by the American Institute of Biological Sciences (AIBS), with financial support from OBFS, and arrangements to meet members of Congress from your district. We also have found that increased collaboration among all sizes of field stations provides them greater coverage of the ecosystems in their region and increases their resources to compete more effectively for new funding sources such as NEON. These collaborations can be built partly as a result of scientific, educational, and personal projects developed at OBFS meetings.

If your LTER site is not a member or not actively participating in OBFS, we encourage you to seek further information from the OBFS web site, or to contact one of the authors for further information. Our next annual meeting will be held 14-17 September 2006 and will be hosted by Flathead Lake Biological Station located in the Rocky Mountains near Glacier National Park in Montana. We invite all LTER sites to join OBFS, attend our meetings, and to further develop the linkages between the OBFS and LTER networks.

Table 1. Summary of LTER site involvement with the Organization of Biological Field Stations as of October 2005.

LTER sites that are members of OBFS	LTER sites that routinely send representatives to the OBFS annual meeting	LTER sites encouraged to become OBFS members
AND, ARC, CWT, HBR, KBS, KNZ, NTL, SEV, SGS, VCR	AND, CWT, HBR, KBS, SEV	BES, BNZ, CAP, CCE, CDR, FCE, GCE, HFR, JRN, LUQ, MCM, MCR, NWT, PAL, PIE, SBC
Total = 10	Total = 5	Total = 16

Brian Kloeppel (CWT), Renee Brown (SEV), Nina Consolatti (KBS), James Costa (Highlands Biological Station), Ian Halm (HBR), Claudia Luke (UC Davis Bodega Marine Reserve), William Michener (LNO), Don Natvig (SEV), Kari O'Connell (AND), Sedra Shapiro (San Diego State University Field Station Programs), Larry Weider (University of Oklahoma Biological Station), Marshall White (LNO), and Robert Wyatt (Highlands Biological Station)

LNO Launches New Document Archive Format

New structure streamlines document submission and search process.

One of the most-requested items in the 2004 LTER Site Survey was an updated version of the LTER document archive. Survey responders felt that the old archive (located under the 'documents' link at intranet.lternet.edu) was difficult to search and navigate, and bad links often caused frustration.

The old archive was also a source of frustration at the Network Office, as each new document had to be added to the old Access database individually, and linked in several places in order to appear on the documents archives page. This multi-step process has been shortened considerably by the new archive and better yet, all LTER members will soon be able to submit documents directly to the archive via the web.

The new archive can be viewed through the documents link on the intranet page, or directly at *http://intranet.lternet.edu/*. All documents have been re-categorized into much more specific categories and the new structure is extremely user-friendly and transparent. All document titles were standardized to be as succinct and descriptive as possible, and over 400 documents were moved individually into a new, MySQL-based database after being checked for bad links.

The new archive's search feature is designed to search all titles and document descriptions. Looking for the *spring 1999 climate committee meeting report* from *Luquillo*? Entering any one of the italicized underlined key words will bring up the document you need. Each document is represented by an icon denoting its type (doc file, PowerPoint, html, etc.), followed by the title and a short description. This new format should make document archiving and retrieval a fast, efficient process for everyone in the LTER Network.

Jeanine McGann, LNO

SGS Scientist Elected AAAS Fellow

Dr. William Lauenroth, co-Principal Investigator of the Shortgrass Steppe LTER and a professor in the Department of Forest, Rangeland and Watershed Stewardship in the Warner College of Natural Resources, Colorado State University, has been elected to the rank of Fellow by the American Association for the Advancement of Science (AAAS).

Dr. Lauenroth is being honored for his major contributions to the understanding of primary production in grasslands and for excellence in the mentoring of students.

Each year, the AAAS Council elects members whose "efforts on behalf of the advancement of science or its applications are scientifically or socially distinguished."

The honor of being elected a Fellow of AAAS began in 1874 and is acknowledged with a certificate and rosette, which will be presented to Dr. Lauenroth in St. Louis on February 18, 2006, during the AAAS Fellows Forum, a part of the Association's Annual Meeting. The Forum will be held in the Landmark Ballroom of the Renaissance Grand Hotel, St. Louis, Missouri.

Dr. Lauenroth teaches undergraduate courses in rangeland ecogeography and ecosystem ecology and a graduate course in ecology of grasslands and shrublands. His research interest include the plant community ecology and ecosystem ecology of grasslands and shrublands. His results are widely used by researchers and land managers. He is an ISI highly cited researcher and a member of the Ecological Society of America, Sigma XI, and the Society for Range Management, as well as the AAAS.

Congratulations to Dr. Lauenroth on this well-deserved recognition for his accomplishments.

Story courtesy of SGS LTER and Jayleen Heft, Colorado State University

Andrews LTER Gets Down to Business with HydroDB Data

Andrews Forest LTER has scored a first in the Network with a major publication using HydroDB data. Appearing in the WATER RESOURCES RESEARCH VOL. 40 (2004), "Seasonal and successional streamflow response to forest cutting and regrowth in the northwest and eastern United States" compares trends in streamflow response to forest cutting and regrowth in experimental watersheds on the U.S. west coast (Andrews, Coyote Creek, and Caspar Creek) and east coast (Hubbard Brook, Fernow, and Coweeta) using more than 900 basin-years of record from 14 treatment/control watershed pairs. Differences between the sites reflect climate (especially roles of snow) and conifer *vs.* deciduous vegetation. In the first 5-year period after cutting, maximum daily increases in flow ranged from 2–3 mm at deciduous forest sites and 6–8 mm at conifer forest sites. Significant increases in spring flows persisted for up to 35 years in conifer sites. Streamflow increases in the first 25 years after cutting were significantly related to the age of the forest at the time of cutting, which ranged from as little as 12 years in an eastern site and as old as 450-plus years in several Pacific Northwest sites.

Information managers at Andrews LTER continue to develop the HydroDB data harvester system to provide ready access to streamflow data via the internet. Twenty-four LTER sites and 23 USDA Forest Service sites (six sites have both designations) now have metadata (descriptions of sites and methods) and streamflow data posted at *www.fsl.orst.edu/climhy/*. Funding for the development of HydroDB has come from the NSF/LTER and Forest Service Research.

(To read or download the pdf version of the report please visit *www.lternet.edu*).

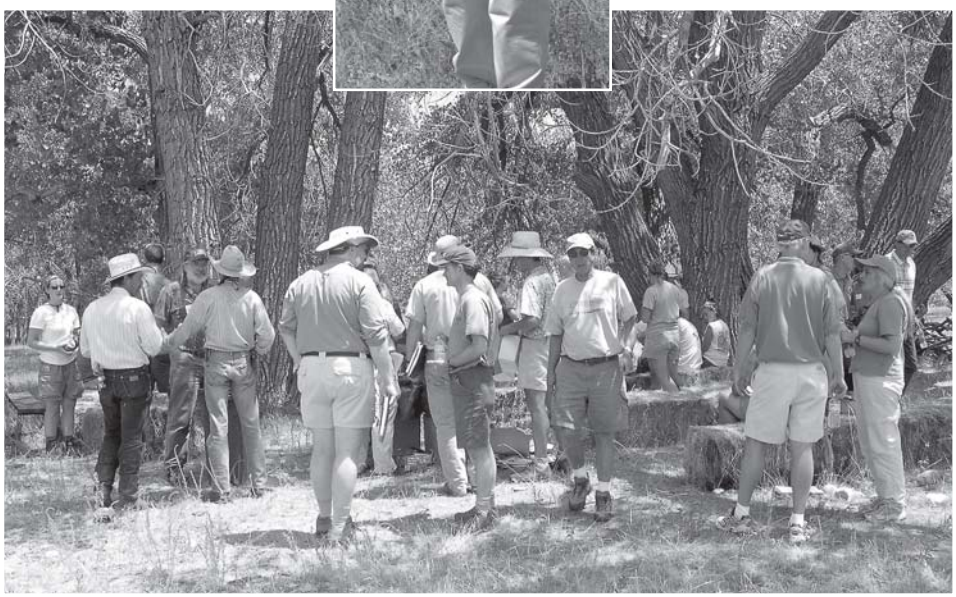
Story courtesy of Andrews LTER

NSF Completes Year 2005 LTER Site Reviews

It was a very busy review year for LTER sites; in all seven sites (including the LTER Network Office) were reviewed by NSF review panels during 2005. Each LTER project is funded independently for six years at a time. An exception occurs if renewal proposals are recommended for probation or decline.

