NETWORK NEWS
Newsletter of the Long-Term Ecological Research Network Fall/Winter 1994/1995, Issue 16

REORGANIZING LTER

The 1995 retirement of LTER Coordinating Committee Chair Jerry Franklin provides the impetus to revamp the Network's organizational structure

The networking aspect of the Long-Term Ecological Research Program continues to increase in size and complexity along with the individual site programs. The responsibilities of the LTER Coordinating Committee (LTER/CC) and the Network Office have far outgrown the approaches (many ad hoc) to Network organization and governance that we have been using. The Executive Committee (LTER/EC), for example, has played an increasing role in conducting the business of the LTER/CC because of the challenges of operating as a committee-of-the-whole.


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My retirement early next year as Chairman of the LTER/CC and Director of the Network Office after ten years in these roles has provided us with an impetus to begin systematically revamping our organizational structure. The LTER/EC began this process in earnest in January 1994 and provided recommendations to the full LTER/CC which adopted them, with modifications, in April. Below are the significant decisions made.

Electing a Coordinating Committee Chair

An important early question was "How do we select, elect, and rotate the positions of LTER/CC Chair and Network Office Director?" The position adopted was that the Chair should be a well-established senior scientist broadly recognized as a leader in ecological science. A three-year term of office was decided upon with the Executive Committee (plus one non-LTER scientist) functioning as a search committee with election by the full LTER/CC. (At press time, the LTER/EC had presented their unanimous recommendation, selected from a field of 15 nominees, for a vote at the October 19 LTER/CC meeting. The new Chair will take office in early 1995.)

Network Office Location & Funding

The location and permanence of the Network Office was another important question addressed. Should it move with the Chair? The LTER/CC agreed with the LTER/EC that the Network Office could not be moved frequently without significantly disrupting its effectiveness. The Office is, therefore, considered semi-permanent with periodic reviews of its current location and the potential for moves, perhaps at five- to ten-year intervals, to other academic institutions. The decision was also made to retain the Network Office at the University of Washington in Seattle for at least the next two years.

Another important change is the decision of the National Science Foundation (NSF) to shift the Network Office funding mechanism from a grant to a cooperative agreement, the instrument used to fund NSF's science technology centers, and it is expected to provide for more frequent and direct interactions between NSF and the Network Office. The terms of such an agreement are negotiated annually between the home institution and NSF. The LTER/CC has been provided with drafts of the proposed work plan and budget to provide oversight and direction prior to the final negotiations with NSF.

Executive Director & Committees

The workload at the Network Office now requires full-time on-site adminsitration, which the LTER/CC feels can best be met by an executive director with full scientific credentials. The likelihood that the Chair may often reside at some location other than the Network Office further accentuates the need for a resident director. The new Chair will direct the recruitment for this position in 1995.

The size of the full LTER/CC makes it extremely difficult to operate as a committee of the whole; smaller committees are necessary to deal with important issues such as publications policy, scientific synthesis, and technology. The standing committee structure has been expanded in these areas, and the LTER/EC has played an important role in developing proposals for the full LTER/CC and will continue to do so. In order to make it more representative, the LTER/EC has been enlarged to five elected site representatives plus the Chair with staggered three-year terms. The LTER/EC will continue to meet at least four times a year in contrast to the twice-yearly LTER/CC meetings. The new committees, as well as a graduate student committee formed last fall, will be supported for an annual meeting through the Network Office. All chairs will also be invited to attend regular LTER/CC meetings.

While the process may sound bureaucratic—and not very relevant to productive scientific research!—these decisions are, in fact, very important to the health of the overall program, which is absolutely critical to the long-term health of the site-based projects and the LTER Network as a whole. Participatory, efficient self-organization is, in turn, essential to achieving a robust network program. These decisions are a major step forward in systematizing LTER's governance structure. ◆

JUDY MEYER NAMED ESA PRESIDENT

Dr. Judy Meyer, principal investigator of the Coweeta Hydrologic Laboratory LTER site, has been named 1994-1995 president of the 7,000-member Ecological Society of America. At the University of Georgia since 1978, she has taught both undergraduate and graduate courses in limnology, aquatic ecology, stream ecology and introductory ecology. Her primary research interests are in nutrient dynamics, the transformation and fate of dissolved organic carbon, and the role of microbes in river and stream ecosystems. Recently, she has become increasingly concerned about aquatic ecosystem degradation and how riparian management practices affect aquatic systems.

GENE HELFMAN

As ESA president, Dr. Meyer plans to keep Society publications and activities at the forefront of emerging scientific and societal issues. Her agenda includes evaluation of electronic communication and publication, developing funding for an education and human resources program to promote ecological literacy and opportunities for women and minorities, providing accessible information for decisionmakers on ecological topics, and implementing programs initiated by her predecessors—the Sustainable Biosphere Initiative, the new ESA Business Office, and a streamlining of ESA's governance structure.◆

EPA AWARDS GRANTS FOR INDICATOR DEVELOPMENT AT LTER & LMER SITES

The U.S. Environmental Protection Agency (EPA) has awarded research grants to two teams affiliated with Long-Term Ecological Research (LTER) and Land-Margin Ecosystems Research (LMER) sites. The three-year studies were chosen for their potential to advance the state of the science in long-term, large-scale ecological monitoring and assessment. EPA's Environmental Monitoring and Assessment Program (EMAP) sponsored the nationally-competitive awards to strengthen the applicability of intensive site research for addressing ecological issues at broad regional scales.

One study will test an index of estuarine biotic integrity across biogeographic provinces. Principal investigators are Drs. Linda Deegan, The Ecosystems Center, Woods Hole Marine Biological Laboratory; John Buonaccorsi, Department of Math and Statistics, University of Massachusetts; and Roxanna Smolowitz, Department of Animal Health, University of Pennsylvania. The team will explore combinations of metrics involving submerged aquatic vegetation and fish community structure for their ability to reflect system condition and to differentiate among a range of anthropogenic and natural stressors at the watershed level. The study incorporates all of the existing LMER sites (Plum Island Sound, Waquoit Bay, Chesapeake Bay, Tomales Bay, Columbia River), the Virginia Coast LTER site, and the San Francisco Bay.

The second study will explore the ability of remotely-sensed data on phenological activity and heterogeneity to detect changes in grassland species composition in response to stress. The researchers, all from Kansas State University, are Drs. John Briggs, Clarence Turner, John Blair, Walter Dodds, Geoffrey Henebry, and Alan Knapp, Division of Biology, and Drs. Douglas Goodin and Duane Nellis, Department of Geography. The study will utilize the differences in the spectral signatures of C_3 and C_4 vegetation to quantify large-scale impacts of stress from land use and climate change. Field sites for imagery and ground-data analysis represent a diversity of grassland regions and include Konza Prairie LTER, Tallgrass Prairie Reserve (OK), Niobrara Valley Preserve (NE), and Cross Ranch (ND), all owned by the Nature Conservancy. Research for the two studies will begin in late 1994. Both studies build on existing projects, and incorporate historical data from field sites. EPA's EMAP is providing a total of $600,000 for the studies over a three-year period.

In 1995, EPA plans to expand its competitive grants program from $20 million to $100 million for investigator-initiated research. Concomitant with this Agency-wide objective, EMAP will significantly increase its support for research grants next year. Upcoming calls for proposals will be distributed widely and will include those for scientists associated with LTER, LMER, and other intensive, long-term monitoring sites. Research issues will likely focus on the development and evaluation of: (1) ecological indicators and indices; (2) testable hypotheses relating observed ecological response to natural and anthropogenic stresses; and (3) models and statistical methods to estimate ecological condition at watershed and regional scales. ◆

Upcoming calls for proposals will be distributed widely and will include those for scientists associated with LTER, LMER, and other intensive, long-term monitoring sites

NATIONAL BIOLOGICAL SURVEY

Making science information available to land managers, policymakers, researchers and the general public

As the biological and ecological research arm of the U.S. Department of the Interior, the National Biological Survey (NBS) is charged with providing better science information on and understanding of the status and trends of the nation's biota and making this information available to land managers, policymakers, researchers and the general public. This is a tremendous task that will require far more resources than NBS will ever have. Therefore, the Survey will be proactive in establishing mutually beneficial relationships with other federal and state agencies, universities, museums, industry and conservation groups. In this way, NBS can serve as a clearinghouse and a catalyst in the federal government and take a broad look at what needs to be done to conserve resources and help coordinate national efforts.

Joint Research Agreements

Since it became operational in November 1993, the NBS has signed a number of agreements to support joint research, including:

◆ *With federal and state government agencies, the timber industry, and several universities:* to study forested wetlands in southern states in a cooperative partnership to provide the basic information needed to establish wetland restoration goals and to measure the success of specific restoration attempts.

◆ *With the Southern Appalachian Man and the Biosphere Cooperative, a partnership of federal and state government agencies and others:* to prepare a regional inventory of databases and design a system for sharing data, and providing information to local communities.

