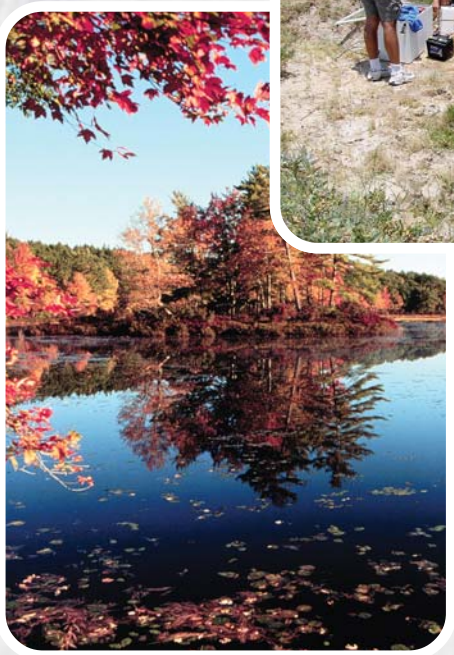


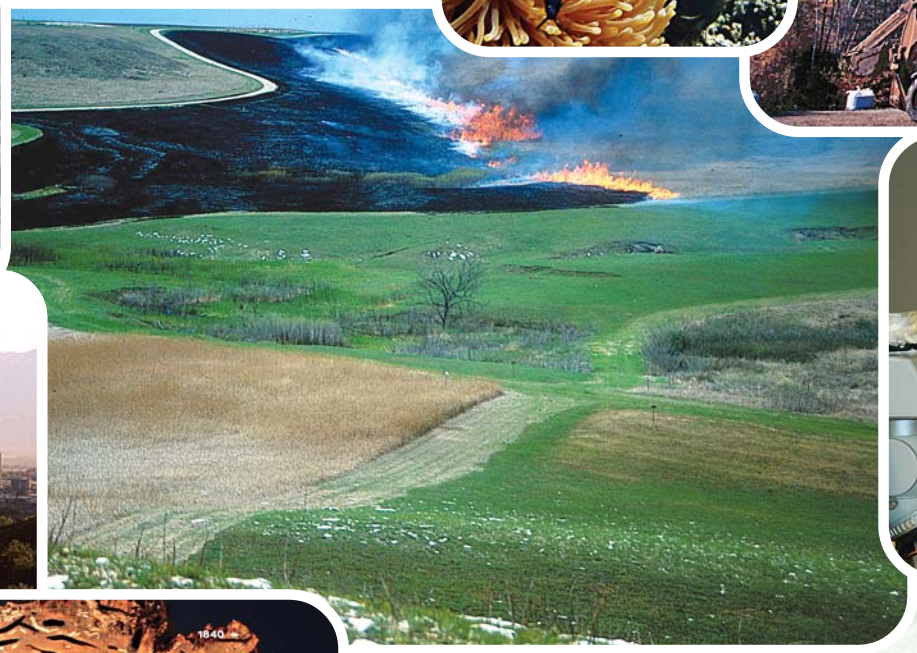
Long Term Ecological Research Network

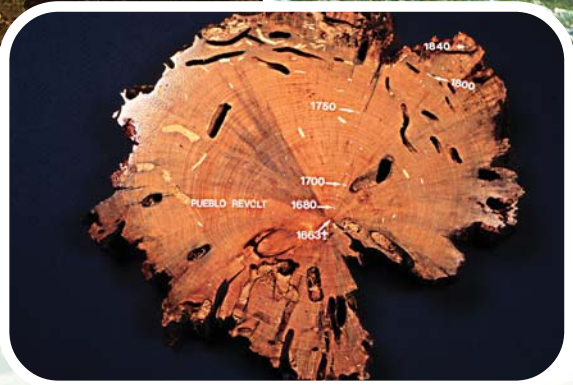
Celebrating 25 Years of Excellence in Long-Term Ecological Research

LTER

NSF



Images of LTER

Clockwise from top: ■ *LTER scientists at the Moorea Coral Reef, French Polynesia, are studying the structure, function, and dynamics of coral reef ecosystems (Photo: R. Schmitt).* ■ *Researchers studying nutrient use in forest and aquatic ecosystems use a helicopter to apply pelletized calcium to a study site at Hubbard Brook, NH (Photo: HBR LTER).* ■ *An LTER research technician examines microscopic marine life aboard the research vessel Roger Revelle, California Current Ecosystem, CA (Photo: McOwiti O. Thomas).* ■ *A well preserved tree ring structure keeps a historical record of weather and climate at the Sevilleta, NM (Photo: SEV LTER).* ■ *The Central Arizona-Phoenix, AZ, is one of two LTER sites studying the ecology of urban ecosystems, such as that in Phoenix (seen here at dusk), which is an arid land ecosystem that is influenced and even defined by human activity. (Photo: CAP LTER)* ■ *A Common Tern nesting in coastal Virginia, where the Virginia Coast Reserve is based (Photo: Dan C. Smith).* ■ *A controlled burn of the grassland at Konza, KS, turns the landscape into a mosaic of shapes and colors (Photo: KNZ LTER).*