In this case, the site is placed on a two-year probation and must come back to the next renewal panel with a new, full proposal for continued funding over the remaining period of four years. If the second proposal is also recommended for decline, the site is discontinued. The current 26 sites are divided into three cohorts. Renewal panels are held in even years and mid-term; on-site reviews are held in odd years—thus, 2005 was an on-site review year. Due to this structure, seven to 11 proposals are considered by each renewal panel, and the same range of sites is visited in the alternate years. Members for new site panels, renewal panels, and mid-term site review teams are nominated by all the programs in NSF that contribute to science funding at the sites under review. Renewal panels usually have about 12 members, while mid-term review teams have five; both panels and site review teams have minority membership by (unconflicted) LTER participants. The LTER Program Officer at NSF makes the final assignments and organizes the review process, including the invitation of renewal proposals. All relevant Program Officers in NSF are invited to participate in the running of the panels and to attend site reviews as observers, as well as to provide input to the construction of the review/award/decline letters. Currently eight jackets are held outside the Division of Environmental Biology (DEB) (five in the Biological Oceanography Program, two in the Office of Polar Programs, and one in the Division of Biological Infrastructure).

Michelle Kelleher, Science Assistant, BIO/DEB, NSF



Photos: Michelle Kelleher

Top: Shortgrass Steppe (SGS) LTER Principal Investigator, Gene Kelly, addresses site review team members. **Bottom**: After a hard morning's work, members of the site review team take a break for lunch under the cottonwood trees at the SGS site.

NSF Develops New Brochure on Applications and Impact of LTER Science

"Translating Science for Society: Broader Impacts of NSF's Long-Term Ecological Research Program."

The excellent presentations during the 2004 NSF-LTER mini-symposium were adapted and transformed at NSF into hard copy and electronic versions of a new brochure highlighting the management impacts of basic LTER science. Hard copies were distributed throughout the Foundation, the Network Office, and LTER sites, and made electronically available through both the NSF and LTER websites, providing a one-stop generic product suitable for supporting outreach activities to a variety of audiences.

NSF FY05 Funding for LTER

In 2005, the LTER program at NSF supported 15 continuing awards and nine renewal projects as a result of a panel held in April 2004 (seven in the Directorate of Biological Sciences (BIO), two in the Directorate of Social and Behavioral Sciences). Total NSF core funding for the LTER program in FY05 was $22.2 million, with $17.2 million (78 percent) coming from BIO.

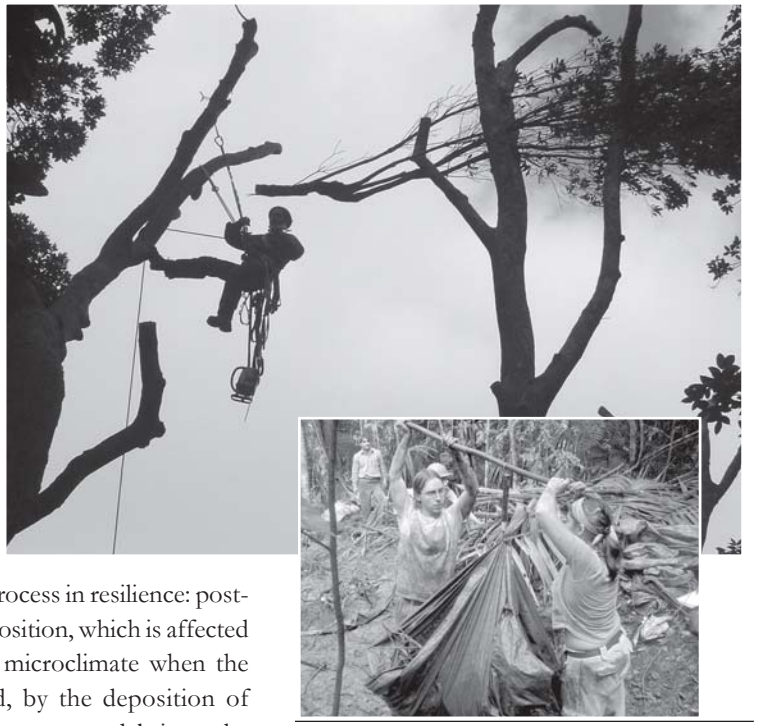
Additional, important support for a range of peripheral and/or new activities at LTER sites is made possible through a very active and dynamic supplement program. Funding from DEB for this program has been level over the past several years at $1.96 million, including the (REU), Schoolyard LTER, and other discretionary components. Historically, a number of other programs in NSF also provide supplement funds (e.g., amounting to more than 60 percent in FY05), so that DEB support is highly leveraged. Supplement funding in 2005 was limited to educational supplements, but at an increased total of $660,000 from BIO (an 83 percent increase). In 2005, however, only Schoolyard (K–12) activities were supported.

Michelle Kelleher, Science Assistant, BIO/DEB, NSF

Luquillo Canopy Trimming Experiment studies

Forest Resilience After Hurricanes

The Luquillo (LUQ) LTER has begun a major field manipulation at its site in northeastern Puerto Rico to simulate the main impacts of hurricanes on a tropical forest ecosystem. Recent devastation in the U.S. shows how ill-adapted some human systems are to hurricanes, but LUQ studies have revealed how resilient forest systems in Puerto Rico can be (Figure 1). This is not surprising, considering that category 3 or greater hurricanes cross the LUQ site on average every 50–60 years. But how will the forests fare if hurricane intensity or frequency increases, as some climate models suggest? How would that change forest structure, biodiversity, CO_2 and trace gas fluxes? Convinced that only a field experiment would reveal the mechanisms of resilience and provide data for reliable predictions, LUQ launched the Canopy Trimming Experiment (CTE) in 2004.



Top: Local arborist trimming forest canopy to simulate the disturbance of canopy defoliation associated with hurricane damage, Puerto Rico. **Bottom:** Student researchers weighing debris from forest canopy trimmed plots. Following weighing and sorting, the detritus was moved down muddy trails to adjacent plots for redistribution (Photos: Aaron Shiels).

The CTE actually consists of two experiments—one on mechanisms of resilience to hurricanes and one on impacts of more frequent hurricanes. The first experiment focuses on a key process in resilience: post-hurricane decomposition, which is affected by the change in microclimate when the canopy is opened, by the deposition of canopy debris on the forest floor, and by the activity of various organisms that feed on the debris. The treatments are designed to separate and quantify the effects of these factors.

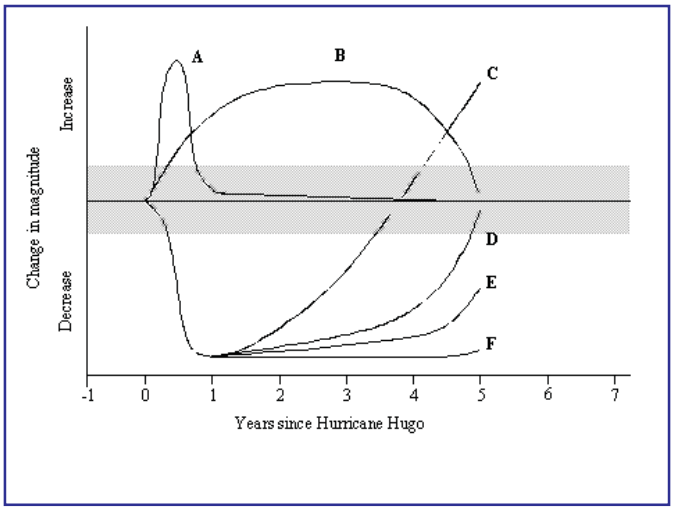


Figure 1. *Idealized 5 yr trajectories of responses of different variables in the LUQ site, Puerto Rico, to disturbance caused by Hurricane Hugo. The shaded portion of the graph represents +/- 15 percent variation indistinguishable from pre-hurricane values. Curve A: transient (<1 yr) increase. Examples include forest floor biomass, some soil nutrient pools, and nitrate concentrations in streams. Curve B: slow increase and return to pre-hurricane levels. Examples are net primary productivity, abundance of Atya shrimp in streams, of adult coqui frogs, and of the terrestrial snail, Cepolis squamosa. Curve C: catastrophic decrease and subsequent rise above pre-hurricane levels. Examples are aboveground pools of potassium and magnesium and of several species of terrestrial snails. Curve D: catastrophic decrease and return to near pre-hurricane levels. Examples are tree biomass and tree density. Curve E: a catastrophic decline and steady increase, but not to within 15 percent of pre-hurricane levels. An example is fine total litterfall. Curve F: catastrophic decline and little recovery until 5 yr post-hurricane. Examples are fine root biomass and abundance of the walking stick, Lamponius portoricensis. Both of the latter returned to near normal values subsequently.*

The experiment consists of four treatments, each 30 m x 30 m, spread over 0.52 hectares: 1) canopy trimmed, debris deposited on the forest floor; 2) canopy trimmed, debris removed; 3) canopy intact, debris added to forest floor; 4) no trim or debris manipulation. For the trimming, professional arborists cut all branches measuring less than 10 cm in diameter in the treatment sites. The trimmed material from the canopy was sorted, weighed and redistributed across the plots as appropriate. The effects of microorganisms and other groups on decomposition were determined through selective access to debris and appropriate manipulations. Many plant, animal, microbe, environmental, and ecosystem variables also were measured in the year before the treatments began to get a broad and synoptic view of the impacts and responses.

