



LTER 2000: CREATING A GLOBAL ENVIRONMENTAL RESEARCH NETWORK

The Long-Term Ecological Research (LTER) Program is a highly successful endeavor in the collection and analysis of scientific data on ecological processes, especially over longer temporal and larger spatial scales. The LTER Network currently consists of 18 site-based projects that span a broad array of ecosystems, and a collective, multi-site program in data collection and sharing, experimentation, and synthesis. Networking has been greatly enhanced through the development of an electronic communication system and standards for collection and management of data. The opportunity for the LTER Network to evolve gradually over 12 years National Science Foundation support has been an important contributor to its success. With its maturation, the LTER Network provides a model for the scientific collection, analysis, and application of ecological data as well as a potential core for a much larger system of environmental research sites. This system is critically needed to provide the global human society with scientific information on environmental issues and their resolution. We propose an eight-year program "LTER 2000" for the creation of a Global Environmental Research Network based upon approaches established in the LTER Program and utilizing an intellectually and geographically enlarged LTER program as a central element. The primary objectives of LTER 2000 are to: (1) link the scientific community with other key elements of society, including government and business, in addressing environmental issues; (2) integrate science across traditional disciplinary boundaries, particularly the biological, physical, and social sciences; (3) create national- and global-scale comparable environmental databases and experiments; and (4) contribute to the improvement of the environmental education of a variety of audiences. Specific elements in the LTER 2000 program are described below.

MAINTAIN STRONG SITE-BASED LTER PROJECTS

- Continued growth in base funding for LTER sites or projects, but with increased recognition by sites of Network responsibilities; goal of \$1 million per site per year by 2000;
- Major expansion in inventories and historical analyses of the LTER sites with emphasis on comprehensive views of biological diversity and of the historical and current role of humans; and
- Major expansion in the use of LTER sites by biological, physical, and social scientists through the use of new grants (not just supplements) using funds targeted for specific topics, such as interfaces between disciplines.

EXPAND THE NETWORK OF RESEARCH SITES DOMESTICALLY AND INTERNATIONALLY

- Expand the network of LTER-like sites to cover key biomes and portions of major gradients lacking adequate coverage; e.g., riverine, Mediterranean, coral reef, freshwater wetlands, estuarine, temperate rainforest, and urban and additional tropical and agricultural sites;
- Domestically, pursue the objective of expanding to 50 LTER-like projects by 2000, 25 to be supported by the NSF and the remaining 25 by other institutions and agencies— the Smithsonian, the U. S. Department of Agriculture (including the Forest Service and the Agricultural Research Service), the National Park Service, the U. S. Department of Energy, and the U. S. Department of Defense following LTER standards for selection, operation, and review;

and

- Internationally, pursue the objective of establishing 50 LTER-like projects in other countries which follow LTER standards for operation (see later objective on global expansion).

CREATE CENTER-LEVEL PROGRAMS AT SELECTED LTER SITES

- Expand at least 10 LTER projects to center-level (\$3 to \$5 million per year) programs by 2000, as leaders in specific areas of research and synthesis; and
- Expand primarily by competition for major funding modules with specific objectives, such as leading institutions for research and synthesis in:
 - regional analysis and modeling,
 - human x environment interactions, and
 - biodiversity and conservation biology.

DEVELOP A STRONGER NETWORK-LEVEL LTER PROGRAM

- Continue and expand the network-level communication capabilities to include essentially all of the relevant scientific community;
- Create major, on-line, network-wide LTER data sets in all core areas and specifically including standardized inventory (biophysical and social) and monitoring data and remotely-sensed images;
- Develop and implement a basic set of standardized measurements at all sites, designed to respond to a more explicitly defined set of core questions or hypotheses;
- Initiate a Network-wide quality control program in the area of chemical and physical analyses;
- Develop and implement additional multi-site experiments using the model of the present LTER litter decomposition study;
- Expand multi-site synthesis efforts, in part by identifying and funding LTER sites as centers for specific topics; and
- Develop a strong LTER publication program, possibly including establishment of a major commercially-produced book series.

LINK THE LTER NETWORK WITH OTHER NSF-FUNDED AND RESEARCH PROGRAMS OF OTHER AGENCIES

- Develop data archiving and management partnerships with the NSF-funded supercomputer centers;
- Develop partnerships with appropriate science and technology centers on the model of the geographic information systems (GIS) center at the University of California at Santa Barbara;
- Develop a full research partnership with the National Aeronautics and Space Administration (NASA) in research utilizing remote imagery, including the joint development of a proposal for a satellite addressing long-term ecological research issues;
- Develop an expanded partnership with the U. S. Geological Survey in hydro-ecological research; and
- Stimulate collaborative research between the LTER Network and research site networks in other agencies.

CREATE OR IDENTIFY, ADAPT AND IMPLEMENT INNOVATIVE TECHNOLOGIES FOR ENVIRONMENTAL RESEARCH

- Focus attention on developing and implementing access or approaches to difficult but critical topics such as belowground habitats, forest canopies, hyporheic zones, microbial organisms and processes, and invertebrates;
- Collaborate with appropriate centers or programs in technological innovation with attention to such areas as advanced systems for communication and computation, remote field data acquisition, use of biosensors and genetic probes, and devices capable of sensing fluxes over large areas; and

- Identify and plan major capital investments needed in environmental research, for example, for national facilities for belowground and canopy studies, and mobile laboratories for research on catastrophic disturbances.
- Seek expansion to a 100-site network of LTER-like research sites by 2000, 50 domestic and 50 foreign;
- Develop and operate an electronic system for communication and data sharing among the international network of sites;
- Assist as a network in the establishment LTER-like programs and networks in other countries, beginning with sponsorship of a global summit in 1993; and
- Create a system of partnerships between individual U. S. and foreign sites to assist in information exchange and, in the case of Third-World countries, technical assistance.

EXPAND LTER-BASED EDUCATIONAL PROGRAMS AT ALL LEVELS

- Establish a new LTER-sponsored graduate program specifically designed to train students in multidisciplinary, cross-site research through exchanges, multi-institutional programs, etc;
- Develop a strong undergraduate and high-school-senior program which includes a nation-wide competition for participation at LTER sites; and
- Develop major efforts in the area of public communication using various media, including the possibility of a TV series based upon LTER sites and research.

DEVELOP COLLABORATIVE EFFORTS WITH RESOURCE MANAGEMENT, ENVIRONMENTAL MONITORING, AND OTHER RELEVANT ORGANIZATIONS TO INSURE APPLICATION OF THE BEST AND MOST CURRENT ECOLOGICAL SCIENCE IN IDENTIFYING AND RESOLVING SCIENTIFIC ISSUES

- Develop a regular (annual?) program of LTER scientific briefings for Congressional and Executive agency staff in Washington, D.C.;
- Cooperate with the Ecological Society of America whenever possible in developing the domestic and global Sustainable Biosphere Initiatives; and
- Develop individual site-level (regional) briefing programs for relevant state and federal resource management and environmental monitoring groups.

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This material is based upon work supported by the [National Science Foundation](#) under Cooperative Agreement [#DEB-0236154](#). Any opinions, findings, conclusions, or recommendations expressed in the material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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