Front page (clockwise from top): ■ *Landsat 7 Enhanced Thematic Mapper image of the Virginia portion of the Delmarva Peninsula showing the barrier island/lagoon complex studied by the Virginia Coast Reserve, VA . Shallow lagoons separate the islands from the mainland on the eastern side of the peninsula, while the Chesapeake Bay on the western side of the peninsula is relatively deep (Photo: VCR LTER).* ■ *A killer whale emerges from the icy water in McMurdo Sound, Antarctica, near McMurdo, Antarctica (Photo: Jeanne Cato).* ■ *The Schoolyard program at Andrews Forest, OR, is helping mold these "future scientists" (Photo: Stuart Perlmeter).* ■ *U.S. and Mexican scientists track plumes of fresh water from fresh springs in the hypersaline desert ecosystem at Cuatro Cienegas, Mexico —whose 70 endemic species rank it near the Galapagos Islands in terms of the world's unique ecosystems—as part of the International LTER effort (Photo: José Velazquez).* ■ *An autumn morning in the Eastern deciduous forest near Harvard Forest, MA (Photo: HFR LTER).*

THE LTER NETWORK

The LTER Program was established in 1980 by the National Science Foundation to support research on long-term ecological phenomena. The Network now consists of 26 sites representing diverse ecosystems and research emphases in continental North America, islands in the Caribbean, the Pacific, and Antarctica—including deserts, estuaries, lakes, oceans, coral reefs, prairies, forests, alpine and Arctic tundra, urban areas, and production agriculture.

Network Vision and Mission

The Vision of the LTER Network includes a society in which exemplary science contributes to the advancement of the health, productivity, and welfare of the global environment that, in turn, advances the health, prosperity, welfare, and security of our nation.

The Mission of the LTER Network is to provide the scientific community, policy makers, and society with the knowledge and predictive understanding necessary to conserve, protect, and manage the nation's ecosystems, their biodiversity, and the services they provide.

Network Goals

The LTER Network Goals are:

Understanding: To understand a diverse array of ecosystems at multiple spatial and temporal scales.

Synthesis: To create general knowledge through long-term, interdisciplinary research, synthesis of information, and development of theory.

Outreach: To reach out to the broader scientific community, natural resource managers, policymakers, and the general public by providing decision support, information, recommendations, and the knowledge and capability to address complex environmental challenges.

Education: To promote training, teaching, and learning about long-term ecological research and the Earth's ecosystems, and to educate a new generation of scientists.

Information: To inform the LTER and broader scientific community by creating well-designed and well-documented databases.

Legacies: To create a legacy of well-designed and documented long-term observations, experiments, and archives of samples and specimens for future generations.

Network Development and Management

The LTER Network was founded with the recognition that long-term and broad-scale research is necessary for understanding environmental phenomena. This understanding becomes increasingly important with increased human pressures on natural populations, communities, ecosystems, and the biosphere. The LTER Network has developed over the past 25 years through periodic requests for proposals from the National Science Foundation (NSF). LTER sites were selected based on:

- Scientific merit;
- A broad spectrum of multidisciplinary scientists demonstrating an ability to work together toward common research goals;
- Existing long-term baseline data sets; and
- Strong institutional support and opportunities for additional funding.

In receiving funding from the NSF, the LTER site agrees to:

- Conduct research on comparable ecological processes;
- Make data accessible to the broader research community using common data management protocols;
- Participate in cross-site and cross-agency research; and
- Participate in Network-level and science synthesis activities.

The renewable six-year grants are independently peer-reviewed and renewed by the NSF based on the soundness of science and Network participation. Each site and the Network Office undergo detailed reviews by NSF at the midpoint of each grant cycle and NSF conducts comprehensive reviews of the entire LTER program every 10 years.