See "Luquillo," p.18

200-Year Decomposition Study at Andrews Forest

An update

The year 2005 marked the 20th anniversary of a very long-term study being conducted as part of the Andrews' long-term ecological research. In 1985, researchers at Andrews began a 200-year experiment to examine the factors controlling the decomposition and nutrient release from logs. Four tree species that range in size from 1 cm to 70 cm diameter, with differing decay-resistances, are being studied. The trees were felled, bucked into logs, and then transported to six old-growth sites on the Andrews Experimental Forest in collaboration among the LTER scientists, the U.S. Forest Service, and a private logging company.

Photo: Sarah Greene

Logs were placed out in old-growth forests 20 years ago in the Andrews Forest.

After being characterized for initial bulk density, moisture, and nutrient content, the logs were mapped to help future location. Thereafter, resampling was done annually for eight years, then every other year until year 12, and now at 4-year intervals. This year samples were again taken from a subset of the logs, and although quantitative analysis is not complete yet, some differences are quite striking:

1) Species of tree did in fact matter. Pacific silver fir lost approximately 6 percent of its mass every year, compared to nearby western red cedar logs that lost only 0.7 percent of their mass. Therefore, there can be an order of magnitude difference among species of trees. The Pacific silver firs are clearly collapsing into the forest floor, and while punching through an entire log is not a standard measurement, it is now possible with these trees. We have found that western hemlock (2.3 percent per year) decomposes faster than Douglas-fir (1.9 percent per year), but this difference is much less than was reported in early studies from the Andrews Forest. The initial finding was largely caused by differences in sizes of the species, which has since been controlled.

2) Examinations of the various parts of the logs indicate that the bark and sapwood of all the species are similar in terms of loss rates. The same is not true of heartwood, with Pacific silver fir decomposing very fast and western red cedar very minimal. Decomposition of the latter is so slow that we think all the other parts will largely have disappeared in another decade, leaving a core of solid wood.

3) In addition to differences in rates of decomposition between the species, we observed a short but significant lag before decomposition began in all the species. Decomposers take considerable time in colonizing the large pieces of wood, but this lag was not evident in diameters less than 10 cm. Therefore, the wood diameter has a large impact on the rate of decomposition—depending on the decay-resistance of the species being examined. For species with low decay-resistance the decomposition rate decreased two-fold as the diameter increased from 1 cm to 50 cm. But for decay-resistant species such as western red cedar, the decrease was almost 20-fold, suggesting that the increase in heartwood as log size increases causes much larger decreases than effects related to surface area-to-volume ratios, or colonization limitations.

Photo: Mark Harmon

Logs are sampled periodically to determine changes in bulk density and nutrient content.

4) Finally, despite having very similar nutrient contents and organic matter constituents, Pacific silver fir and western hemlock decomposition rates differed by a factor of two. One hypothesis points to differences in the decomposer communities that break down these species. This hypothesis is, at least, visually supported: the former is broken down by white-rot fungi (which break down all the polymers and often prefer lignin), whereas the latter is broken down by brown-rot fungi (which cannot break down lignin). This observation suggests that, for wood decomposition, the fungal groups can have a large impact on decomposition dynamics and, ultimately, stores of carbon in forests.

While our next sampling is not due for another decade, we have a lot of data to analyze on both the nutrient content and dynamics of organic matter decomposition of dead trees.

Mark E. Harmon, AND

PAL LTER partners DLESE in

Developing a Classroom Curriculum

The Digital Library for Earth System Education (DLESE), with Palmer (PAL) LTER attending, held a Data Services Workshop April 18–20, 2005 to develop an online curriculum for grade 6–12 education. Since a hallmark of PAL education outreach has always been an interdisciplinary approach to community learning, PAL brought a strong cross curricular team that focused on the use of LTER site long-term data.

During the workshop, participants worked with DLESE (*http://www.dlese.org*) members to develop a chapter in the Earth Exploration Toolbook (EET; *http://serc.carleton.edu/eet/*) by working as interdisciplinary teams drawing upon existing Earth system data sets and information management, data-analysis software development, and expertise in classroom teaching and curriculum development.

PAL's Schoolyard LTER program was initiated by Karen Baker (PAL Information Manager), informed by the seminal LTER Workshop on Education Project Planning at Biosphere 2 in October 1998 that was led by Diane Ebert-May. Subsequent NSF/DEB Schoolyard grants allowed PAL education outreach to build toward partnerships with nationally coordinated programs such as TERC and DLESE, with which the PAL education team has been working since 2000.

Photo: Karen Baker

The curriculum development team gets down to business: **L** to **R**: Clay Hamilton, Sharon Stammerjohn, David Smith, Alec Barron, and Beth Simmons.

The Spring DLESE workshop and EET project built upon education projects incorporating biome approaches (Berkowitz et al., 2003) and appropriate data availability (Edelson, 1998). The workshop provided an opportunity to explore the development of curricula incorporating data sets from scientific data generating programs (termed "authentic data") and to use contemporary software analysis tools in classroom science.

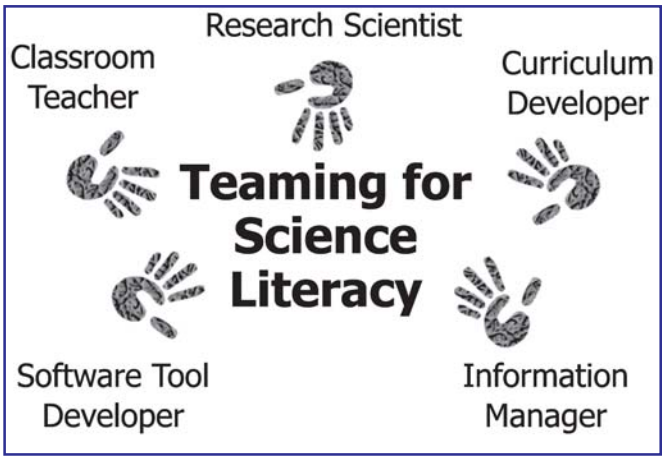


Figure 1: An interdisciplinary team can coalesce the differing perspectives and expertise requisite for producing curricula that will help achieve science literacy.

The workshop structure offered individuals the option to assemble an interdisciplinary team by joining with others during the workshop. However, Beth Simmons, the Education Coordinator for PAL and California Current Ecosystem, decided to form a team—mainly members of the PAL community—in advance of the workshop, thus tapping into LTER site knowledge about the research, data, and education outreach pertinent to the local data sets being used for the curriculum.

The team considered the experience of a classroom science teacher and curriculum developer as essential to crafting the most age-appropriate and effective online curriculum. Team members also realized that although using new software analysis tools could enhance student learning, such usage required tempering by awareness of the computer resources and the target audience's prior knowledge.

Simmons, a curriculum developer and science educator, headed the team that included (Figure 1) Karen Baker; Alec Barron, science educator at The Preuss School, a charter school for grades 6-12 at the University of California, San Diego; Clay Hamilton (Stanford), an analysis tool developer, graphic designer and earth sciences interpreter; David Smith (Northwestern), the developer of the analysis tool My World (*http://www.worldwatcher.northwestern.edu/myworld*); and Sharon Stammerjohn (Lamont Doherty Earth Observatory), who has a long history with PAL and contributed satellite ice research expertise.

Baker observed that the resulting EET curriculum introduced the overarching theme of response to environmental change by

See "Curriculum," p.9

Curriculum (continued from p.8)

using, first, hands-on work with blood worms exposed to wet/dry conditions and, second, the concept of Adelie penguin population dynamics in the warming environment near Palmer Station.