◆ *With the State of California:* to collect, integrate, and provide the biological data needed for making local and regional resource management and conservation decisions.

◆ *With International Paper (IP) and Champion International, two of the nation's largest landowners:* to conduct research on the abundance and distribution of pitcher plants and their habitats on these corporations' properties in southern Alabama (IP) and in Tennessee (Champion) on the northern boundary of Great Smoky Mountains National Park.

Dr. Ronald Pulliam was appointed Director of the National Biological Survey in May 1994

The Survey is interested in collaborating with the National Science Foundation to further the mutual scientific interests of both agencies. In particular, NBS seeks to include NSF's Long-Term Ecological Research sites in a larger network for improved determination, understanding, and forecasting of the status and trends of America's biological resources. The LTER Network's long history of studying large-scale ecological processes holds great promise as a cornerstone of the data resource that will both underlie future research efforts and support comprehensive analysis of present conditions.

◆ *For more information on NBS developments: National Biological Survey, 1849 C Street NW, MS-3040, Washington, D.C. 20240, 202-482-3048*

BARBER NAMED SBI EXECUTIVE DIRECTOR

The Ecological Society of America (ESA) has selected Mary C. Barber as the new Executive Director of the Sustainable Biosphere Initiative (SBI) Project Office. Dr. Barber comes to the Office from Science and Policy Associates, Inc., where she worked on issues related to ecological risk management, global change, biological diversity, ocean pollution, freshwater quantity and quality, and environmental monitoring. The SBI Project Office was established by ESA in 1992 to address compelling environmental problems such as the sustainability of natural resources, loss of biological diversity, and global change.

Dr. Barber will continue SBI's most successful projects and develop new programs to address pressing issues such as managing ecological systems for sustainability and evaluating the consequences of human activities on ecological systems. She has 11 years of experience in the environmental research policy arena, and has worked with policy and decisionmakers in the government, industry and public interest sectors, holding positions with the National Oceanic and Atmospheric Administration, the Oceanic Society, and the National Science Foundation. She received her B.A. from Vassar College and her Ph.D. in Ecology and Evolutionary Biology from John Hopkins University. Her duties at SBI commenced July 1, 1994. ◆

CENTRAL PLAINS EXPERIMENTAL RANGE

Understanding the origin and sustainability of shortgrass steppe ecosystems

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Central Plains LTER results have led to the conclusion that shortgrass ecosystems are unique in their resistance to climatic variation and grazing

Pattern and process in shortgrass steppe ecosystems at the Central Plains Experimental Range (CPR), located in the eastern plains of northern Colorado, are shaped both by the past history of the site and by current events. In the past 10,000 years, soil and vegetation have developed in concert with a fluctuating climate resulting in changes in C_3 and C_4 species composition through time. Large herbivores and semiarid conditions have also been important over the same time period, resulting in an ecosystem that is both grazing- and drought-tolerant. In the past 100 years, the cultivation and subsequent abandonment of agricultural fields has had profound influences on current landscapes. In addition, interactions between plants and soil processes have been and continue to be important in generating and maintaining spatial and temporal system heterogeneity. The shortgrass ecosystems that we currently observe are a product of these past events, as well as current factors such as climate, disturbance, and landuse.

The focus of the shortgrass steppe LTER is to understand the factors affecting spatial and temporal variability in the structure and function of shortgrass steppe ecosystems in order to understand the origin and sustainability of these systems. It is only by knowing the role of both past and current events that we can make predictions about the future responses of the system to new events, such as global change.

Research Areas

Paleoenvironmental research: The evolutionary history of the shortgrass steppe is preserved in Holocene paleosols, soils which formed in ancient landscapes and retain an imprint of the climate and ecosystems which prevailed during their formation. Our research utilizes the stable C isotope composition of paleosol organic matter, carbonate and opal phytoliths to establish paleovegetation and make inferences to Holocene climate change.

In order to make regional inferences regarding paleoenvironmental conditions, we must determine: ◆ the regional extent of paleosols, ◆ the areal extent and provenance of major alluvial and eolian deposits, and ◆ the relationship of paleosols to their paleolandforms. An understanding of paleosol occurrence, in the context of the geologic episodes that resulted in their burial, is critical to interpreting the prevailing paleoclimate.

Influence of current environmental perturbations: climate and human landuse: We recently conducted a study to evaluate the influence of interannual variability in temperature and precipitation on aboveground net primary production using a CPR data set from 1938. Our analysis suggested that the response of primary production to increased or decreased precipitation and temperature is small relative to the inherent spatial variation in the system. We hypothesize that alteration of species composition as a result of human use will dramatically influence ecosystem responses to climatic variation.

Large herbivores have been an important component of shortgrass steppe ecosystems since the retreat of the Pleistocene glaciers. Currently, livestock grazing occurs over approximately 44 percent of the shortgrass steppe. Long-term grazing intensity treatments and exclosures were established at the site in 1939. We have conducted a wide range of studies on these treatments, including plant population dynamics, primary productivity, vegetation structure above- and belowground, other consumer populations, and nutrient dynamics, transport and volatile losses as influenced by cattle. Spatial scales of the investigations range from the individual plant to patch, catena and landscape. Research conducted by the USDA Agricultural Research Service and the LTER project has established that grazing has a very small effect on plant species composition and net primary production. In fact, invasions by exotic and native "weed" species are more likely to occur in ungrazed than in grazed treatments. Recently, we found that soil organic matter pools and nutrient availability are only slightly affected by grazing.

Our results have led us to the conclusion that shortgrass ecosystems are unique in their resistance to climatic variation and

grazing. These two potential disturbances fall within the evolutionary history of the ecosystem. What attributes determine resistance to certain disturbances? Our hypothesis is twofold. First, all of the organisms of the shortgrass steppe evolved under selection pressure and periodic drought. In the case of plants, this selected for species with morphological and physiological adaptations to drought and grazing. Second, shortgrass steppe systems maintain over 90% of their organic matter in soils, with a relatively slow turnover rate. Disturbances such as cattle grazing that target the aboveground plant component have a very small impact on these aspects of ecosystem structure and function.

Our LTER project has recently focused efforts on understanding the recovery of shortgrass steppe ecosystems following cropland abandonment. We also recently evaluated the recovery of vegetation and soils on old fields that had been abandoned for 53 years, on both the CPR and the Pawnee National Grasslands. We found that variability in recovery patterns of vegetation are not easily explained by simple environmental factors, such as climate. Historical factors, such as reseeding and grazing intensity, may provide a better explanation. Total soil organic matter appears to recover extremely slowly relative to the amounts lost due to cultivation (1% recovery relative to 30% losses). Nitrogen mineralization, however, and other indices of active soil organic matter, appear to recover within about 50 years, probably because the turnover time of those pools is small relative to the long recovery period.

DEBRA COFFIN

Plant-soil interactions: Shortgrass ecosystems are characterized by low-growing vegetation with a distinct plant-interspace pattern at a small scale. The resulting "islands of fertility" associated with individual plants are similar to patterns documented in desert systems. The small scale pattern of plants and interspaces provides the framework for much of our vegetation and soil process work. We recently examined the role of individual plants and abiotic factors in the development of soil heterogeneity in two intersite studies, one addressing the gradient from shortgrass steppe to tallgrass prairie and the other on the gradient from shortgrass steppe to desert grassland. The shortgrass to tallgrass gradient encompassed the CPR, a long-term research site at Hays, Kansas, and the Konza Prairie LTER site. We found that small-scale heterogeneity induced by plants was most important at the shortgrass steppe site; the identity of the plant had minimal influence on nutrient accumulation or cycling. Alternatively, in the mid- and tallgrass prairie sites, there was minimal heterogeneity induced by plant presence or absence, but there was a significant effect of plant species or lifeform on nutrients, suggesting that interactions between plant communities and ecosystem function are strongly influenced by climate. The shortgrass to desert grassland study used three LTER sites: Central Plains, Sevilleta and Jornada. We are still in the process of analyzing these results, but here we also found that the two dominant grasses at the three sites, ***Bouteloua gracilis*** and *B. eriopoda*, were associated with significant variation in soil properties.

DEBRA COFFIN

Above: Old field (on left) 53 years after abandonment.

