LTER Network News

Issue Number 2 Fall 1987

Network of LTER Sites

The network of Long-Term Ecological Research Sites includes 15 sites that range from arctic and alpine tundra to estuaries, from deserts to lakes and streams, from grasslands to forests. The five new sites added in 1987 (★) are featured in this newsletter.

From the Editor

The re...onses received after issue # 1 of the LTER Network Ne... was distributed were enthusiastic, to say the east, and we would like to thank you--and request more responses.

What would you like us to feature in future editions? Are there items of specific interest at one of the sites that you would like to see? Or maybe a subject with enough general interest that an entire issue could be devoted to it? We may not be able to fill every request, but since this newsletter is designed to meet the needs of the LTER community, we will certainly make every effort to provide what is needed.

Send comments/requests to: Judy Brenneman, Department of Forest Science, Oregon State University, Corvallis, OR 97331.

Editorial Staff: Judy Brenneman
Jerry F. Franklin
John J. Magnuson

Here We Go Again

James T. Callahan
National Science Foundation

I am struck by the thought that after nearly six years of LTER work we seem to be at the point of beginning again. Of course, what I have in mind is the fact that we are faced with the job of seeing to it that five brand new sites are integrated into the extant LTER network. What's more, there is to be yet another competition for new funding in just a few months which, presumably, will yield yet another, and possibly the final, cohort of projects.

Attending the recent LTER Coordinating Committee meeting in Denver provided me the opportunity to acquire perspective on the state of development (especially on an intellectual plane) of the five new groups of colleagues and their plans for the projects and sites. Perhaps the most meaningful summary observation I can make is, "The older projects better look out!" My impression is that the newly incorporated project groups are ready to move on a number of things that their predecessors have spent five years talking about.

It must be obvious by now that the Division (BSR), in response to the encouragement of the research community, is actively promoting the exploration, adoption, and use of new technologies. In LTER, and across the BSR Programs, this new emphasis translates into things like Geographic Information Systems, Remotely Sensed Imagery, Advanced Analytical Methods, Molecular Techniques, and "things too weird to mention." For LTER there is the opportunity to get in on the "ground floor" of many of these developments and to assume a leadership role in the incorporation of new approaches into the standard repertoire of ecological tools. The chance is too good to miss.

Such opportunities would appear to be truly exceptional when one considers the increasingly probable development of major programs like the International Geosphere/Biosphere Program (IGBP). In the same international context there are now efforts beginning to initiate formal interactions specifically regarding LTER. Within the next several months it is likely that a meeting will be announced under international auspices. Whatever the specific eventual course of these developments, it will be the responsibility of LTER scientists to assume significant roles in the effort to integrate the driving questions pertinent to the geosphere and the biosphere.

The LTER "Briefing" scheduled for November 6, is another link in the developing chain of opportunities. Presenters will "show their stuff" to an audience that will be influential in the planning and execution of many efforts that might associate with or build upon individual LTER projects or interproject activities. If early indications are reliable, then "showing their stuff" will include not only the reporting of significant results but also the display of advanced stages of thinking about the kinds of things that should be accomplished in the near- to mid-term future.

My earlier comment about the strength and state of readiness of the five new projects has solid bases in fact. Four of the sites have been the foci for considerable funding from Ecosystem Studies, other NSF programs, and other agency programs for quite some time (Hubbard Brook, Kellogg, Tundra, and Taiga). The Barrier Islands site has its own significant record of support but is essentially new to NSF as a site, although the senior scientists have records of NSF and other agency support for work in other places. Apparently, we can look forward to immediate, positive, and productive interactions with the new LTER network members.

I'm sure everyone is anticipating the winding down of the busy growing season and that backlogs of preserved material and accumulated data will be addressed in good order. It would be appropriate to emphasize that even though new primary data are undoubtedly exciting, one should not lose sight of the necessity to sit down and think and talk about things with one's colleagues. That's the way ideas for putting the pieces back together come about. Keep up the full court press.

Call for Proposals for New LTER Sites

J.T. Callahan

The new LTER competition, with a February 2 proposal deadline, is an exciting prospect. NSF announced (publication no. NSF 87-41) its special interest in receiving proposals representing "tropical forest ecosystems" and "land margin ecosystems." Both of these emphases are expected to generate quite a bit of traffic in proposals. Also in support of the competition announcement, NSF's Division of Polar Programs (DPP) indicated in its periodic "Dear Colleague" letter an interest in receiving LTER proposals having to do with the Antarctic. We would evaluate such proposals utilizing the regular LTER review process, then defer to DPP for subsequent final action. As in the past, the identification of specific ecosystems of interest should not be interpreted to exclude proposals representing other types of ecosystems. I would reasonably expect proposals dealing with "other types" to outnumber proposals dealing with those of "special interest."

For information contact Dr. J.T. Callahan, Division of Biotic Systems and Resources, National Science Foundation, 1800 G Street, N.W., Washington, D.C. 20550 or telephone (202)357-9596.