Simmons, who facilitated the workshop, added, "Our story unfolds by exposing students to temperature and sea-ice concentration data and then guiding them to investigate the influence of these parameters on penguin colonies along the Western Antarctic peninsula." Simmons and Barron focus on in-classroom assessment of curricula, an essential step in honing the final product (Wiggins, 1998; Ebert-May et al, 2003; Simmons, in press), so the initial version of the curriculum developed by the workshop was tested this Spring in Barron's sixth grade science class at Preuss. The pair presented the results from this assessment at the PAL Steering Committee meeting held at the Scripps Institution of Oceanography in August 2005. The final version of the curriculum will appear on the SERC/EET website.

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Relevant Links

DLESE: The Digital Library for Earth System Education provides collections of educational resources, Earth data sets and imagery as well as support services for utilizing these resources in the classroom.

SERC: The Science Education Resource Center, an office of Carleton College, has special expertise in geoscience education, community organization, workshop leadership, digital libraries, and website development. SERC's Cutting Edge program (see *http://serc.Carleton.edu/usingdata/related.html*) emphasizes inquiry-based curriculum units using authentic data.

Earth Exploration Toolbook (EET): A collection of computer-based Earth science activities, or chapters, that introduce data sets and analysis tools enabling users to explore Earth system science.

TERC (no longer an acronym, but a noun): A not-for-profit education research and development organization based in Cambridge, Massachusetts with the mission of improving mathematics, science and technology teaching and learning. TERC supports inquiry-based learning.

MyWorld: A classroom Geographic Information System (GIS) tool developed by Daniel Edelson and David Smith within the research education program at Northwestern.

Beth Simmons (Education Outreach Coordinator), Dawn Rawls (Science Writer), and Karen Baker (Information Manager), PAL

PIE LTER facilitates

Student-Teacher-Scientist Collaborations

It was a busy summer for several Plum Island Ecosystem (PIE) LTER scientists who, in addition to their regular research duties, added teaching responsibilities to their schedules. Their action has helped local teachers and students better understand PIE-LTER science and, in turn, helped the scientists better understand teachers and students. These groups were brought together thanks to the efforts of PIE-LTER education representative, Liz Duff, who is also education coordinator for Mass Audubon's Salt Marsh Science Project. Duff has been engaging Middle and High School teachers and students in long-term research of the invasive reed *Phragmites*.

As PIE-LTER education representative, Duff has been working toward making PIE-LTER science more accessible to teachers, students, and the wider public. This effort has taken some creativity, since most PIE research sites are fragile and barely accessible.

Three events last spring and summer supported the goal of bringing teachers and

See "Collaborations," p.10

Photo: Elizabeth B. Duff

Gone fishing: PIE-LTER scientists hard at work.

Collaborations (continued from p.9)

scientists together. The first event involved teachers in the PIE-LTER All Scientists Meeting in May. Ten teachers attended the presentations by LTER scientists, and brainstormed with them the various ways of incorporating research into the Massachusetts curricula. Many of the best connections and conversation happened informally during the dinner and social events after the presentations. During this time educators could follow up on the scientific presentations with one-on-one questions.

In summer, the Gulf of Maine Institute (GOMI) brought together over 50 participants including scientists, researchers, youth, community members, and educators in a bid to move participants from awareness to understanding and, ultimately, action about the controversy surrounding striped bass fishing in nearby costal waters. Funded in part by New England Center for Ocean Sciences Education Excellence (NE-COSEE), the four-day summer institute included scientists for the first time and was dubbed "Ocean Science Education Institute" (OSEI). PIE-LTER researchers Martha Mather, Jack Finn, Sarah Pautzke, and Bob Muth from the Department of Natural Resources Conservation at the University of Massachusetts–Amherst, explained to students and teachers the habits of striped bass, how to fish for them, and the political controversies surrounding the fish. Participants learned to seine, cast fishing rods, interview fisherman, and present their findings to a wider group. Additionally, PIE-LTER researcher James Morris demonstrated how he studied responses of coastal wetlands to rising sea level using a multi-tiered structure called a "marsh organ." The salt marsh theme team assisted Morris in building a new marsh organ that will likely be located at a public viewing area, the Mass Audubon's Joppa Flats.

While the GOMI event reached 50 participants, we intend to have a much greater impact. To bring PIE-LTER research closer to the public eye, we plan to make available video footage and photographs from the event via cable access television and displays at local nature centers.

Photo: Elizabeth B. Duff

Photo: Mass Audubon

Top: Urban youth with the catch of the day. **Left**: Striped Bass Theme Team used seine nets to investigate what the bass might be eating.

Video footage and photographs taken during a second event, a graduate level course for High School teachers titled *Climate Change and Coastal Communities*, will similarly be carried on cable access television and exhibited at local nature centers. This course also was organized by PIE-LTER researchers, who gave presentations, led lab activities, introduced teachers to working with PIE-LTER data, and led them on a kayak tour of PIE-LTER research sites. Many teachers said the tour was the highlight of the course for them. It was clear that they had bonded with and learned a great deal about the Great Marsh and the Rowley River, judging by their reluctance to leave. Besides learning about local research, the class attended a talk by a senior scientist, Dr. Bruce Peterson, about his research in the Arctic. Titled "*Global Warming and the Acceleration of the Arctic Freshwater Cycle*," Peterson expressed his appreciation for the opportunity to get the message out about global warming. In turn the teachers requested copies of his presentation to share with their students.

Through the three summer events we were able to connect teachers, students, and scientists in a productive, informative, and educational manner, providing valuable experiences for all involved. We look forward to being able to maintain the connectivity between education and science in the future of the PIE-LTER.

Liz Duff, PIE

BES quarterly research meeting grounds

Ecosystem Science with Urban Design

Urban Design was the hot topic during the Baltimore Ecosystem Study (BES) quarterly research meeting on June 15, 2005. Participants found common ground through cross disciplinary presentations and discussions to connect ecosystem science and urban design. This development creates new opportunities that are unprecedented and unique to Baltimore.

The meeting brought together members of the Baltimore design community, BES scientists, representatives of the Parks & People Foundation (PPF) community engagement programs, and urban design faculty and students from the Graduate School of Architecture, Planning and Preservation (GSAPP) at Columbia University, to discuss Baltimore's potential as a healthy, well-designed city. BES incorporates a watershed framework in order to understand how to structure cities to function as healthy ecosystems. Students and faculty are using urban design as a tool to reorganize space around urban geology, topography, water systems, vegetation, and historical building patterns.

The day long meeting consisted of presentations and break out sessions where attendees discussed their roles in developing further connections between BES research and urban design. Jackie Carrera, Executive Director of PPF, opened the meeting in the Brown Center at Maryland Institute College of Art, which she cited as an excellent example of contemporary architectural design and a fitting place to find common ground between ecosystem science and urban design. Ms. Carrera's introduction was followed by a presentation by Thor Nelson of the Baltimore City Department of Planning, and Walter Schamu's historic overview of the city's urban design heritage.

Steward Pickett, BES director and scientist from the Institute of Ecosystem Studies, introduced the second part of the meeting by outlining the importance of urban design in achieving the main goals of BES. There followed presentations by Brian McGrath, coordinator of BES's Urban Design Working Group and the Urban Design studio coordinator at GSAPP, and his teaching colleagues: Sandro Marpillero (urban designer and architect), Victoria Marshall (urban designer and landscape architect), and Petia Morozov (urban designer and architect). The Columbia faculty presented two years of student work under the headings of "water," "vegetation," and "people."

Graduate students of the Masters of Architecture and Urban Design Program at Columbia, Phanat Sonemagkhala, Justin Moore, and Morana Stipisic, assisted by visiting students from Aalborg University in Denmark, Dorte Jensen, Kirstine Iversen, and Christian Acherman, presented their designs for incorporating ecosystem frameworks into several West Baltimore neighborhoods. BES scientists Peter Groffman, Mary Cadenasso, Morgan Grove, and Erika Svendsen acted as moderators.

Sonemagkhala's and Marpillero's project, "Watershed of Fortune," created an urban nursery in the Franklin Square neighborhood alley gardens. These community nurseries incorporated water retention practices as part of a regional effort to reduce nitrogen input to Chesapeake Bay, but also created a new economy for residents who could sell nursery products to suburban gardeners. Morozov and Stipsic presented a project called "More Baltimore," in which new strategies for tree planting, water collection and mobile programs can be implemented within various school districts of Baltimore. Another project, "Point Cloud," aroused great interest for its innovative translation of ecosystem theories to an urban design model. Rather than working with bounded zones, such as neighborhoods or land use, this project involves a system of local points and five interlaced strategies: storm water, grey water, debris, vegetation, property ownership and value. The project aggregates the idiosyncratic, physical, environmental, economic, and social conditions of inner-block spaces to form multi-scale networks within the watershed.