Opportunities

Located in the middle of the moisture and productivity gradient along which the grassland LTER sites lie, the CPR provides unique opportunities to investigate ecosystems whose components have had long evolutionary histories of intense selection pressure by both herbivory and drought. Additionally, it represents the point along the grassland productivity gradient at which the spatial location of individual plants and their life histories have strong influences on the biogeochemistry of the system. Finally, the CPR is located in the portion of the grassland region in which landuse change is most dynamic and the conversion of land from rangeland to cropland, or *visa versa,* is heavily influenced by weather, economics, and government programs. This conversion of land from one use to another raises many interesting and challenging ecological questions with important policy implications. Our LTER research group invites interested collaborators to join us in answering these and other questions on shortgrass ecosystems. ◆

Recent Central Plains studies suggest that interactions between plant communities and ecosystem function are strongly influenced by climate

Left: Bouteloua gracilis *plants and interspaces.*

For more information: Deborah Coffin, Colorado State University, Range and Ecosystem Science Department, Fort Collins, CO 80523, 303-491-7662, dCoffin@LTERnet.edu

COWEETA HYDROLOGIC LABORATORY

Examining ecosystem response to disturbance in a landscape context

By Judy L. Meyer & Wayne T. Swank

Coweeta LTER researchers are examining three linked components of the landscape: upland forests, riparian zones, and streams

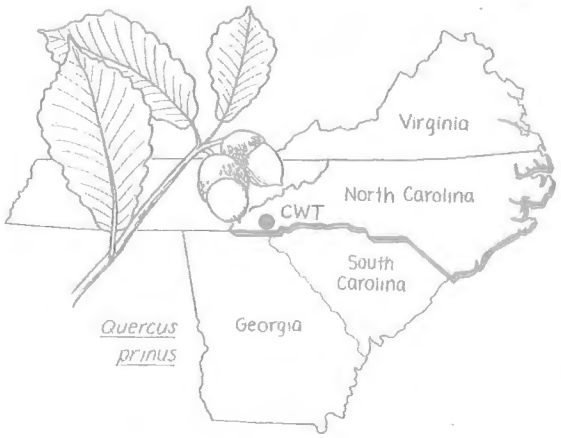
Coweeta Hydrologic Laboratory, located in the Southern Appalachians, has been administered by the USDA Forest Service since its establishment in 1934. The site contains stands of eastern deciduous forest of varying age at elevations from 680 to 1590 m, white pine plantations and 73 km of streams. LTER research at Coweeta Hydrologic Laboratory focuses on studies along complex environmental gradients to examine ecosystem response to disturbance in a landscape context. Coweeta LTER researchers, including scientists from University of Georgia, Virginia Tech, Duke University, and the U.S. Forest Service, are examining three linked components of the landscape: upland forests, riparian zones, and streams.

Forests

One of the hypotheses structuring our work on forest ecosystems at Coweeta is that community and ecosystem dynamics in representative forest community types change with position along an environmental (elevational) gradient. We have established five fully instrumented study plots (climate stations, seed and litter traps, throughfall collectors, soil lysimeters, dendrometers) along the altitudinal gradient: xeric oak-pine (782 m), cove hardwood (795 m), low-elevation mixed oak (865 m),high-elevation mixed oak (1,001 m), and northern hardwood (1,347 m).

Macro-scale climatic data indicate a strong gradient in precipitation and temperature among the plots, with high-elevation plots receiving more precipitation and experiencing lower air temperatures. Topography, soils, and vegetation mediate these macroclimatic factors to produce plot-level microclimatic gradients that differ from macro-climatic gradients. For example, soil moisture is greatest on the low-elevation cove hardwood site. Watershed-scale nutrient budgets and plot-level responses do not necessarily agree. For example, at the watershed scale, N budgets indicate very similar N fluxes on high- versus low-elevation watersheds. However, N-mineralization rates are much greater at the high- elevation northern hardwoods site; yet this elevated N is not being stored in the vegetation. It appears that at the watershed scale, these plot-level responses are being dampened. A system of extensive plots over the gradient provides a measure of spatial variability for select processes.

In addition to studies of production, decomposition and biogeochemistry, we are developing models of population dynamics for dominant tree species and quantifying biodiversity of the forest floor fauna, both invertebrates and small mammals. The population models focus on seedling recruitment predicted from a model of seed source strength and dispersal. Modelled seed rain has been used to partition the extent to which seed availability regulates recruitment along the gradient. Additional studies along the gradient include studies of below-ground and canopy communities. Analyses of the dynamics of roots and rhizosphere communities are being examined using root boxes, and canopy arthropod communities are being studied using canopy walkways, recently featured on a segment of a CNN news program.



Coweeta experienced a severe drought in the late 1980s. A major impact of this drought was the death of pines (*Pinus rigida*) and oaks (*Quercus coccinea*), which created gaps in the forest canopy. To understand the long-term response of the vegetation to this natural disturbance, we have initiated a set of experiments to test the hypothesis that elevation

and the presence of rhododendron influence succession in canopy gaps. Experimental gaps in the canopy were created by girdling trees in 1993 after collecting pre-treatment data on light, climate, soil moisture and N mineralization, tree growth, and seedling physiology. These gaps are at high and low elevations, with and without rhododendron in the understory.

Riparian Zone

Riparian zones form critical linkages between forest and stream ecosystems. We hypothesize that in the Southern Appalachians, the presence of rhododendron in the riparian zone alters hillslope export of carbon and nutrients to streams. We are in the second year of the pre-treatment phase of a vegetation manipulation experiment in which we will remove riparian rhododendron and examine the impact of removal on export of nutrients and organic matter using a model of hillslope hydrology and nutrient transport to interpret the data.

Streams

Our current LTER studies on streams are designed to determine the longitudinal patterns of stream populations and ecosystems that are controlled by changes in geomorphology. We are sampling at four representative sites along Ball Creek as defined by a principal components analysis of geomorphic survey data. The four sites differ in hydrologic parameters, amount of woody debris, and standing stock of benthic organic matter. Gross primary productivity and fish production vary several-fold over the gradient, but there is less variation in litter input, invertebrate production, leaf decay rate, and benthic respiration. The physical template is more variable than the ecological response. One of the unique aspects of this study is that we have measured both invertebrate and fish biomass and production. At one site, fish biomass exceeds invertebrate biomass. How can the biomass of a predator exceed that of its prey? Because prey production exceeds predator production by at least an order of magnitude. Hence, when trying to understand trophic relationships, it is essential to compare production rather than biomass.

JUDY MEYER

Additional Research

In addition to the LTER research described above, there are over 25 other projects at Coweeta funded by NSF, Forest Service, EPA, and other agencies and institutions doing research that complement the LTER studies. These projects include an ecosystem management demonstration project on a nearby watershed, an analysis of the response of Southern Appalachian forests to burning as a technique of site preparation, and a study of the community and ecosystem responses of streams to elimination of leaf litter inputs. ◆

For more information: Judy Meyer, Institute of Ecology, University of Georgia, Athens GA 30602-2602 or Wayne Swank, Coweeta Hydrologic Laboratory, 999 Coweeta Lab Road, Otto NC 28763

JUDY MEYER

The presence of rhododendron in the Southern Appalachian riparian zone may alter hillslope export of carbon and nutrients to streams

***Above:** Coweeta Creek, the largest stream on the site, is well-shaded by the riparian forest. **Left:** The former office building has recently been renovated into a dormitory for LTER and visiting investigators.*

FRESHWATER IMPERATIVE RESEARCH

Excerpted from the Executive Summary of *The Freshwater Imperative: A Research Agenda*
edited by Robert Naiman, John J. Magnuson, Diane M. McKnight,
Jack A. Stanford & other members of the FWI Steering Committee

The Freshwater Imperative: A Research Agenda, *will be available in early 1995 from Island Press*

As demands for freshwater resources increase, resource managers and policymakers are faced with ensuring that the benefits from water use and the protection of water resources are optimized. The United States spends approximately $50 billion annually on the protection of aquatic systems; wise use of these funds requires a comprehensive and integrated understanding of those ecosystems (U.S. EPA 1991, National Research Council 1992). This requirement underlies the integrating theme of the Freshwater Imperative (FWI) research agenda: providing a predictive understanding of inland aquatic systems in a changing world.

The National Science Foundation (NSF), the Environmental Protection Agency (EPA), the National Aeronautics and Space Administration (NASA), the Tennessee Valley Authority (TVA), and the National Oceanographic and Atmospheric Administration (NOAA) sponsored a working group of leading aquatic scientists, which included present and former LTER-affiliated scientists, to identify research opportunities and frontiers in freshwater sciences for this decade and beyond. A book summarizing the two-year FWI effort of the FWI Committee will be published in 1995 by Island Press.

The FWI research agenda focuses on three water issues of fundamental importance to the United States—water availability, aquatic ecosystem integrity, and human health and safety—and incorporates scientific issues that relate directly to the needs of society, the predictive management of freshwater resources, and the ability to meet future needs as unforeseen freshwater issues emerge.

The Imperative supports the current movement in many agencies toward an ecosystem management approach and encourages the incorporation of an integrated watershed management perspective into existing programs. Implementation of the FWI research program is expected to cost approximately $200 million per year—less than 1 percent of what the United States spends annually on procurement regulation and remedial protection of its waters. Key elements of the proposed program to provide more effective water management are a science-management-policy partnership, increased resources for extramural research, and freshwater scientific advisory panels for agency directors.