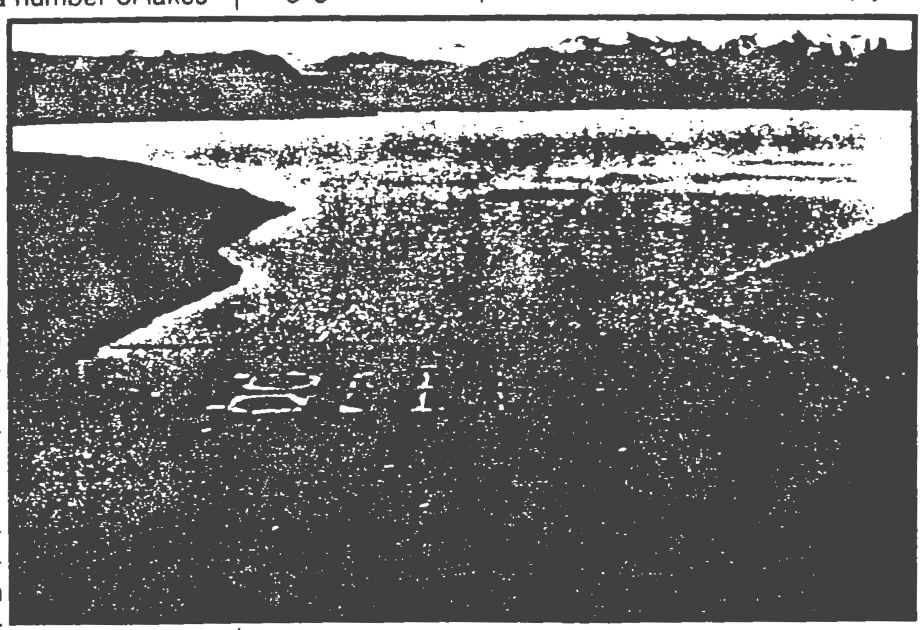
NEW LTER SITES

Featured this month are the five new LTER sites. Each site has provided a brief description of the site, the research being done there, and the scientists who will be carrying out the LTER related research.

If you are interested in obtaining additional information about the sites, please contact the Principal Investigator listed at the end of each description.

Arctic LTER Site

The site is located at 69°N near Toolik Lake, an oligotrophic kettle lake in the northern foothills of the Brooks Range, Alaska. Nearby are found all of the common types of arctic tundra as well as a number of lakes and streams of various sizes. The entire region is underlain by permafrost, with continuous daylight from mid May to late July and a snow-free season normally lasting from late May to late September. The research camp at Toolik Lake is operated by the University of Alaska, has a capacity of 40 scientists, and is accessible year-round by gravel road from either Prudhoe Bay (4 hours) or Fairbanks (9 hours). The road, which parallels the oil pipeline, provides access to boreal forests, river valleys, mountain valleys, and the arctic coastal plain.



Long-term aquatic research at Toolik Lake began in 1975, and terrestrial ecologists began long-term experiments and observations there in 1976. Since then, about 25-30 senior investigators and many more students and technicians, from a number of institutions in the United States and Europe, have worked at Toolik Lake. About 10 of these scientists have maintained their research there continuously since the mid-1970's.

The new arctic LTER program at Toolik Lake is designed to build on this extensive research base, to provide core funding for ongoing, long-term experiments, and to link terrestrial, lake, and stream studies more explicitly than has been possible in the past. The program currently includes 15 principal investigators from 7 different institutions, including the Universities of Alaska, Cincinnati, Kansas, Massachusetts, and Minnesota, Clarkson Technology Institute, and the lead institution, the Marine Biological Laboratory, Woods Hole, Massachusetts.

The heart of the program is a series of parallel, whole-ecosystem experiments in lakes, streams, and the major terrestrial ecosystem types. The experiments are of two kinds: "top-down" manipulations of herbivores or predators, and "bottom-up" manipulations of nutrient availability. The overall goal is to understand and to separate the role of animal consumers versus plant/nutrient responses as controls over terrestrial and aquatic ecosystems.

Previous research at Toolik Lake has shown that arctic ecosystems respond dramatically to such experimental manipulations, and that the responses are often easier to interpret than in more complex, species-rich ecosystems at lower latitudes. The effects of manipulation can often be traced clearly through several trophic levels; in addition there are major changes in productivity and species composition within trophic levels or guilds. For example, phosphorus fertilization of the Kuparuk River (near Toolik Lake) changed the entire basis of the food web from heterotrophy to autotrophy by stimulating algal growth. It changed the structure of the insect community by favoring grazers over particle collectors, and it sharply increased growth of larval and adult fish. Fertilization experiments in a lake have resulted in changes in both zooplankton and benthic community structure and provided an excellent example of predator-prey dynamics within the microbial food web. On land the growth form composition of the vegetation as well as its productivity is strongly affected by nutrient availability as well as by air temperature and shading. An important reason for continuing these experiments in the long term is that not all species respond at the same rate, and that there is much to be learned by observing the sequence of changes and interpreting their causes.