As a result of the research meeting on urban design and the creation of the BES Urban Design Working Group—which invites and includes participation from area architects, landscape architects, planners and urban designers—there is a new kind and degree of involvement of science, education, and community engagement in Baltimore. This linkage of urban design with a sound scientific base promises benefits for both disciplines and the quality of urban life.

Story courtesy of BES

Comings & Goings

Kevin McGuire recently joined Hubbard Brook through a collaborative appointment that is jointly supported through the USDA Forest Service and the Center for the Environment at Plymouth State University (PSU). The Center for the Environment is a new research, outreach, and education program focused on regional environmental issues in New England. Kevin is an assistant professor of hydrology at PSU and is teaching several new courses in the new environmental science and policy Master of Science program where he will use the Hubbard Brook LTER as a field laboratory. He holds a Ph.D. in forest engineering (hydrology) from Oregon State University and completed his dissertation work at the H.J. Andrews LTER. His research interests focus on understanding how water moves through terrestrial ecosystems and into the stream environment. Kevin's approach combines field experiments using natural and artificial tracers, geochemistry, and hydrologic measurements with simple models at the hillslope and watershed scales. The overall goal of his work is to develop better conceptual models of watershed hydrological processes that can assist with management applications and in understanding environmental change and variability.

Jenna Guarino became Director of Education at the Hubbard Brook Research Foundation (HBRF) in September 2005. HBRF is a nonprofit organization that supports ecosystem research, long-term monitoring, and education at the Hubbard Brook Experimental Forest in Woodstock, NH. Jenna spent 13 years at the Vermont Institute of Natural Science, where she served as the Director of Education and Environmental Citizenship Program. For over 20 years, she has developed curricula, taught student field studies, trained teachers in ecological education and conducted watershed studies with teachers and students in Africa and the Middle East. Jenna received a Master of Science degree in Environmental Education from the University of Michigan (1989), where she co-founded the Global Rivers Environmental Education Network (GREEN).

Photo: Marshall White

Group Photo of participants at the the 2005 LTER Graduate Student Symposium at Andrews LTER

Graduate Students Hold First Ever Conference

The graduate student committee (GSC) has emerged as a strong voice for LTER graduate students and is being received with very receptive ears by the LTER community.

LTER graduate students had a very exciting and rewarding 2005. Perhaps the highest point of the year was the first LTER Graduate Student Collaborative Research Symposium, which was held at the H.J. Andrews LTER, Blue River, OR from April 13-17, 2005. The symposium was conceived, organized and managed by graduate students Robert Daoust (PIE), Tiffany Troxler Gann (FCE), Harmony Dalgleish (KNZ), Stephanie Oakes (PAL), Rachel Michaels (VCR), Evan Kane (BNZ), and Tamara Heartsill Scalley (LUQ), with the invaluable assistance of LTER Executive Committee member and CAP lead PI, Nancy Grimm. Whendee Silver (LUQ) and Scott Collins (SEV) attended the symposium as plenary speakers, but stayed on and helped in other roles during the symposium. For more details please visit our Symposium website at *http://student.lternet.edu/symposium/*.

A total of 66 graduate students comprising one to two representatives from 24 US LTER sites and 11 international students representing ILTER sites in China, Mongolia, South Africa, Austria, the Czech Republic, Brazil, Mexico, and Sweden, attended the symposium. Two post-doctoral and one undergraduate student also attended. Overall, 35 site presentations, 17 personal research presentations, 19 research posters, and 13 training sessions or student-led collaborative workshops were held during the meeting. Five teams formed during the workshops are currently working on data analysis of long-term data sets from all the LTER sites to be published in peer reviewed journals.

Other highlights

♦ Six students were selected to participate in the ongoing LTER Planning Grant activities, and each was appointed to one of the six working committees. The students include Nancy Harris (LUQ), Jennifer Shah (SEV), Katie Bertrand (KNZ), John Parker (CAP), Amy Burgin (KBS), and Chelsea Crenshaw (SEV). They each have attended meetings and participated in the planning process, and will continue to participate in their committees and attend future planning meetings.

♦ In late July, the student committee welcomed newly elected co-chair, Amy Burgin (KBS), following the end of Tiffany Troxler Gann's tenure as the GSC co-chair.

♦ During the annual Ecological Society of America meeting in Montreal, Canada, in August, the GSC and the ESA student section held a "lunch chat" during which students mingled with faculty members, LTER researchers and other professional scientists attending ESA. The informal setting allowed for great interaction, and turn out among the students and professionals was excellent.

♦ Two graduate students have been invited to join the team that is organizing the 2006 All Scientist Meeting, which is scheduled for September 20–23 in Estes Park, CO.

This is only a short summary of LTER graduate student activities during the year. More students are doing incredible work, not only in research but also in education and outreach. Their involvement in large-scale, forward-looking projects illustrates the many opportunities for knowledge and growth within the LTER network. Best of all, there are continuing, excellent opportunities to become involved. Keep it up everyone!

Chelsea Crenshaw (SEV) & Amy Burgin (KBS), Co-Chairs, and Tiffany Troxler Gann (FCE), former Co-Chair, Graduate Students Committee

Diversity in the Schoolyard

LTER Changing the face of science (one smile at a time)

In its unique position as a liaison between scientists, teachers and students, the Schoolyard LTER program is reaching many traditionally underserved schools. Now in its fifth year, SLTER scientists and their associates are realizing their potential to reach well beyond laboratories and research sites to involve their local communities in the science happening in their own backyards. For some sites, local demography provides the ideal opportunity to interact with Hispanic, African-American, Native, and Asian American children.

Stephanie Bestelmeyer, director of the Jornada Basin LTER schoolyard program in southern New Mexico, works with eight schools that have an average of 85 percent Hispanic students. "[Our] teachers report that it increases their own comfort level with science and increases the likelihood that they will teach science using inquiry practices in the future," Stephanie says. Preliminary test results show that program participants excel in science. "We are still getting data from all of the schools," she says, "However, we are really proud of these early results."

At the Baltimore Ecosystem Study LTER site, 'SuperKidsGrow' is a unique after-school program targeted to minority youth in low-income communities in the city, says Janie Gordon of the "Parks and People Foundation," a key member of the BES Schoolyard team. The program integrates urban ecology with homework, character development, and improved literacy skills, Janie says.

At the Central Arizona-Phoenix LTER site, "Many of us do make choices to work with schools whose student populations are dominated by underrepresented groups," says Monica Elser, director of the Schoolyard program at CAP. "Students are demonstrating skills with the scientific method, explaining local scientific processes, learning about biodiversity and research technology, as well as presenting and defending their results," Elser says.

Elena Sparrow of the Bonanza Creek LTER site in Alaska partners with the GLOBE program (*http://www.globe.gov/*) in schools where the student population is mostly if not all Alaska Natives, she says. Susan Daly at Florida Coastal Everglades LTER says her Schoolyard constituency is greater than 80 percent underserved minorities.

Other sites must reach further to bring the experience home for minority children. But special funding helps. NSF's Education and the Environment Venture (EdEn) fund "very much emphasizes targeting underserved groups," says Pam Snow, Harvard Forest LTER. With EdEn funding, Snow reaches schools with higher numbers of underrepresented groups. "This year we have a teacher participating in our professional development program who works with Spanish speaking students, primarily."

Photo: Pam Snow

Students check for an invasive insect threatening hemlock populations in MA, in a study related to the work of Harvard Forest's David Orwig.

For the Santa Barbara Coastal and Moorea Coral Reef LTER sites, Ali Whitmer works with 60 middle and high school students from inner city Los Angeles, a program made possible by a combination of funds from SBC Schoolyard LTER, the University of California, Santa Barbara (UCSB) Natural Reserves, and UCSB campus outreach initiatives.

Photo: Janie Gordon

Baltimore Ecosystem Study's Quin Holifield studies soil with school children.

While abundant, many of these success stories are precarious, and participants agree that the work they do requires dedicated funding. Liz Duff of Plum Island Ecosystem LTER was depending on the EdEn Venture funding to target several urban school districts with high levels of minority students. "I am not sure what I will do now that we no longer have the EdEn funding," Duff says. "We have pieced together some smaller grants that will allow us to provide support for the fall only. But I have lost my support staff and I have no funding for working with [inner city schools] in East Boston."