The anticipated immediate benefits from the enhanced institutional support for freshwater science recommended by the FWI agenda include: strengthening the research, education, and technology needed to respond effectively to critical freshwater issues; ensuring that these issues are evaluated at scales commensurate with the problems identified; and developing multidisciplinary approaches to better address problems of increasing complexity. The anticipated benefits to the nation include: increased health and safety, more efficient use of the nation's resources, greater responsiveness of management to societal needs, a greater ability to respond to future threats, and increased environmental security. ◆

NEW LMER SITE ◆ GEORGIA RIVERS

The newest site in the Land-Margin Ecosystems Research (LMER) Program is the Georgia Rivers LMER headed by Richard Wiegert at the University of Georgia. The Georgia Rivers project (GARLMER) will conduct a comparative study of the transport and transformation of inorganic and organic materials from five major coastal rivers into the sea. Other investigators on the project are Bob Hodson, Bill Wiebe, Mary Ann Moran, Alice Chalmers and Merryl Alber, Jack Blanton and Clark Alexander.

The rivers studied by the GARLMER project—the Savannah, Ogeechee, Altamaha, Satilla and St. Mary's—differ in landscape characteristics, geological setting, flow rate, inorganic and organic loading and pH, but have similar temperature, rainfall and tidal regimes because their mouths are located within a 120-mile stretch of the Georgia coast. These five rivers offer the opportunity of comparing the impact of the land, via rivers, on the nearshore ocean and the impact of the sea, via tidal flooding, on the riparian and coastal wetlands.

Major Questions

Two major questions the project will address are:

◆ *What terrestrial materials are transported into or through the Land-Sea Margin (or LSM, the estuarine continuum from freshwater tidal zone to nearshore marine) and to what extent are they intercepted or modified within this zone?*

Some materials are kept within the LSM, but it is unknown whether terrestrially derived organic matter and both dissolved and particulate inorganic matter are sedimented out at the salinity-freshwater interface or diluted and carried to the nearshore.

◆ *Do the intertidal vegetated zones of the LSM significantly filter and trap or modify terrestrially-driven materials? Do their characteristics and functions differ with the river?*

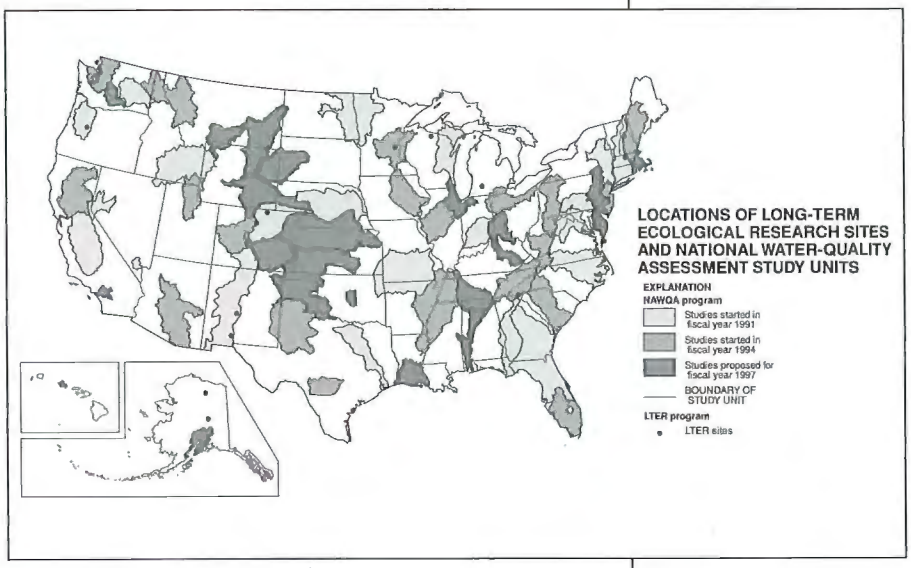
There are presently a total of five LMER sites: the Georgia site and Chesapeake Bay in the Virginian biogeographic province, Columbia River and Tomales Bay in the Oregonian province, and Plum Island Sound in the Acadian province. ◆

USGS NATIONAL WATER QUALITY ASSESSMENT (NAWQA) PROGRAM

The National Water Quality Assessment (NAWQA) Program was begun by the U. S. Geological Survey in 1991 as a systematic assessment of the quality of the Nation's water resources. The program will describe the status and trends in the quality of a large, representative part of the Nation's surface and ground water resources, and define the primary natural and human factors affecting the quality of these resources. In meeting these goals, NAWQA will produce information that will be useful to policymakers, scientists, and the general public at the national, state and local levels.

The building blocks of the NAWQA program are 60 study-unit investigations that include parts of most of the Nation's major river basins and aquifers. These study units include 60 to 70 percent of the Nation's water use and population served by public water supplies. Sampling occurs on a rotational basis, with 20 study units intensively sampling over three years, while others are writing results or in a planning period. The first 20 began sampling in 1993; the second and third groups will begin sampling after three-year intervals. Subsequent cycles of intensive sampling will begin in a study unit six years after sampling ceased in the previous study cycle.

NAWQA presents a nationally consistent framework that has potential for stimulating and facilitating comparative research across locations. For example, results from a single LTER study might be placed in a larger context by drawing on information from the NAWQA study unit near to or enveloping that LTER site. Comparisons across LTER sites might be guided by existing comparisons across NAWQA study units spanning the same regions. Hypotheses developed from the integrated physical, chemical, and biological assessments of NAWQA streams or aquifers may lead to hypotheses or process studies that would be testable in one or more LTER sites, or LTER results scaled up to NAWQA. Collaborative field work, and exchanges of data and "good ideas" are all possibilities.



Collaboration among scientists in both programs can occur at several levels. Liaison (advisory) committees for the second group of NAWQA studies are now being formed. LTER scientists are welcome to participate. Co-location of sampling sites, which has occurred in a few instances already, offers mutual benefits—NAWQA establishes reference (background) sampling sites that are similar to conditions at many LTER locations. Other key areas where collaboration is desirable include methods for regionalization of results, quality assurance, and archiving taxonomic specimens. ◆

For more information: Dennis Helsel, 703-648-5713, dhelsel@usgs.gov *(NAWQA program), or Marty Gurtz at 919-571-4018,* megurtz@usgs.gov *(biological aspects)*

ECOSYSTEM MANAGEMENT ANALYSIS "ECOMAP" AVAILABLE

A new map entitled "Ecoregions and Subregions of the United States," edited by Robert G. Bailey and others (1994), is available from the Ecosystem Management Analysis Center at Fort Collins, CO. The full-color, 25" x 36" map is on a scale of 1:7,500,000 and has an Albers Equal Area projection. It is accompanied by a table of map unit descriptions.

A digital version is also available. The data is in ARC-INFO coverage file format and is divided into several directories: lower 48, Hawaii, and Alaska. The user can manipulate the data into regional and forest maps for further analysis.

The UNIX version is in TAR compression format and is being distributed on 8mm tape. The PC version is in ZIP compression format and can be RISed from the Forest Service Data General system by using mail address WO4A:-STAFF:LMP:BAILEY:ECOMAP. The file name is ECOMAPPC.EXE and is a self-extracting ZIP file. When uncompressing, use the -d switch in order to retrieve the directories.

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To receive information or to obtain the map in hard copy or digital form, contact Sarah Hall at 303-498-1768. Forest Service users may contact her at S.Hall:W04A.

LTER scientists visited the range of ecosystem types that exist within the country, from dry, sandy grasslands to wet, loess grasslands to temperate forests and lakes

LTER SCIENTISTS VISIT HUNGARIAN NATURE RESERVES

Identifying a research basis and sites, scientists and databases for collaboration

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As part of a National Science Foundation (NSF) International Program grant funded to Diana Freckman (McMurdo LTER) and Debra Coffin (Central Plains LTER) at Colorado State University, ten LTER scientists visited the Hungarian Nature Reserves May 22 to 29, 1994. The visit and grant are part of an exchange begun with a 1993 visit to Hungary by NSF Division of Environmental Biology Director James Gosz and Sevilleta data management specialist James Brunt (see *Network News* Issue #15, 1994).

Objectives

The objective of the grant is to promote the exchange of knowledge on biodiversity research between Hungarian scientists, who are world leaders in conducting biological surveys, and U.S. scientists, who are among the world leaders in ecosystems research. Three meetings are planned in 1994-95 as part of the collaboration. Dr. Edit Kovács-Láng, Hungarian Academy of Sciences Institute of Ecology and Botany, is organizing participating Hungarian scientists from the Balatón Limnological Institute, Eotvos Lorand University, the Institute of Soil Science and Agricultural Chemistry, the Hungarian Natural History Museum, and the Plant Protection Institute.

The purposes of the nine-day trip to Hungary in May were to identify: ◆ a research basis for collaboration, ◆ potential sites and scientists for collaborative partnerships, and ◆ long-term biological survey databases that would be useful for comparison with U.S. LTER databases. LTER participants included Linda Blum and Bruce Hayden (Virginia Coast LTER), Jack Lattin and Tim Schowalter (H.J. Andrews LTER), John Magnuson (North Temperate Lakes LTER), Bob Parmenter and Terry Yates (Sevilleta LTER), Bob Waide (Luquillo LTER) and Freckman and Coffin. Over 20 Hungarian scientists participated.