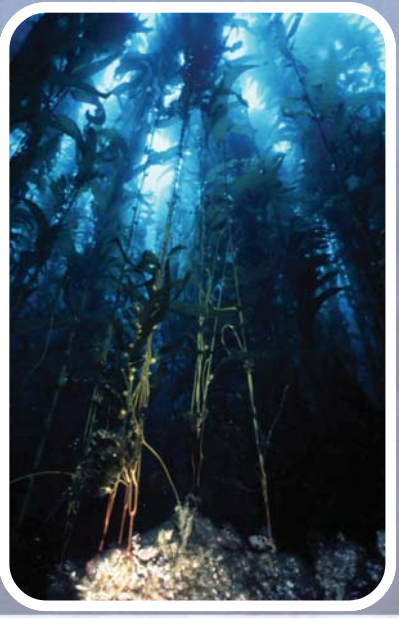
Major Funding and Support

Funding for the LTER Network is provided in various forms by:
The ***National Science Foundation***

- Directorate for Biological Sciences
- Directorate for Computer & Information Science & Engineering
- Directorate for Education and Human Resources
- Directorate for Geosciences
- Directorate for Social, Behavioral, and Economic Sciences
- Office of International Science & Engineering
- Office of Polar Programs

The ***USDA Forest Service*** financially supports six sites at which LTER projects are located (AND, BES, BNZ, CWT, HBR, LUQ). At these sites, the Forest Service works jointly with LTER to measure and understand ecological and geophysical processes in order to improve management strategies. Other supporters include:

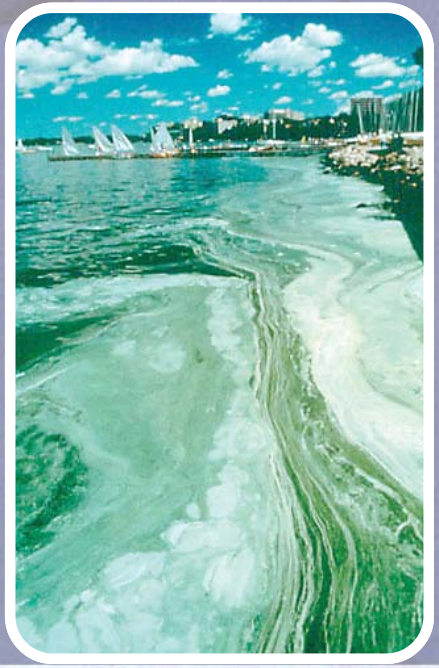
- ***National Aeronautics and Space Administration***
- ***US Geological Survey***
- ***Environmental Protection Agency***
- ***USDA Agricultural Research Service***
- ***US Department of the Interior***
  - ***-National Park Service***
  - ***-Fish & Wildlife Service***
- ***The Nature Conservancy***



Top (clockwise from left): ■*The marine mammals research team aboard the R/V Roger Revelle scour the horizon for mammal sightings during a scientific research cruise in the Pacific Ocean, California Current Ecosystem, CA (Photo: McOwiti O. Thomas).* ■*In a litter exclusion study at Coweeta, NC, Dr. Jack Webster and an assistant draw samples downstream from the point where phosphorus was artificially introduced to the stream to test whether the addition of phosphorus and nitrogen into the stream aided in the microbial respiration of wood biofilms in a leaf litter exclusion stream (Photo: CWT LTER).* ■*A researcher investigates the snowpack at the Niwot Ridge, CO, while studying the path of snowmelt water from the snowpack in the mountains of the upper lake basin (Photo: NWT LTER).* ■*Counting snails in one of the creek beds at low tide, Plum Island Ecosystem, MA. The 'ladder' being used for quadrats was designed and built by high school students in the PIE Schoolyard LTER program (Photo: PIE LTER).* ■*Bonanza Creek scientists Jamie Hollingsworth and Mark Winterstein unloading tree seedlings from a river boat on the Tanana River in Alaska. The seedlings will be planted on a fire scar from the Survey Line Fire as part of a study on the effect of tree establishment in a post-fire setting (Photo: Brian Charlton).*

Left: ■*A fish-eye-view of the Southern California kelp forest off the Santa Barbara coast, Santa Barbara Coastal, CA (Photo: Ron McPeak).*

Right: ■*Algal bloom on eutrophic Lake Mendota in Southern Wisconsin, where the North Temperate Lakes researchers are studying the ecology and management of lakes from a long-term perspective at individual lake, multiple lake, lake-district and regional scales (Photo: NTL LTER).*



RESEARCH COLLABORATION AND SYNTHESIS

The LTER Network offers the greater ecological research community, including students and foreign scientists, the opportunity to use the sites for both long- and short-term projects appropriate to individual sites, a group of sites, or the Network as a whole. Initial arrangements for collaborations should be made with personnel at the site under consideration, and proposals to the National Science Foundation for such collaborative work should be submitted to the relevant disciplinary program. NSF Program Directors also may be contacted for information about short-term funding opportunities or joint international efforts.