It is often necessary for Schoolyard programs to cobble together funding. The Shortgrass Steppe (SGS) LTER combines their efforts with the University of Northern Colorado to host many diverse education efforts, reports John Moore, a key liaison between the Schoolyard program and SGS science. John finds support through the U.S. Department of Education and through several NSF programs such as Research Assistance for Minority High School Students, Research Experience for Teachers, and GK-12. The SGS-LTER's Native American Environmental Education and Outreach program is funded via EdEn.

See "Schoolyard," p.15

Ecosystem Response to Episodic Floods in a Polar Desert

Lakes in the McMurdo Dry Valleys (MCM) of Antarctica are among the most pristine ecosystems on our planet in which to study biogeochemical transformations. The first scientific observations on these lakes came from Captain Robert Falcon Scott's Discovery Expedition in 1903. These early records made it possible to recreate historic lake levels and examine how much water levels have risen in the lakes over the past century (Chinn, 1993). The lakes in the MCM are extremely dynamic systems that respond rapidly to what would be considered subtle climate variations in more temperate environments (Lyons et al., 2001). Owing to the large amount of ice poised near the melting point during the austral summer, small climatic changes can lead to major changes in liquid water production, producing a cascade of ecosystem responses (Doran et al., 2002).

During the austral summer of 2001-2002, the Taylor Valley experienced a significant warming event which triggered what we refer to further as "the flood." During the 2002-2003 season, we investigated lakes in the MCM to determine the impact of the warming event and subsequent high melt input into the lakes. Regional warming during the flood caused increased glacial run-off, record stream discharge, an increase in lake levels, and thinning of the permanent ice covers. Lake volumes in all dry valley lakes increased following the flood, reversing a declining trend reported from 1993 to 2000 (Doran et al., 2002). This decline in lake volumes was rapidly corrected with a single flood. According to historical measurements these periods of oscillating lake levels are not uncommon in the ecosystem. These changes in the physical environment drove subsequent changes in the biogeochemistry of MCM lakes. Our data show that primary production in West Lake Bonney during the flood was reduced by 23 percent due to of stream induced water column turbidity. Increased nutrient levels within the lakes occurred in the year following the temperature-induced high flow year. For example, soluble reactive phosphorus on Lake Fryxell was four times the long-term average loading rates. These high nutrient levels corresponded with increased primary production in the upper water columns of Lakes Bonney and Fryxell. Depth integrated *chlorophyll-a* values increased 149 percent in East Lake Bonney, 48 percent in West Lake Bonney, and showed little change in Lake Fryxell. Chlorophyll-a in Lake Hoare decreased 18 percent compared to long-term averages in our 10-year monitoring program, presumably due to decreased under-ice photosynthetically active radiation (or, commonly, PAR) caused by increased sediment loads on the ice cover.

Photo: Christine Foreman

An MCM scientist (foreground) is dwarfed by a waterfall coming off the Canada Glacier, McMurdo Dry Valleys, Antarctica during 2001-2002.

Disturbances are discrete events in time that disrupt ecosystems, change resource or substrate availability, and alter the physical environment. Organisms in the dry valleys are poised at the edge of their survival ranges and are highly susceptible to disturbances, particularly when water changes from solid to liquid. Liquid water affords a key habitat in the frozen deserts of the MCM, and acts as a medium to transport nutrients from glaciers, soils, and streambeds to the lakes. Clearly, the common currency linking individual components within the dry valley ecosystem is the availability of liquid water.

Overall, our data suggests that the warming event served to "recharge" the ecosystem with liquid water and associated nutrients and had a clear effect on lake biota. If periodic warming events have occurred in the MCM dry valleys in the past, then such "floods" may play an important role in the long-term maintenance of liquid water in these dry valley lakes. The high variability in lake responses shown in this study reaffirms the unique character of each lake in the McMurdo Dry Valleys, and drives home the need for continued long-term monitoring of these systems. Episodic climate events, such as infrequent floods, may have a long-term influence on the structure and functioning of these eco-

See "Floods," p.15

Floods (continued from p.14)

systems. In an environment where life is limited by the availability of liquid water, floods such as that of 2001-2002 appear to be significant and reoccurring events that govern life processes in this extreme polar desert ecosystem.

This report is based on the paper, Christine M. Foreman, Craig F. Wolf, and John C. Priscu. 2004. Impact of episodic warming events on the physical, chemical and biological relationships of lakes in the McMurdo Dry Valleys, Antarctica. *Aquatic Geochemistry*, 10: 239-268. You can read or download the pdf version of the full article online at the LTER Network News page, *www.lternet.edu*.

Photo: Christine Foreman

An extensive moat developed around the edge of Lake Fryxell during the "flood year" 2001-2002 in the McMurdo Dry Valleys, Antarctica.

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Christine M. Foreman, Craig F. Wolf, W. B. Lyons, and John C. Priscu, MCM/Montana State University, Center for Biofilm Engineering & Dept. of Land Resources and Environmental Sciences

Grad Students Get Teaching Publication With LTER Data

Graduate students at Cedar Creek and Konza are authors of several *TIEE (Teaching Issues and Experiments in Ecology)* "Data Sets". In the process, these students have learned a good deal about inquiry teaching and added a peer-reviewed Ecological Society of America (ESA) electronic publication to their vitas. *TIEE* (*tiee.ecoed.net*) is funded by the National Science Foundation (NSF) and designed to help busy ecology faculty improve their teaching.

TIEE's LTER data sets include Microsoft Excel files with data representative of the site that help undergraduate and graduate students learn ecological concepts, and about ecology as a science. In Joe Fargione and Dave Tilman's data set, *Effects of Plant Biodiversity on Ecosystem Productivity within a Savannah Grassland Community*, students work with seven years of data to examine effects of diversity on productivity. And in Jesse Nipper and John Blair's *Comparing the Influence of Precipitation, Fire, and Topography on Plant Productivity in the Tallgrass Prairie* students examine the interactive effects of fire frequency, topography and inter-annual variation in precipitation on the annual productivity of grasses and forbs. There are also data sets from the Arctic and North Temperate Lakes sites.

*Please email Charlene D'Avanzo (*cdavanzo@hampshire.edu*) with questions about writing an LTER data set for* TIEE. *Our evaluation shows that* TIEE *is widely used and very highly valued by ecology faculty.* TIEE *can also be used to meet criterion 2 in NSF proposals.*

Schoolyard (continued from p.13)

Like LTER science, education requires a durable commitment. "The critical issue is building a long-term relationship with the schools," says Bruce Hayden, one of the founders of the Schoolyard LTER program. "They need to know that the scientists will return year after year. If so, the teachers can think of their work as an investment that will continue to pay dividends." One of the key hubs of this partnership is the NSF, which "has to continue to value the idea—and the allocation of money—to keep it alive," Hayden says.

Ali, John, and Monica are representing education in the ongoing LTER planning process, which has identified enhancing diversity as a primary goal in its education and outreach programs. Issues of diversity also will be the focus of a meeting of the Education, Outreach and Training committee this October.

For more information, please see *http://www.lternet.edu/planning/*

Patty Bonito, Special Projects, LNO

Grid Computing: A Vision for LTER Cyberinfrastructure

Landscape acoustic sensing has been a passion of Dr. Stuart Gage for the past five years. As a Distinguished Professor at Michigan State University and a principal investigator at the Kellogg Biological Station LTER, Gage is managing a network of sensors that capture and record a large amount of acoustic data from the environment every 30 minutes. His dream now is to seamlessly integrate this network of sensors into a single virtual system that collects, stores, and analyzes the data automatically. Recently, Gage participated in the LTER Grid Pilot Study, a demonstration of grid technology that has created a web-based environment for the analysis of his acoustic data.

The Grid Pilot Study is part of the LTER Network Information System (NIS) strategic planning effort to investigate grid middleware and high-performance computer applications. Grid middleware is the software that enables interoperability between heterogeneous computer systems, including those systems that provide services for the analysis of acoustic data. Gage observes, "The issue of scaling has emerged as a significant issue, and grid technologies are an important approach to solving large scale data and analytical requirements."

The Pilot Study was supported by the National Center for Supercomputer Applications (NCSA), a partner in the National Science Foundation GRIDS Center, and the LTER Network Office (LNO). The study began in March 2005 and successfully demonstrated a functional application called the "Biophony Grid Portal" to the LTER Coordinating Committee's September 2005 meeting in Cape Charles, Virginia.