Datasets, Climatic Types & Ecosystems

LTER participants were impressed with the quality and quantity of data on biodiversity collected in the past and currently being collected by Hungarian scientists. Some climate and terrestrial and aquatic taxonomic datasets date from the late 1800s. Hungary has three climatic types (humid atlantic, dry continental, and mild submediterranean) that, along with the topography, contribute to produce an ecologically interesting aridity gradient for soils and vegetation over relatively short distances. The LTER scientists visited the range of ecosystem types that exist within the country, from dry, sandy grasslands to wet loess grasslands to temperate forests and lakes.

One site the group visited was Kiskunsagi National Park, the 30,000-hectare site of an all-taxa survey, which is a good example of a mosaic of ecosystems, each influenced by land management practices: marsh, meadow, steppe, forest, agricultural field and saline lake. Organisms within the Park have been identified and results published in two volumes each on the flora and fauna. The fauna includes vertebrates (and their parasites) and soil invertebrates, such as tardigrades and nematodes.

DEBRA COFFIN

Right: Dr. Katlin Torok describing grassland in the Pilis Biosphere Reserve to LTER participants.

Potential Areas for Collaboration

Since Eastern Europe has comparable ecosystems to North America, a comparison of various community-structure datasets (biodiversity, trophic analyses, etc.) would be productive for both U.S. and Hungarian scientists. Datasets of different taxonomic resolution could be examined in terms of landscape-level changes, stability of foodweb structures in disturbed ecosystems, socioeconomic issues, and effects of land-use management and climate. The collaboration promises to provide critical information on biodiversity that will enhance and strengthen both research programs, expand on the use of both collections of datasets, and add to our collective knowledge of the relationships among species and ecosystems.

There are a number of potential long-term ecological research sites in Hungary, including national parks and biosphere reserves with lakes, streams and rivers which have a history of long-term biodiversity data collection. Areas of common interest with LTER sites include effects of land management and human use, grazing, fire, biomonitoring (short-term) versus trend monitoring (which species is selected for trend analysis), climate change and policy issues, and securing stable funding.

DEBRA COFFIN

DEBRA COFFIN

Recommendations

The LTER participants returned from Hungary enthusiastic about the possibilities for collaboration. Noting the strengths of the long-term datasets and the Hungarians' desired focus on training in systematics and taxonomy, they recommended initiating the following activities as an aid to ongoing collaboration:

DEBRA COFFIN

- Invite Hungarian scientists to attend workshops in the United States where topics include the long-term species database management, and the use of GIS and simulation modeling to analyze long-term data, in order to enhance understanding of the relationships between species diversity and ecosystem function.

- Establish a program for exchanges of graduate students and scientists between Hungary and the United States.

- Establish an electronic link between U.S. LTER and Hungarian scientists for the exchange of information on research programs, bibliographies and datasets, utilizing the LTER electronic information system. Bruce Hayden, Virginia Coast Reserve LTER site, is leading this effort with the assistance of LTER Network Office staff.

Further Activities

Following the U.S. LTER trip to Hungary, 16 Hungarian scientists representing a wide range of specialties visited five LTER sites (Kellogg, Sevilleta, Central Plains, Niwot, Andrews) in September 8-18, 1994 to discuss management, analysis and synthesis of long-term data.

The final meeting under the grant will be a workshop in February 1995 in Hungary to initiate and establish research collaborations in the areas of biodiversity and climate change. ◆

Diana W. Freckman, Natural Resource Ecology Laboratory and College of Natural Resources, Colorado State University, Fort Collins, CO 80523, 303-491-1982, 303-491-1965 (Fax), dfreckman@LTERnet.edu

A comparison of various community-structure datasets would be productive for both U.S. and Hungarian scientists

***Above:** Loess steppe vegetation in eastern Hungary near Mezokovesd (east of Budapest) with cultivated fields in background. **Above Left:** Jack Lattin collecting insects with Hungarian colleague. **Lower left:** Diana Freckman and Dr. Janos Tardy, Deputy Secretary of State, President of the Hungarian National Authority for Nature Conservation.*

INTERNATIONAL LTER STEERING COMMITTEE MEETS IN UNITED KINGDOM

International Networking in Long-Term Ecological Research, *the report of the initial ILTER meeting, September 1993, is now available from the Network Office*

The second meeting of the Steering Committee for the International Long-Term Ecological Research (ILTER) network was held at Rothamsted Station in the United Kingdom on August 27 and 28, 1994. Attending were 18 individuals from seven countries, including all but one of the Steering Committee members elected at the initial meeting following last year's LTER All Scientists meeting at Estes Park, CO. The August U.K. meeting was associated with the International Congress of Ecology (INTECOL) in Manchester which included a demonstration of communication technology by the LTER Connectivity Team (Rudolf Nottrott, John Porter, and James Brunt) and a paper session on long-term ecological research chaired by Network Manager John Vande Castle.

Mission & Action Program

The ILTER group focused primarily upon mission definition and development of an action program for improved communications among sites and scientists engaged in long-term ecological research throughout the world. A draft mission statement was prepared, to be refined over the next several months, which identifies the main objectives of ILTER:

- Promote and enhance understanding of long-term ecological phenomena across national and regional boundaries
- Promote comparative analysis and synthesis across sites
- Facilitate interaction among participating scientists across disciplines and sites
- Promote comparability of observations and experiments, integration of research and monitoring, and encourage data exchange
- Enhance training and education in comparative long-term ecological research and its relevant technology
- Contribute to the scientific basis for ecosystem management

Future Meetings & Participation

Primary participants in ILTER are expected to be scientists, sites, and networks of sites committed to the concept and practice of long-term ecological research. At the U.K. meeting, an action program was developed for improving communications among these participants, including development of a global directory. The U.S. LTER Network Office will lead much of this activity.

A schedule has been established for ILTER annual meetings, workshops or symposia, as well as meetings of the ILTER Steering Committee. Meetings are planned for Hungary (1995), Latin America (1996), China (1997), Canada (1998), Africa (1999) and the United States (2000). More information on these and other ILTER meetings and activities will be reported in future issues of the *LTER Network News.* ◆

SOIL BIODIVERSITY WORKSHOP

An invited workshop on soil biodiversity was held at The Natural History Museum in London, August 30-September 1, 1994. British and U.S. scientists (systematists, ecologists and information management specialists) examined approaches to the key questions in soil biodiversity and determined recommendations for integrated studies of soil biodiversity as related to function in ecosystems. Follow-on information will be reported in the *Network News.*

The workshop was funded to Diana W. Freckman (McMurdo), Natural Resource Ecology Laboratory, Colorado State University. Other U.S. participants included: Valerie Behan-Pelletier, Caroline Bledsoe (LTER), Tom Duncan, Ted Elliott, Sheridan Haack, Sam James, Dan Janzen, Leonard Krishtalka, Jack Lattin (Andrews), Parke Rublee, Tim Seastedt (Niwot), Carol Shearer, Kelley Thomas, Kristina Vogt (Luquillo), and NSF representatives James Edwards and James Gosz. U.K. representatives included: co-convenor and host, Steve Blackmore, Chris Arme, Paul Eggleton, David Hawksworth, Bill Heal, Steve McGrath, Richard Thomas, Jo Anderson, David Bignell, Tony O'Donnell, Alistair Fitter, Jim Harris, Jim Lynch, Janet Sprent, Michael Usher, Keith Vickerman, and Bernard Tinker. ◆

Diana W. Freckman, Natural Resource Ecology Laboratory & College of Natural Resources, Colorado State University, Fort Collins, CO 80523, 303-491-1982/6675, 303-491-1965 (Fax), dfreckman@lternet.edu

A COMPARATIVE ANALYSIS OF THE TEMPERATE GRASSLAND REGIONS IN NORTH AND SOUTH AMERICA

Unraveling basic ecological principles and solving urgent applied problems such as the evaluation of the effects of global change on ecosystems will require a diversity of approaches including monitoring, experiments, and simulation modeling. A comparative approach to these kinds of investigations may prove to be a very powerful tool. The LTER site network provides many opportunities to conduct comparative investigations both within the network and with other long-term research sites and networks.