National and International Networking

As a global leader in long-term and broad-scale ecological research, the U.S. LTER Network establishes linkages with existing and developing long-term ecological research programs in the United States and abroad. These relationships range from exchanges at the individual scientist and site research program levels, to participation in national and international meetings, to global-scale research planning and collaboration. Priorities include:

National

- Developing innovative partnerships with leading ecological research organizations and synthesis centers
- Facilitating the advancement of current ecological science and innovative research technologies
- Developing strong multidisciplinary science and public education programs
- Pursuing a multi-agency approach to develop databases of long-term research in key biomes and along major gradients.

International

- Assisting in the establishment of regional and national networks for long-term ecological research
- Creating opportunities for collaboration between U.S. and International LTER sites and networks
- Developing and operating a communication and data sharing system between an international network of sites
- Facilitating the establishment of a global network of ecological research sites.

The US LTER Network is a charter member of the International Long Term Ecological Research (ILTER) Netowrk, **www.ilternet.edu,** and participates in other international scientific efforts.

THE LTER NETWORK OFFICE

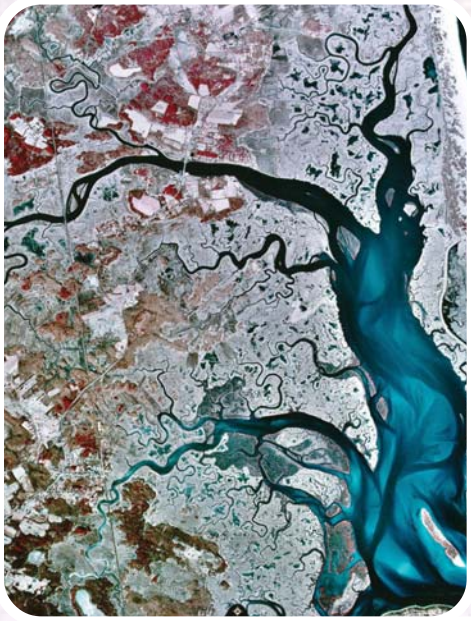
The LTER Network Office was created by the National Science Foundation in 1983 to support and coordinate network and site activities of the LTER Network. With more than two dozen sites participating in the Network within the United States, rapidly advancing technology, and a growing collaboration with over 30 countries participating in the International Long Term Ecological Research (ILTER) network, the complexity of facilitating collaborations among sites and maintaining supporting infrastructure has created great challenges and an even greater need for infrastructure, thus the need for a central Network Office.

The mission of the the LTER Network Office is to provide a central point of contact and collective expertise to support the objectives of the LTER Network by:

* Providing an efficient computational and communication infrastructure
* Developing and deploying state-of-the-art techniques in information management
* Maintaining a forward-looking public outreach program
* Coordinating interactions with other scientific networks, agencies, and entities
* Providing administrative support
* Contributing to an efficient and effective environment in which site, cross-site, and synthetic research and education can be conducted.

The LTER Network Office is housed at the University of New Mexico in Albuquerque, NM.

LTER SCIENCE



Society today faces an increasing array of natural and human-induced environmental challenges. Answers to these complex challenges must be informed by coordinated long-term, inter-disciplinary research.

Global climate change, altered biogeochemical cycles, loss of biodiversity, and the impacts of invasive species are only a few of the pressing environmental challenges facing society today.

LTER research helps address these complex environmental challenges by providing comprehensive information to the broader ecological community, general public, resource managers, and policy makers.

Sustainable policies require understanding based on sound, long-term data. The LTER Network tracks changes in key ecosystems, providing data for testing and refining models, for generating predictions, and for testing scenarios.

From top: ■*Color aerial photo of Plum Island Sound and the surrounding estuarine system, Ipswich, Rowley and Newbury, Massachusetts, March 1992, 1:40,000 scale (Photo: USGS National Aerial Photographic Program).* ■*Meteorological stations in Elfin woodland overlooking the Luquillo, Puerto Rico, where LTER researchers are studying the long-term dynamics of tropical forest ecosystems characterized by large-scale, infrequent disturbances, rapid processing of organic material, and high habitat and species diversity (Photo: LUQ LTER).* ■*The Sonoran desert biome landscape near Phoenix, Central Arizona-Phoenix (Photo: CAP LTER).*

LTER Netwo

The LTER Network comprises 26 research sites selecte diversity of ecosystems they represent. LTER aims to ecological changes at multiple time and geographica transitions for ecosystem structure and function.