Researchers access the Biophony Grid Portal via a secure, one-time log-on process that verifies their user names and passwords with the LTER LDAP registry. Once logged on, a researcher can select an acoustic signature from a dataset of known sounds (e.g., chirping sparrow) and determine if the sound (and hence the species) is present in a selected time series of acoustics contained in a digital library. The application computes the probability of match between the signature and each unknown sound in the library, along with an option to generate a sonogram, sound profile, power spectrum, and frequency histogram of the acoustic samples in the selected time series.

From a cyberinfrastructure perspective, the Grid Pilot Study utilized standard middleware components of the Globus Toolkit and other grid software to achieve secure authentication and transactions, enabling remote job submission, file transfer, and data analysis. All transactions in the system were logged into a relational database for use in audit and data provenance reporting. The use of standard middleware components ensures interoperability between the LTER NIS and resources from other networks, such as the Science Environment for Ecological Knowledge's "EcoGrid" or the National Ecological Observatory Network (NEON).

The success of the Grid Pilot Study, exemplified by the Biophony Grid Portal application, fully demonstrated the efficacy of grid middleware in supporting LTER science, and identified middleware components that could meet the requirements of a production version of an LTER Grid. Such insight would have been difficult to grasp without a hands-on evaluation of the technology. The pilot study provided a vision for a grid computing infrastructure (Figure 1) as an important component of the LTER NIS.

Mark Servilla, LNO

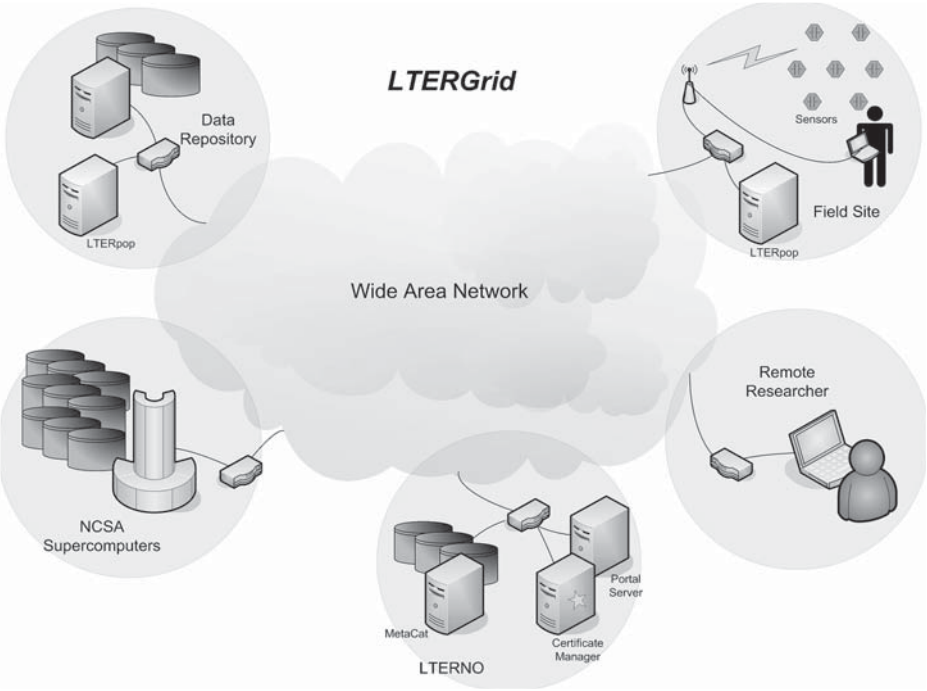


Figure1: Conceptual view of an LTER Grid.

For more information, read *DataBits*, the Information Managers' newsletter, online at *www.lternet.edu*.

A Coming of Age

Resource Discovery for Field Stations prepares for its final year

More than 70 information managers, directors, and field station representatives from over 40 different field stations representing the United States, Canada, the Bahamas, and French Polynesia have participated in an innovative and successful training opportunity provided through the Resource Discovery for Field Stations (RDIFS) grant provided by the National Science Foundation.

The goal of RDIFS is to facilitate storage, discovery, and access to the strategic environmental information resources that are collectively held at North American biological field stations. A variety of activities were designed to achieve this goal, including providing software engineering support for data registries and repositories, creating a thesaurus for field biology, a site characteristics database, a bibliography of field station publications, and a database of field station quality assurance/quality control and standard methods. The trainings and workshops have provided a primary mechanism for training and distribution of these resources.

Since RDIFS's inception in 2002, the grant has organized four, 2-week trainings. Held in the fall, the trainings provide hands-on computer experience with a variety of proprietary and open source software programs, including software created through the grant. Participants learn the skills and tools to resolve issues of data acquisition and archiving that can be taken back and applied at field stations. Ninety-seven percent of the participants in these trainings who completed the post training survey reported that the training met their expectations. Furthermore participants thought the instructors were knowledgeable and well-organized, the materials were useful, and the knowledge and skills they learned will be useful in their jobs. The last training in the series will be held at La Selva field station in Costa Rica in 2006, on a date to be determined.

In addition to the trainings in February 2005, RDIFS held a 2½-day workshop on data discovery and the creation of data registries and metadata catalogs at the LTER Network Office's Informatics Training and Software Usability Testing Laboratory at the University of New Mexico. The workshop brought together informatics leaders in the ecological community to review existing data registries and technologies, perform crosswalk of registry elements, evaluate capacity of a standardized data registry, assess the usability and identify needed functionality of existing data registries and search engines, examine how existing data registries can support National Ecological Observatory Network (NEON), and determine the next steps in bringing these goals to reality. Participants at the workshop proposed the establishment of a web-based Ecological Society of America (ESA) Data Registry that will provide a comprehensive catalog and archive of all data associated with ESA publications. After a presentation to the ESA Governing Board, the Data Registry will be unveiled in January 2006. This web-based registration of metadata allows a search facility to locate data easily and speedily, and supports community-standards Ecological Metadata Language (EML).

Photo: McOwiti O. Thomas

A training session in the Informatics Training and Software Usability Testing Laboratory.

Among other achievements, the RDIFS grant has enabled a variety of improvements to the Organization of Biological Field Stations (OBFS) website. The data registry and repository has an updated registry form, better search and performance capabilities, and is now EML 2.01 compliant. The registry currently holds over 4200 items, and the database of field station standard methods has over 1300 references, can be searched using a simple (keyword, title, author, abstract) or advanced search, and the results or subsets of results can be stored as a list and exported into Endnote or EML.

RDIFS also has created a virtual community to take advantage of new information technologies such as instant relay chat and list-serves. Through this means and the relationships fostered between participants and facilitators, workshop participants have access to software designers, information managers, and metadata coordinators who, together, provide an extensive network of support for participants after they return home to implement the skills learned.

Samantha Romanello, SEEK/LNO

LNO Remote Sensing Data Archive Now Available Through Metacat

The LTER Network Office (LNO) maintains a data archive on remote sensing that provides researchers within the LTER Network access to a variety of Earth observation imagery acquired from 1990 to 2000 and covering 25 LTER sites. To make the data more easily accessible, the LNO has started to standardize its metadata content and structure using the Ecological Metadata Language (EML). The following article describes the process and results of documenting the LNO remote sensing data archive in EML, and the registration of each EML instance in the LTER Metacat Data Catalog. The LNO remote sensing data archive consist of roughly 400 individual data packages that include Earth observation imagery from the AVHRR, AVIRIS, Landsat TM/ETM, MODIS, and SPOT sensing platforms, in addition to various images from the Global Fiducial Library. The type of sensing platform and date of collection vary from site to site. Each package comprises the set of digital files for a specific date and location of collection from the sensing platform that the vendor distributes, including metadata, raster imagery, and any ancillary material associated with the collection. The archive file system is organized in order beginning with each site's three-letter acronym, the sensing platform, and the collection date. An example of the hierarchical structure for Landsat TM data collected on May 3, 2000 for the Sevilleta LTER is SEV/TM/20000503. This particular package contains nine raster files, three metadata files, and one JPEG browse image.

Generating the EML for the Sevilleta data for the data archive was done in two steps: (1) an automated traversal of the file system to document all the remote sensing packages, and (2) a manual update of nine EML documents with detailed metadata describing Landsat TM datasets covering the Sevilleta LTER. The metadata content documented in these two steps represent, respectively, "discovery" and "access" level EML—which are two of six categories of an ascending classification system developed by the LTER Network that is used to rate the metadata completeness of EML documents. Discovery level EML provides sufficient information for researchers to search and examine the remote sensing archive by browsing directly to the archive from the EML document; access level EML, which contains much richer metadata, enables automated searching and processing of the remote sensing data.