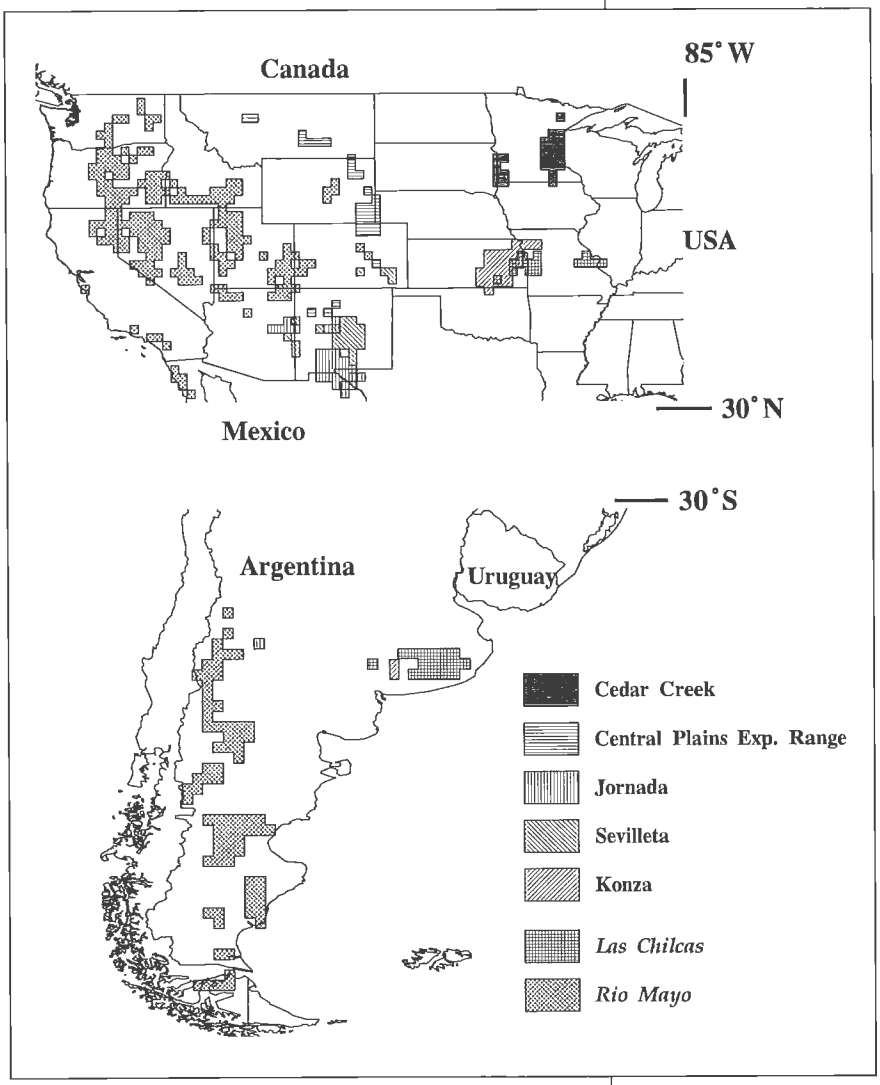
The temperate zones of North and South America contain substantial areas of grasslands and offer many opportunities for comparative research. Why is it important to have similar sites on different continents? Some of the value derives from having sites with similar floras and faunas that have been subject to different evolutionary histories over the past 10,000 years. Additionally, recent (in the past 100 years) and current land use, as well as the predicted rate of climate change, are different in the grassland regions of North and South America. Using a comparative approach, ecologists can begin to test the generality of our understanding of particular ecosystems.

Our overall objective is to quantify the degree of similarity of the two grassland regions. The specific objective for this short article is to determine the degree to which long-term sites in the grassland regions of both continents are climatically similar. Using a global climatic data base developed by Leemans and Cramer, multivariate statistics, and image analysis software, we investigated the following specific question: To which portions of the two continents is each long-term research site most similar? The variables used in the comparison were mean annual temperature, mean annual precipitation, and seasonality of annual precipitation. The resolution of the analysis was 0.5 ° for both latitude and longitude.

The grassland LTER sites are poorly represented in South America but are representative of relatively large areas in North America (see figure). Only Konza and Jornada have climatic analogs in South America. By contrast, two long-term sites in South America are well represented in terms of North American climates. Las Chilcas is a tallgrass site in the Pampas region and is similar to Konza and some of the wetter parts of the tallgrass prairie in Kansas and Missouri. Río Mayo is a shrubsteppe site in Patagonia and is very well represented in the Great Basin region of the United States. Although there is remarkable similarity within the grassland and shrubland regions of North and South America, there are also interesting climatic differences. These differences are related to differences in the shapes and sizes of the temperate zones of the two continents. ◆

W.K. Lauenroth, J.M. Paruelo, H.E. Epstein, I.C. Burke, M.R. Aguiar & O.E. Sala ◆ Central Plains Experimental Range LTER & University of Buenos Aires, Argentina

To what degree are long-term sites in the grassland regions of both continents similar?



Right: Climatic similarities of long-term ecological research sites in the temperate grasslands and shrublands of North and South America. Each pixel is 0.5° latitude x 0.5° longitude. Pixels of similar climatic conditions on each continent are displayed with the same pattern.

HARVARD FOREST POPULATION STUDIES

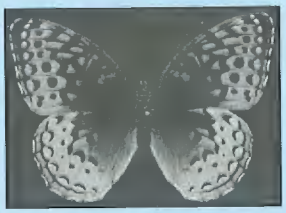
Considerable work in population ecology is being conducted at many of the sites that constitute the LTER Network

Under its LTER renewal grant, Harvard Forest (HFR) is broadening the scope of its forest ecology studies to include spatially explicit work in the population biology of animals and plants. Harvard Forest, due to its long history of research in forest ecology, has an extraordinary spatial and temporal database. This wealth of information permits a multi-scale approach to the study of populations in the context of the LTER Program, forest disturbance, and landscape ecology. For example, deforestation and agriculture in north central Massachusetts during the 18th and 19th centuries destroyed or disrupted populations of forest plant species, but subsequent reforestation has led to a period of population expansion for these species. Work completed under HFR's initial LTER grant showed that the current pattern of plant species distribution in the area resulted from differences in species' abilities to respond to changes in land-use activity.

Site-based studies are being initiated that will focus on selected understory plants and their associated butterfly herbivores to determine the impact of the physical disturbance of plowing on host plant distribution, and whether or not this impact cascades across trophic levels. Landscape and regional studies will determine whether butterfly and host plant distribution are decoupled because of processes acting at different scales. The distribution of a butterfly species at a site may depend on the presence of host plants. At a landscape scale, distribution will depend on its ability to colonize and persist in available habitats.

Additional studies, to be linked with existing long-term ecosystem-level studies such as the chronic nitrogen addition experiment, will focus on the potential effects of land use on nutrient levels. Increases in soil nitrogen may increase host plant quality, affecting herbivore growth rates and fecundity. Remotely-sensed canopy nitrogen estimates and ground-based surveys of insect damage to foliage will be used to predict the location of future insect outbreaks. These studies will link population- and ecosystem-level processes. ◆

Richard Lent / Harvard Forest & Taber Allison / NSF Division of Environmental Biology



MARCHETERRE FLUET

SURVEY *of* LTER POPULATION BIOLOGISTS

While considerable work in population ecology is being conducted at many of the sites that constitute the LTER Network, it has recently been criticized for its apparent lack of population studies (*Science* 262:334, October 15, 1993). At the September 1993 All Scientist's Meeting, Taber Allison and Richard Lent chaired a roundtable discussion of graduate students interested in population ecology. Out of those discussions came the suggestion that a survey of LTER population biologists and a subsequent report be completed to increase the level of awareness—both within and outside the Network—of the population ecology work being conducted at LTER sites.

Lent and Allison propose to conduct such a survey. The effort promises to improve communication among LTER researchers engaged in population studies, identify common interests and gaps, and create more opportunities for intersite comparisons and comparisons with other research programs. And the time is ripe, the two researchers argue, given the increased need for population-level studies expressed in the Ecological Society of America Sustainable Biosphere Initiative and last year's 10-year evaluation of the LTER Program, which called for increased LTER involvement in conservation biology, biodiversity issues, and applied ecology.

◆

Interested participants may send suggestions to Richard Lent, Harvard University, Harvard Forest, P.O. Box 68, Petersham, MA 01366 USA, 508-724-0228, *rlent@LTERnet.edu.*

MARCHETERRE FLUET

Far left: Great spangled fritillary butterfly, Speyeria cybele, *collected by Richard Lent. Left center: Waved sphinx moth,* Ceratomia undulosa, *collected by Richard Lent.*

"DREAM SUITE" SYNTHESIS TOOL KIT

Over the next three years, a team of root biologists and information managers will work together to develop and use software tools for synthesis of root biomass data from a number of LTER and non-LTER sites. The project, "Distributed Research Environment for Analysis, Modeling, and Simulation, Using Integrated Technologies for Ecologists" (DREAM SUITE), funded by NSF's Division of Environmental Biology, will be directed by Caroline Bledsoe (LTER Research Coordinator) and Jordan Hastings (Data Manager, McMurdo Dry Valleys LTER). Collaborators include root biologists (Bill Lauenroth, Central Plains; Alvin Smucker, Kellogg) and Network Office staff Rudolf Nottrott and Harvey Chinn.