AND –.Andrews Forest LTER, Oregon
Temperate coniferous forest—douglas-fir, western hemlock, western red cedar, true fir and mountain hemlock, streams.

ARC – Arctic Tundra LTER, Alaska
Arctic tundra—lakes, streams, tussock tundra, heath tundra, riverine willows.

BES – Baltimore Ecosystem Study LTER, Maryland
Eastern deciduous forest—suburban-agricultural fringe, urban parks.

BNZ – Bonanza Creek Experimental Forest LTER, Alaska
Taiga—boreal forest, floodplain seres.

CAP – Central Arizona-Phoenix LTER, Arizona
Sonoran Desert scrub, urban parks, residential, interior remnant desert patches.

CCE – California Current Ecosystem LTER, California
Pacific pelagic coastal upwelling zone.

CDR – Cedar Creek Natural History Area LTER, Minnesota
Oak savanna and tallgrass prairie—Old fields, conifer bog, lakes, pine forest, wetland marsh.

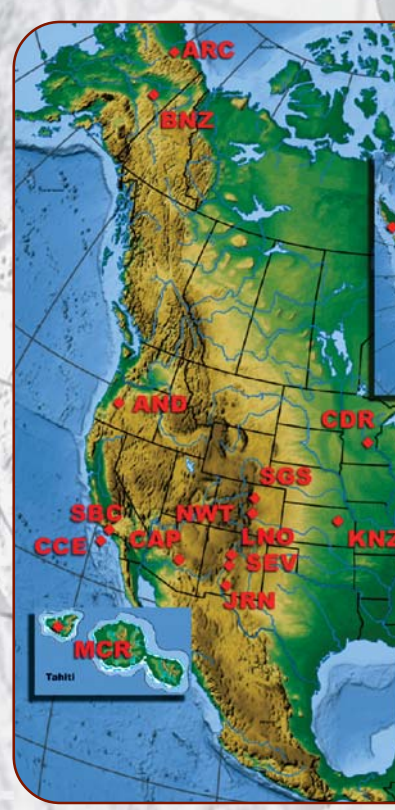
CWT – Coweeta Hydrological Laboratory LTER, North Carolina
Eastern deciduous forest—hardwood forests, white pine plantations.

FCE – Florida Coastal Everglades LTER, Florida
Freshwater marsh, estuarine mangrove, seagrass, estuary.

GCE – Georgia Coastal Ecosystem LTER, Georgia
Salt marsh, estuary, intertidal sediments, surficial aquifer, oyster reefs

HBR – Hubbard Brook LTER, New Hampshire
Eastern deciduous forest—Northern hardwood forests, spruce-fir forests, streams, and lakes.

HFR – Harvard Forest LTER, Massachusetts
Eastern deciduous forest—hardwood, white pine-hemlock forest, spruce swamp forest.



***LNO –** LTER Network Offic

JRN – Jornada Basin LTER, N
Chihuahuan desert—playa swale, bajada, basin, mour shrubland, mesquite dune

KBS – Kellogg Biological Sta
Row-crop agriculture—con based corn-soybean-wheat

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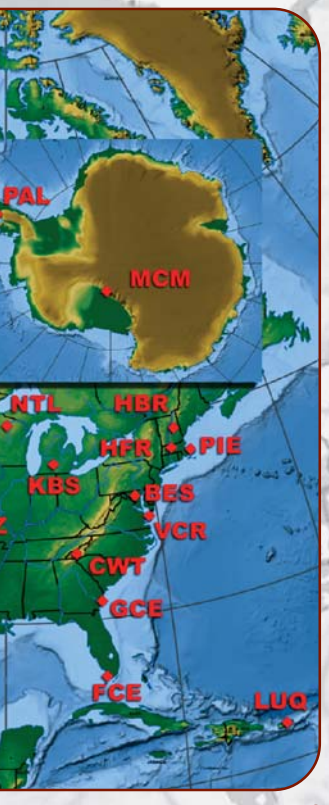

KNZ – Konza Prairie LTER, Kansas
Tallgrass prairie—gallery forest, prairie stream.

LUQ – Luquillo Experimental Forest LTER, Puerto Rico
Tropical rainforest—palm brake, elfin woodland, and montane streams.