The LNO's remote sensing data archive has been documented successfully using EML and entered into the LTER Metacat Data Catalog. It contains 351 remote sensing data packages described by "discovery" level EML and nine packages described by "access" level EML, for a total of 360 EML documents. New or revised packages are harvested and inserted into the Metacat database on a weekly basis. The 360 documents represent the first comprehensive remote sensing data archive to exist in the Metacat database that is accessible to researchers within the LTER Network through various web-based or desktop applications.

The EML documents were first harvested and stored in the LTER Metacat Data Catalog (*http://prairie.lternet.edu/query*) in January 2005. The documents' contents will be augmented with additional metadata as time permits, making the whole remote sensing archive "access" level compliant.

Mark Servilla, LNO

Luquillo (continued from p.6)

Photo: Aaron Shiels

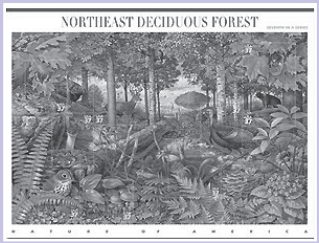
Luquillo LTER researchers redistribute debris that was trimmed from the canopy in Puerto Rico. The addition of organic matter to certain plots is to mimic the large quantity of detritus distributed onto the forest floor resulting from a hurricane.

The second experiment will simulate increased hurricane frequency by repeating the treatments every six years.

The trimming has produced a forest structure and plant responses that nicely resemble those seen after big hurricanes. Resilience is obvious: trimmed trees are resprouting limbs and leaves, understory plants are flowering, previously suppressed saplings are growing, and newly-germinated pioneer trees are colonizing the open sites. This experiment provides an unprecedented, detailed and broad look at hurricane impacts and ecosystem responses and, LUQ researchers hope, a view of future forests.

Aaron Shiels, LUQ

Harvard Forest Site Featured in U.S. Stamp



The U.S. Postal Service has issued the *Nature of America: Northeast Deciduous Forest* commemorative souvenir stamp sheet. The sheet's reverse side provides the common and scientific names of the 27 animals and plants pictured on the front.

The artist's rendition was modeled after Harvard Pond and was created with some input from Harvard Forest Staff.

Pamela Snow, Environmental Educator, HFR

ILTER Network Hires New Coordinator

The International LTER (ILTER) network this year appointed Holly Kaufman the Executive Coordinator of the network. Ms. Kaufman is founder and president of Environment & Enterprise Strategies (*http://www.environmentstrategies.com*), a consultancy that specializes in the design and management of projects that integrate business, human, and environmental needs, and brings over twenty years of international environmental experience to her new position

Kaufman has a B.S. in Conservation of Natural Resources from the University of California at Berkeley and a Masters in Public Administration from Harvard University's Kennedy School of Government, with a specialty in International Environmental and Economic Policy. She held a Presidential appointment in the U.S. Department of State in the Clinton administration, representing the United States at the United Nations Framework on Climate Change treaty negotiations. Kaufman developed and executed diplomatic strategy as a special advisor to the US Assistant Secretary of State for environment and the US Ambassador for sustainable development.

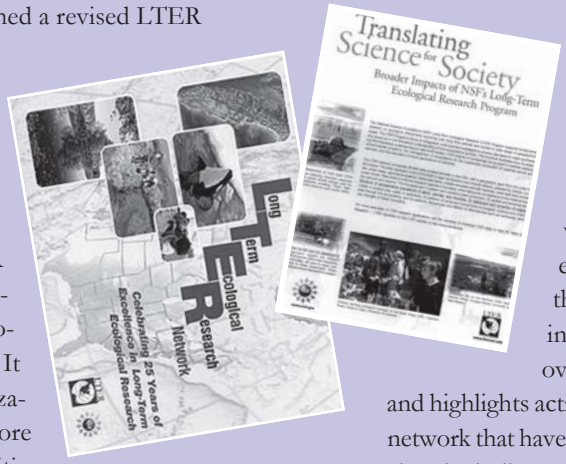
The Executive Coordinator position is a short-term consultancy that runs until Fall 2006, during which Holly and her team will be responsible for coordinating the development of strategic and fundraising plans for the organization. The plans will be developed based on discussions and interviews with the ILTER committee and regional representatives and scientists from ILTER networks. She will work closely with ILTER members from around the world to ensure that members participate fully in developing the plan, and that it reflects their needs and opinions. The draft plan will include a 10-year vision/mission statement, with 5-year goals and strategies for achieving those goals. Based on the strategic plan, Kaufman's next goal will be to develop an organizational plan that will include recommendations for the organizational structure, location, governance, staffing, and budget of the ILTER network.

Kaufman will also take responsibility for maintaining the ILTER website for the duration of the project, updating it as necessary, and using the ILTER listserve to communicate with members and solicit their feedback in the execution of this project. We very much look forward to wide participation in this important effort for the future of ILTER.

Story courtesy of ILTER

LNO, NSF Publish New Brochures

The LTER Network Office recently published a revised LTER network brochure entitled *Long Term Ecological Research Network: Celebrating 25 Years of Excellence in Long-Term Ecological Research,* which replaces the outdated version that served the network well for over three years. The new brochure was prompted by the need to capture the many new developments within the LTER Network in the last three years, including the addition of two new sites (California Current Ecosystem LTER and Moorea Coral Reef LTER). It provides an overview of the Network's organizational structure and features descriptions of core network components, including research activities and areas; a synopsis of site ecosystem types; information management; and education and training activities.



The National Science Foundation's LTER Program has also published a brochure entitled *Translating Science for Society: Broader Impacts of NSF's Long-Term Ecological Research Program*. The idea for the new brochure was seeded in the 4th NSF/LTER Mini-symposium in 2004, during which scientists and educators considered important issues in the application of LTER science to ecosystem management.

The NSF brochure was the brainchild of Henry Gholz, the LTER Program Director, who, together with his assistant, Michelle Kelleher, expanded on the symposium theme to consider a wider array of broader impacts arising from the LTER Network and connected them in a way that carries a cohesive message of why LTER science, and basic science in general, is important to the American public. It provides, in layman's terms, a contextual overview of the LTER program and highlights activities underway throughout the network that have relevance and importance to society, including applied research, education, international collaboration, and the human dimensions of LTER.

"We hope you will find these brochures to be useful tools for enhancing the public understanding of LTER science as a part of your outreach program," Gholz wrote, announcing the two publications.

You can read or download both brochures at *www.lternet.edu*.

For more information please contact McOwiti O. Thomas (tmcowiti@lternet.edu) at LNO or Henry Gholz (hgholz@nsf.gov) at NSF.

Calendar

Coming Events of Interest to the LTER Community

JANUARY 2006

January 8-12: Ecology in an Era of Globalization: Challenges and Opportunities for Environmental Scientists in the Americas organized by the Ecological Society of America (ESA) and co-hosted by the Universidad Autónoma de Yucatán and the Centro de Investigaciones Científicas de Yucatán, Merida, Mexico.

January 9-13: SEEK Early Career Faculty Training, LTER Network Office, University of New Mexico, Albuquerque, NM. For more information contact Samantha Romanello (*sroman@LTERnet.edu*).

January 18: Baltimore Ecosystem Study quarterly research meeting geared toward the local scientific community. Theme: Integrated Land-use. For more information contact Jonathan M. Walsh (*WalshJ@EcoStudies.org*).

January 19: CAP LTER's 8th Annual Poster Symposium, Old Main, Arizona State University, Tempe, AZ. For more information contact Kathleen Lohse (*klohse@asu.edu*).

FEBRUARY 2006

February 8: Andrews Forest Annual Symposium. Theme: "Evolution of long-term ecological research—examples from the Andrews Forest program." For more information contact Suzanne Remillard (*suzanne.remillard@oregonstate.edu*).

MARCH 2006

March 2-3: Sevilleta LTER Research Symposium, The University of New Mexico campus, Albuquerque, NM. For more information, please contact Mike Friggens (*friggens@sevilleta.unm.edu*)

March 24-26: Arctic LTER Annual Planning Meeting, Marine Biological Laboratory, Woods Hole, MA. For more information, contact Deborah Scanlon (*dscanlon@mbl.edu*).

APRIL 2006

April 11: Baltimore Ecosystem Study's quarterly research meeting. Theme: Environmental Health. For more information contact Jonathan M. Walsh (*WalshJ@EcoStudies.org*).

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