DREAM SUITE focuses on synthesis of belowground productivity by plant roots at a number of sites in North America. Belowground productivity is a key part of net primary productivity, yet few synthetic hypotheses have been developed which might explain factors controlling root growth, death and carbon allocation to roots. Progress has been limited not only by difficulties measuring root biomass and activity, but also by a lack of appropriate, convenient computer systems for analysis and modeling. The project will develop the necessary systems and teach root biologists how to use them effectively, so that LTER can begin to answer key questions about belowground productivity in a wide range of ecosystems. A tenet of the project is that information technology for intersite/synthetic work has not been integrated appropriately for ecologists. Yet there are many excellent commercial and public computer programs which can be customized for specific disciplines. DREAM SUITE will explore how ecologists and information engineers can collaborate both to develop new computer systems and to conduct innovative research applying these tools to root systems.

Research will be carried out at a series of workshops preceded by computer software evaluation and development, collection of root datasets, and entry of root data into appropriate software (such as databases, spreadsheets, graphics and statistical analysis routines). These efforts will be further tested and refined at the workshops, which will address progressively more complex belowground environments—cultivated agroecosystems, short-stature ecosystems (grasslands, deserts, tundra, wetlands), and tall-stature ecosystems (forests), at which participants will receive training and support. The final step is to publish workshop results and databases. ◆

WORLD WIDE WEB SERVICES SAMPLER

The World Wide Web (WWW) is a method for making information available on the Internet, using an interactive, hypertext-hypermedia approach. *Hypertext* is a text document in which certain words or phrases are highlighted as "links." When selected, they allow the user to "jump" from one document to another. *Hypermedia* is a multi-media extension to hypertext: the highlighted link may also be an in-lined image. The other end of the link can be a picture, sound, movie, PostScript file or scientific data, as well as another hypertext document.

The number of information servers on the WWW, several of particular interest to ecologists, is growing rapidly. Below is a sampler of items currently on-line. All of these—and more—are available at the ICE House, the on-line information service of the Information Center for the Environment, operated by Harvey Chinn at the University of California-Davis. The Center is a cooperative effort of an interdepartmental team of environmental scientists at Davis and collaborators at over 30 private, state, federal and international environmental organizations. Harvey Chinn developed and maintains the on-line LTER Bibliographic Catalog and is working with Caroline Bledsoe (LTER Research Coordinator) Jordan Hastings (McMurdo LTER) and Rudolf Nottrott (Network Office) and others on technology ttacking and producing integrated software to support ecological science and synthesis.

Information Center for the Environment

(To access via Mosaic, use URL: http://ice.ucdavis.edu/)
The Information Center for the Environment (ICE) is supported by and presents on-line information for California Rivers Assessment, the Center for Ecological Health Research, the U.S. Environmental Protection Agency, Division of Wildlife and Vegetation (U.S. National Park Service, Inventory and Monitoring Directorate (National Biological Survey), LTER, and the Man and the Biosphere Program (UNESCO).

Biodiversity software for DOS PCs under development at UC Davis includes:

- U.S. NATIONAL PARK SERVICE (NPS)
  NPS Fauna and Observe
- MAN AND THE BIOSPHERE (MAB)
  On-line species lists for selected MAB Biosphere Reserves
  MAB Fauna
- CA STATE DEPT. OF PARKS & RECREATION
  CP Fauna and Observe
- JOHN MUIR EXHIBIT
  A collection of materials on the life and legacy of John Muir

◆ *Harvey Chinn*

From the ICE House Jump Station, which can also be reached by following the link "Other Items of Interest on the Internet," users can access over 25 servers under the biology category alone. Other categories include: "Environmental Politics," "Dictionaries, Glossaries, and Thesauri," and "Bibliographies"

GIS & REMOTE SENSING DATA COMPILED AT NETWORK OFFICE

New GIS and remote sensing data are regularly added to that already compiled at the Network Office GIS and Remote Sensing Laboratory

The following data have been compiled as of September 1994 at the LTER GIS and Remote Sensing Laboratory at the Network Office for LTER researchers and their collaborators. This is a partial list; new items are added regularly. (Landsat and SPOT scenes are listed by LTER site).

Landsat Thematic Mapper (TM) Scenes

H.J. Andrews	91/07/07, 92/08/10, 93/08/29, 93/09/30
Arctic Tundra	91/07/04
Bonanza Creek	91/06/22, 92/09/04
Cedar Creek	91/07/18, 93/08/24
Central Plains	91/07/12, 92/08/15, 93/07/01, 93/09/03, 93/10/05
Coweeta	91/07/03, 93/04/19, 93/06/06
Hubbard Brook	91/07/16, 93/08/22
Harvard Forest	91/07/16, 92/06/16, 93/07/05, 93/08/22
Jornada	91/07/28, 92/07/06, 93/03/27, 93/05/30, 93/09/03, 93/10/05
Kellogg	91/06/06, 93/08/14
Konza Prairie	91/08/26, 93/04/09, 93/07/30, 93/08/15, 93/09/16
Luquillo	91/09/03
North Inlet	91/05/02
N. Temp. Lakes	91/08/05, 92/10/03, 93/08/10
Niwot	89/07/05, 93/09/10, 93/09/26
Palmer Station	89/11/26, 90/12/15, 91/02/25
Sevilleta	91/09/30, 92/04/09, 92/07/06, 92/07/14, 92/08/15, 93/05/30, 93/09/03, 93/09/19, 93/10/05
Virginia Coast	92/01/15, 92/08/10, 93/06/10, 93/07/12, 93/07/28

SPOT Panchromatic Scenes

H.J. Andrews	91/07/04
Bonanza Creek	91/08/29
Cedar Creek	91/07/31
Central Plains	91/07/03, 91/08/14
Coweeta	91/07/13
Hubbard Brook	90/10/07
Harvard Forest	90/10/06
Kellogg	91/08/23
Konza Prairie	91/09/26
North Inlet	91/06/23
N. Temp. Lakes	91/08/01
Niwot Ridge	91/09/24
Sevilleta	91/06/07, 91/09/24
Virginia Coast	91/06/29

SPOT XS (Multispectral) Scenes

Arctic Tundra	89/07/28

AVHRR (Advanced Very High Resolution Radiometer) Imagery

Conterminous United States (tape copies of single-pass data, EROS Data Center): 91/05/02, 91/06/06, 91/07/02, 91/07/07, 91/07/16, 91/07/18, 91/07/28, 91/08/05, 91/08/26, 91/09/09, 91/09/30

Conterminous United States Biweekly Composites (CDROM): 1990, 1991, 1992, 1993

Conterminous United States Companion Data

Global Change Data Base, Volume 2—Experimental Calibrated Global Vegetation Index from NOAA AVHRR, 1985-1991 (NOAA/National Geophysical Data Center)

Northern Great Plains AVHRR Data Set

Other Data on CD-ROM

Alaska—Twice-Monthly Composites: 1990, 1991, 1992

Collected Data of the First ISLSCP Field Experiment (FIFE), Volumes 1 and 2

Digital Chart of the World ESRI (ARC/Info format)

Digital Line Graph (DLG) 1:2,000,000-scale data for the Conterminous United States (USGS)

Geophysics of North America (NOAA/National Geophysical Data Center)

GLOBAL GRASS 1 (U.S. Army Corps of Engineers)

Global Relief Data (NOAA-NGDC)

Solar Variability Affecting the Earth (NOAA-NGDC)

Street Atlas, USA (DeLorme Mapping)

U.S. Airborne and Satellite Snow Data: 1990, 1991, 1992, 1993, Alaska and Canada 1992-93

U.S. Snow Mapping Windows (National Operational Hydrologic Remote Sensing Center, NOAA) ◆

John Vande Castle, 206-543-6249, jvc@LTERnet.edu

GLOBAL TERRESTRIAL OBSERVING SYSTEM (GTOS)

Several international agencies are collaborating in the organization and implementation of three programs which focus on monitoring change in different interrelated portions of the Earth system—the Global Climate Observing System (GCOS), the Global Ocean Observing System (GOOS), and the Global Terrestrial Observing System (GTOS).

Under the sponsorship of four agencies of the United Nations (Food and Agriculture Organization, United Nations Environment Programme, United Nations Educational, Social and Cultural Organization, World Meteorological Organization) and the International Council of Scientific Unions (ICSU), in 1993 an Ad Hoc GTOS Scientific and Technical Planning Group, chaired by David Norse, Overseas Development Institute, London, and consisting of 22 international scientists, was requested to define and develop plans for implementing a GTOS which can provide essential documented information for identifying kinds and quantizing rates of change in all terrestrial ecosystems of the Earth system in both the near and distant future. The Planning Group was requested by the sponsors to complete its study by mid-1995 and submit its report on a definition of what GTOS should be and plans for GTOS implementation.