MCM – McMurdo Dry Valleys LTER, Antarctica
Polar desert soils, lakes, and streams.

MCR – Moorea Coral Reef LTER, French Polynesia
Coral reefs.

NWT – Niwot Ridge LTER, Colorado
Alpine tundra—subalpine forest interface, fellfield, meadow, glacial lakes, streams and wetlands.

NTL – North Temperate Lakes LTER, Wisconsin
North temperate lakes—glacial landscapes, watersheds, urban, agricultural systems.

PAL – Palmer Station LTER, Antarctica
Polar marine--coastal and open ocean pelagic communities; seabird nesting areas.

PIE – Plum Island Ecosystem LTER, Massachusetts
Atlantic coastal estuary

SBC – Santa Barbara Coastal Ecosystem LTER, California
Semi-arid coastal zone, giant kelp forests.

SEV – Sevilleta LTER, New Mexico
Intersections of Great Plains grasslands, Colorado Plateau shrub-steppe, Chihuahuan Desert, montane and riparian.

SGS – Shortgrass Steppe LTER, Colorado
Shortgrass steppe—upland steppe, floodplain, shrubland, salt meadow.

VCR – Virginia Coast Reserve LTER, Virginia
Coastal barrier islands—sandy intertidal, open beach, salt marsh, lagoon.

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CORE RESEARCH AREAS

Five core research themes are central to LTER Network science. Research in these core areas requires the involvement of many scientific disciplines, over long time spans and broad geographic scales. Data on the Core Areas are collected to establish and understand the existing conditions in an ecosystem before any experimental manipulation is begun. The common focus on core areas facilitates comparison among and across sites in the Network..

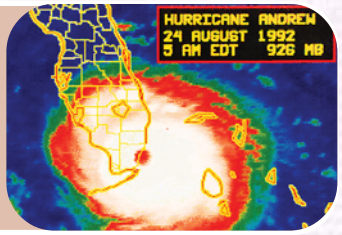
1) Primary Production - Plant growth in most ecosystems forms the base or "primary" component of the food web. The amount and type of plant growth in an ecosystem helps to determine the amount and kind of animals (or "secondary" productivity) that can survive there. *A scientist at the Konza Prairie cutting grass to measure productivity in the tallgrass prairie (Photo: KNZ LTER).*

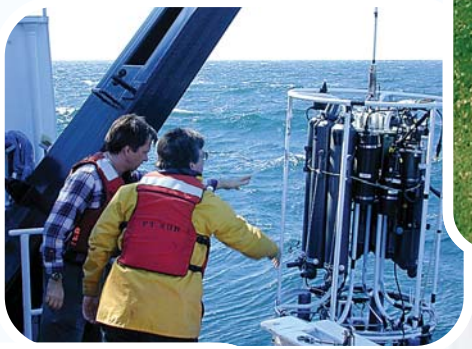
2) Population Studies -A population is a group of organisms of the same species. Like canaries in the coal mine, changes in populations of organisms can be important indicators of environmental change. *Adelie penguins (Pygoscelis adeliae), which make their home on the Antarctic Peninsula, provide good indicators of the status of the the Antarctic environment (Photo: PAL LTER).*

3) Movement of Organic Matter - The entire ecosystem relies on the recycling of organic matter (and the nutrients it contains), including dead plants, animals, and other organisms. Decomposition of organic matter and its movement through the ecosystem is an important component of the food web. *Scientists study the decomposition of litter in a riparian forest at the Sevilleta (Photo: SEV LTER).*

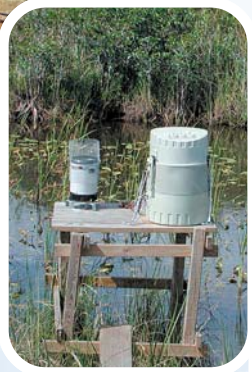
4) Movement of Inorganic Matter - Nitrogen, phosphorus, and other mineral nutrients are cycled through the ecosystem by way of decay and disturbances such as fire and flood. In excessive quantities nitrogen and other nutrients can have far-reaching and harmful effects on the environment. *A scientist samples dissolved inorganic carbon at a stream in the Alaskan Arctic (Photo: ARC LTER).*

5) Disturbance Patterns - Disturbances often shape ecosystems by periodically reorganizing structure, allowing for significant changes in plant and animal populations and communities. *An infrared satellite photo of Hurricane Andrew, considered one of the worst storms ever to hit Florida, was taken 24 August, 1992 (Photo: FCE LTER).*





Clockwise from top left: *■Palmer scientists aboard the research ship LM Gould lower a CTD (conductivity, temperature, and depth) instrument to take readings deep in the ocean during an oceanographic research cruise along the Antarctic peninsula (Photo: PAL LTER). ■The BioCON (Biodiversity, CO_2 and Nitrogen) ring at Cedar Creek, MN, is an ecological experiment begun in 1997 to explore the ways that plant communities will respond to environmental changes which are known to be occurring on a global scale (Photo: CDR LTER). ■Tending a water sampling station in the freshwater Everglades by airboat, Florida Coastal Everglades, FL (Photo: FCE LTER). ■Instructors ready equipment for training in the Ecoinformatics Training and Software Usability Testing Lab at the LTER Network Office (Photo: McOwiti O. Thomas). ■Igniting the fire, during a prescribed burn at the Sevilleta in June 2003 (Photo: SEV LTER). ■Investigators at the North Temperate Lakes, WI, work with local agencies to determine the impact of people on the landscape, as well as the impact of the landscape on the people (Photo: Michael Rothbart). ■Melting an ice hole in the Taylor Valley, McMurdo, Antarctica (Photo: Russ Kine). ■An autosampler at a freshwater site in the Florida Everglades collects extensive water samples which are then analyzed for nutrient concentrations and salinity, Florida Coastal Everglades, FL (Photo: FCE LTER). ■Student intern Gregory Greene sets up prairie dog cages during a prairie dog relocation at the Sevilleta, NM (Photo: Renee Robichaud). ■Chisel plowing is an intentional ecological disturbance that redistributes soil carbon, changes soil food webs, and disrupts the germination of plant competitors as Kellogg Biological Station cropland is prepared for planting (Photo: KBS LTER).*



INFORMATION MANAGEMENT AND SHARING

Ecology is a data-rich discipline that covers vast time and geographic scales. A major goal of the LTER Network is to improve and increase ecological knowledge by providing fast, effective, and open access to LTER data among scientists, resource managers, and policy makers.

Ecological Informatics

Ecological Informatics is the application of information technology and computer science to ecology. Informatics is critical to managing LTER data for the future, making it accessible in a form that can be used and interpreted accurately, and producing answers to questions from a community of researchers, policy makers, and educators. Informatics efforts in LTER span the gap between data and knowledge and involve the participation of Information Managers, LTER scientists and a wide array of informatics partners.

Information Technology Infrastructure

The LTER Network Office (LNO) provides infrastructure to support information technology within the LTER Network. Examples include support for network-wide databases, informatics and geographic information systems (GIS) training, Remote Sensing data archives, and communication and collaborative technologies such as wireless networking, web hosting, and video teleconferencing. LNO scientists are also leading efforts to design and develop applications and provide support for synthetic data products and network-wide databases as part of a Network Information System.

Information Management

Information managers at LTER sites provide critical functions of data management, archiving, and curation to maximize the quality of the data and ensure its preservation. LTER information managers have pioneered site-based ecological data management and actively share their experiences with the greater scientific community through outreach, education, and training.

Data Policies

The sharing of scientific data has the potential to greatly increase communication, collaboration, and synthesis within and among disciplines—something that LTER scientists greatly encourage, foster, and support. To promote the maximum availability of ecological data, LTER scientists endorse open and unrestrictive data policies across the Network. These policies standardize data release, access, and use across LTER sites, enabling unhindered access to LTER data via a common data catalog.

The Data Catalog

Currently, the LTER Data Catalog contains entries for over 2000 ecological datasets and continues to grow daily. The Catalog includes data on (1) Ecology (e.g., biodiversity, disturbance, population dynamics), (2) Evolution (e.g., adaptation, mutation), (3) Habitat (e.g., alpine, forest, tundra), (4) Level of Organization (e.g., cell, global, organism), (5) Measurements (e.g., biomass, carbon, radiation), and (6) Taxonomy (e.g., amphibian, invertebrate, virus).

Information Technology Research

The LTER Network is actively involved in research and education that applies information technology specifically to ecological information systems. Examples include the Science Environment for Ecological Knowledge (SEEK) project and the Knowledge Network for Biocomplexity (KNB) project, which are developing applications to facilitate and promote collaboration and synthesis in ecological science. The multidisciplinary nature of the LTER Network also provides a wide range of research and employment opportunities for biological, physical, social, and behavioral scientists, computer scientists and engineers, educators, and others.