Working Group 1

The initial organizational meeting of the GTOS Working Group was held in Geneva, Switzerland, in December 1993. From that meeting three smaller Working Groups were formed. Working Group 1, chaired by Marion F. Baumgardner, Purdue University, is focusing on GTOS data management, access and harmonization. Group 1 held its initial meeting, hosted by the office of Harmonization of Environmental Measurements (HEM-UNEP), in Munich, Germany June 7-10, 1994. The major accomplishments of the meeting were:

- the formulation of a set of principles for the structure and operation of GTOS,
- the identification of essential near-term action items, and
- the development of a priority list of important research questions which should be addressed in support of GTOS.

The next meeting of this eight-member working group was scheduled for November 2-4 ,1994 at the University of Maryland.

Working Group 2

Working Group 2 has the responsibility to develop operational and organizational aspects of GTOS. Under the chairmanship of Jean-Claude Menaut, Laboratoire d'Ecologie, Paris, France, this group will had its initial meeting in Trondheim, Norway, September 12-14, 1994. (John Vande Castle attended for the Network Office.)

Working Group 3

Working Group 3 (WG3) will consider national needs related to GTOS and incentives for participation in and implementation of GTOS. Under the chairmanship of Hamid Narjisse, Institut Agronomique et Veterinaire Hassan II, Rabat, Morocco, this group had its initial meeting in Birmensdorf, Switzerland in September 1994.

It is the intent of the GTOS Planning Group and Working Groups to collaborate as closely as possible and to share data and information with all other international, regional and national efforts which have related interests and activities in identifying, monitoring and quantizing changes in terrestrial ecosystems. ◆

Marion F. Baumgardner, Vice-Chair
Ad Hoc GTOS Scientific & Technical Planning Group

The GTOS planning and working groups plan to collaborate as closely as possible and to share data and information with all other international, regional and national efforts to identify, monitor and quantize changes in terrestrial ecosystems

PILOT GLOBAL CHANGE DATA MANAGEMENT STUDY

The Interagency Working Group (IWG) on Data Management for Global Change, which is responsible for the coordination of data and information for the U.S. Global Change Research Program (USGCRP), has begun to determine the highest priority actions needed for improving existing datasets and creating new products from existing datasets to enhance the understanding of policy-relevant global change processes. The Group is conducting a pilot study to establish which is the most efficient method for determining these needs. Interested scientists are encouraged to participate. The study is planned for completion in early 1995, and a summary of the final report will be mailed to all respondents. ◆

For more information: Robert M. Cushman, Task Group Chair, Identification and Prioritization Pilot Study, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, 615-574-0390

NETWORK

El Niño and Long-Term Ecological Research Sites. Proceedings of the 1993 LTER All Scientists meeting workshop, with an introduction by editor David Greenland and reports from six LTER sites.

ARCTIC TUNDRA

The Ecosystems Center, 1993 Annual Report. Marine Biological Laboratory, Woods Hole, Mass.

H.J. ANDREWS

Geology of the Blue Mountains Region of Oregon, Idaho, and Washington: Stratigraphy, Physiography, and Mineral Resources of the Blue Mountain Region. U.S. Geological Survey Professional Paper 1439.

CEDAR CREEK

UPI, National Public Radio, the *Boston Globe* and the *Minneapolis Star Tribune*, and other media sources, covered the release of: Tilman, D., R. May, C. Lehman and M. Nowak. 1994. Biodiversity and the extinction debt. *Nature* (370):65-66.

HARVARD FOREST

Harvard Forest Long-Term Ecological Research Program. Abstracts from the 5th Annual Harvard Forest Ecology Symposium, 1994.

NORTH TEMPERATE LAKES

"Acid Dumped iuto Lake Aids Science Project" and "Lake Research Holds Water." *Wisconsin State Journal*, Page 1C, August 22, 1994.

SEVILLETA

"Oue Year Later; The Hantavirus Investigation Contiuues." July 25, 1994, *The Scientist.* Pp. 15 &17.

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OF INTEREST

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Biological Effects of Climate Change: An Introduction to the Field and Survey of Current Research. Center for International Climate and Energy Research, P.O. Box 1066, Blindern, N-0316, Oslo, Norway, +47 22 85 62 84 (Fax).

Environmental Information Management and Analysis: Ecosystem to Global Scales. Editors W.K. Michener, J.W. Brunt and S.G. Stafford include several LTER-affiliated contributors. Taylor & Frances, Ltd., London.

Global Change Biology. New international journal on environmental change and biological systems. Published bimonthly beginning in February 1995. Managing editor: Harry Smith, Department of Botany, University of Leicester, Leicester LE1 7RH, U.K., +44 (0)509 856822 (Ph./Fax), has@leicester.ac.uk.

New Publications of the U.S. Geological Survey. Monthly Catalog. Subscribe *in writing* to: U.S. Geological Survey, 582 National Center, Reston, VA 22092.

Scientific Assessment of Coastal Wetland Loss, Restoration and Management in Louisiana. Executive summary and special issue (No. 20) of the *Journal of Coastal Research,* available from the Coastal Education and Research Foundation, 810 E. 10th Street, Lawrence, KS, 66044.

Water-Quality Monitoring in the United States. Third-Year Report of the Intergovernmental Task Force on Monitoring Water Quality. U.S. Geological Survey Office of Water Data Coordination, 703-648-5023 or 703-648-6802 (Fax).

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1995 LTER Coordinating Committee Meetings: April 19-21, Virginia Coast Reserve; October 20-22, LTER Network Office, Seattle, Washington

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CALENDAR

NOVEMBER

14 **NSF Program Deadline.** Education & Human Resources: Instrumentation & Laboratory Improvement (306-1667).

AERC Symposium: "Ecosystem Management, Ecological Risk, & Public Policy" (James Kitchell, 608-262-9512)

15 **NSF Program Deadline.** Social, Behavioral & Economic Sciences: U.S.-Israel Binational Science Foundation (306-1707)

28 **NSF Program Deadline:** New Technologies Program (Richard Hirsh, 306-1970, *rhirsh@nsf.gov*). Postdoctoral Research Associateships in CISE Experimental Science—Cross-Disciplinary Activities (Tse-Yun Feng, 306-1981, *tfeng@nsf.gov*). Computer Systems (Zeke Zalcstein, 306-1914, *zzalcste@nsf.gov*). Database & Expert Systems (Ron Ashany, 306-1926, *rashany@nsf.gov*). NSFNET Program—Connections to NSFNET (Daniel VanBelleghem, 306-1949, *dvanbell@nsf.gov*).

30 **National/ International Conference:** Center for Environmental Information. Ramada Plaza Hotel, Washington. D.C. (716-262-2870)

DECEMBER

1 **NSF Program Deadline:** Joint NSF/Alfred P. Sloan Foundation Postdoctoral Research Fellowships in Molecular Evolution (Carter Kimsey, 703-306-1469)

NSF Target Date: Animal Developmenral Mechanisms (Ralph Hecht, 306-1417), Biochemistry and Molecular Structure and Function (Brenda Flam, 306-1443)

4 **NSF Program Deadline:** Postdoctoral Research Fellowships in Biosciences Related to the Environment (Carter Kimsey, 306-1469)

15 **NSF Program Deadline:** Research Planning Grants & Career Advancement Awards for Women Scientists and Engineers; Environmental Biology (306-1481); Integrative Biology and Neuroscience; (306-1421); Molecular and Cellular Biosciences (306-1440); Plant and Microbial Developmental Mechanisms (Judith Verbeke, 306-1417)

15 **NSF Target Date:** Animal Behavior (Fred Stollnitz, 306-1419); Ecological and Evolutionary Physiology (Sharon Emerson, 306-1421); Ecological Studies, Ecosystems (Clifford Dahm or Michael Allen, 306-1479); Ecology (Michael Auerbach or Scott Collins, 306-1479); Integrative Animal Biology (Eldon Braun, 306-1421); Integrative Plant Biology (Machi Dilworth, 306-1422); Research Collections in Systematics and Ecology (James Estes, 306-1483); Systematics and Population Biology, Systematics (Annalisa Berta or James Rodman, 306-1481); Population Biology (Taber Allison, 306-1481)

JANUARY

1 **NSF Program Deadline:** Minority Graduate Student Travel Award (Carter Kimsey, 703-306-1469)

6 **NSF Program Deadline:** Minority Postdoctoral Research Fellowship Awards (Carter Kimsey, 306-1469)

15 **NSF Target Date:** Behavioral Neuroscience (Christopher Comer, 306-1416); Computational Neuroscience (Karen Sigvardt, 306-1416); Developmental Neuroscience (Lawrence Stanford, 306-1423); Neuroendocrinology (Kathie Olsen, 306-1423); Neuronal and Glial Mechanisms (Felix Strumwasser, 306-1424); Sensory Systems (Christopher Platt, 306-1424);

FEBRUARY

1 **NSF Program Deadline:** Doctoral Dissertation Research in Environmental Biology (Elizabeth Behrens, 703-306-1483)

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For more NSF information, contact the relevant program officers or consult NSF's Science & Technology Information System, stis@nsf.gov, 703-306-0214.

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