Clockwise from top left: ■*Student researchers apply 15N (nitrogen isotope) to a series of long-term fertilization plots at the Niwot Ridge, CO (Photo: Keri Holland).* ■*An instructor gives tips to a student during a field research session at Niwot Ridge, CO (Photo: Jane Larson).* ■*Graduate student Frank Parker conducts an experiment using intertidal mudflat sediments from Nickawampus Creek at the Virginia Coast Reserve (Photo: Iris Anderson).* ■*Students and teachers learn about the Chihuahuan Desert through on-site discovery activities at the Jornada Basin, NM (Photo: Stephanie Bestelmeyer).* ■*Dr. Betsy Colburn, Harvard Forest, MA, shows K-12 school teachers how to study vernal pools and streams during the Summer Institute for Teachers at Harvard Forest. The institute, which is funded by the National Science Foundation's EdEn Venture, and in part by Green Leaf Foundation, helps teachers to adapt Harvard Forest curriculum to meet the needs of their particular students and districts (Photo: Susan Cloutier).*

EDUCATION AND TRAINING

A primary goal of the LTER Network is to provide a wide range of educational opportunities for students at participating institutions. Many undergraduate and graduate students are supported directly from LTER awards each year and others use LTER facilities and equipment in support of their research programs. In addition, the LTER Network, through its association with other networks worldwide, provides opportunities for the international interchange of students and faculty.

Graduate learning opportunities

LTER sites constitute a primary national training ground for graduate students in ecology. Currently more than 400 graduate students participate in the LTER network.

LTER offers the opportunity to train graduate students across disciplines and ecosystems. Our vision is for LTER to become the primary training ground for students interested in long-term, interdisciplinary ecological projects.

Undergraduate learning opportunities

Most LTER sites or their home institutions participate in the National Science Foundation's Research Experience for Undergraduates (REU) program, which offers opportunities for students at both LTER and non-LTER institutions to work with LTER scientists. Participating sites fund REU students through separate grants and supplements or out of project funds. REU students receive stipends and course credit and work closely with scientist mentors on ongoing site research programs or specially designed projects. Some sites provide similar opportunities through private foundations and sources like the United Negro College Fund.

APPLICATION INFORMATION is available directly from the individual LTER sites.

GENERAL INFORMATION about the REU Program is available from the NSF's website, www.nsf.gov.

The Schoolyard LTER Program

In 1998, the LTER program developed a special initiative aimed at utilizing LTER resources at each site to enhance hands-on science learning for K-12 students. All 26 LTER sites now participate in this Schoolyard LTER Program. Each site has a slightly different model for their program.

Through LTER's Schoolyard program, scientists, teachers, and students are integrating LTER basic research into a range of hands-on learning experiences. The program includes:

- Student enrichment through hands-on laboratory experiments and field data collection and management methods
- K-12 teacher professional development
- Preparing teachers to use scientific protocols
- Instructional materials development, integrating scientific protocols and real data sets.

You can learn more about the Schoolyard LTER program at http://schoolyard.lternet.edu/.







Clockwise from top left: ■*Local shrimpers use a baited trap net to catch Macrobrachium (shrimp species) : At the Luquillo Forest, Puerto Rico , researchers found that large dams on watercourses dramatically reduce the abundance of economically important freshwater shrimp and native fish (Photo: Alan Covich).* ■*Aerial photo of the Georgia coast, Georgia Coastal Ecosystem, GA (Photo: GCE LTER).* ■*The endangered northern spotted owl is a resident of the Andrews Experimental Forest, Oregon (Photo: AND LTER).* ■*With the downtown Baltimore skyline in background, birds roost in Carroll Park near the main Baltimore Ecosystem Study stream gauging station at the Gwynns Falls (Photo: Kenneth Belt).* ■*A diver examines the underside of a glacier: Palmer LTER researchers in Antarctica are studying the pelagic marine ecosystem in the Antarctic, and the ecological processes which link the annual pack ice to the biological dynamics of different trophic levels. Interannual cycles and/or trends in the amount of pack ice are thought to impact all levels of the food web, from total annual primary production to breeding success in seabirds (Photo: PAL LTER).* ■*A nitrogen-treated site (center, surrounded by fence line) in the hot desert in spring, part of a disturbance study at the Jornada Basin, NM (Photo: Jerry F. Franklin).* ■*One of the long-term studies at the Shortgrass Steppe involves the monitoring of small mammal populations, achieved through live trappings that occur even during the winter (Photo: Mark Lindquist).*

LONG TERM ECOLOGICAL RESEARCH NETWORK

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