A second major goal of the arctic LTER program is to advance understanding of how mineral nutrients move over the arctic landscape, from terrestrial to aquatic ecosystems. This goal is especially important in the context of human disturbance because we know that the structure and productivity of terrestrial ecosystems is strongly nutrient-limited, and that disturbance in general tends to increase nutrient cycling rates and overall nutrient availability. We also know that aquatic ecosystems are strongly dependent on nutrient inputs from the surrounding tundra. To describe the cycling of nutrients within different terrestrial ecosystems, and the movement of nutrients over the landscape, we are focusing on development of a model of nutrient transport, combined with the use of stable isotopes as tracers to identify major sources, sinks, and pathways of element cycling.

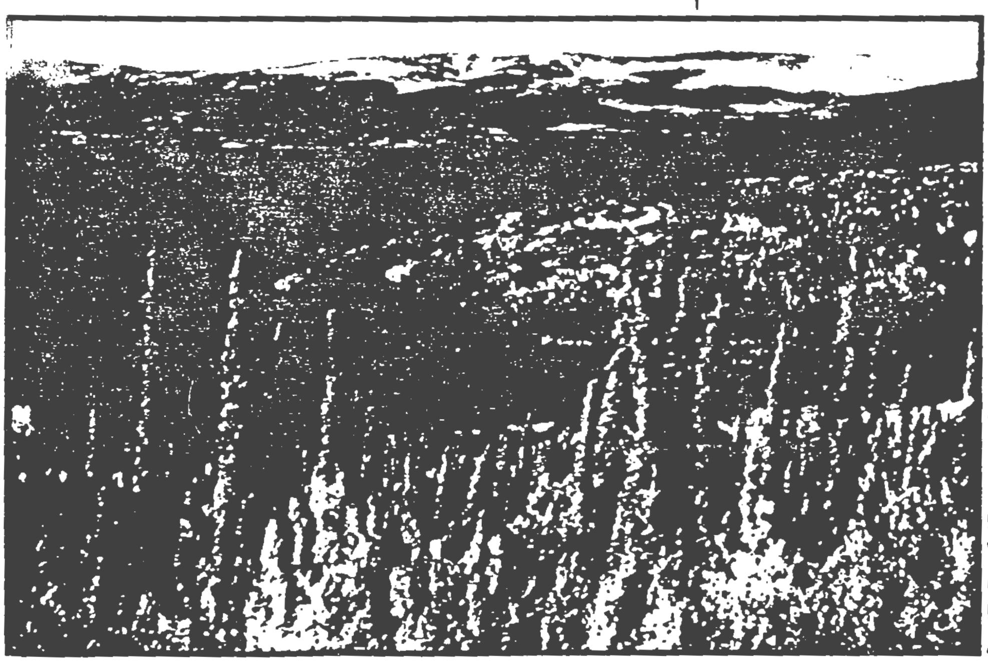
For additional information contact John E. Hobbie, The Ecosystems Center, Marine Biological Laboratory, Woods Hole, MA 02543.

Bonanza Creek LTER Site

The newly established Bonanza Creek LTER site in Fairbanks, Alaska, will examine successional changes in controls over ecosystem function in upland and floodplain taiga forests. The central hypothesis of the program is that the pattern of succession is determined primarily by initial site characteristics and by the life history traits of component species and that the rate of successional change is then determined by vegetation-caused changes in environment and ecosystem function. The major emphases in this program include (1) demographic and physiological controls over vegetation change (L.A. Viereck and F.S. Chapin), (2) vegetation-caused changes in resources and standing crops of biomass and nutrients (K. Van Cleve, C.T. Dyrness, and J. Yarie), (3) controls over microbial activity and nutrient supply (P.W. Flanagan, K. Van Cleve, P.B. Reichardt, and R.G. Cates), and (4) the role of herbivores as consumers and modifiers of succession (J.P. Bryant). Major study stles are three replicate stands in early, mid, and late succession in upland south-facing slopes and in the floodplain of the Tanana River.

Several long-term experiments are planned that will serve as a facility for taiga and visiting researchers. (1) Resource availability will be altered by adding nitrogen, sawdust, or sucrose or by limiting precipitation input. (2) The natural pattern of colonization and succession will be altered by planting artificial communities in early succession (vegetation-free silt, Nfixing alder, spruce, or alder + spruce). (3) Moss will be removed to document the role of mosses in controlling soil temperature and nutrient cycling. (4) Herbivores will be excluded from some of the artificial communities. Measurements planned for these experiments include plant establishment and growth, soil nutrient availability, biomass and standing stocks of nutrients, soil microbial and invertebrate activity, and secondary metabolite concentrations in plants and forest floor.

Some of the major emphases in the taiga LTER program are on (1) combining population and ecosystem approaches to the study of succession, (2) considering in detail the controls over nutrient availability as mediated by microbial processes, (3) exploring the role of plant-derived secondary metabolites in regulating nutrient cycling, and (4) examining the role of mammalian herbivores in causing successional change.



The taiga LTER group encourages participation from other researchers, particularly those working at other LTER sites. We particularly wish to encourage research on root production and turnover, insect herbivory, and secondary productivity.

For information about the Taiga LTER site contact Dr. Keith Van Cleve, Agricultural and Forestry Experiment Station, University of Alaska, Fairbanks, AK 99775.

Hubbard Brook LTER Site

The overall goal of the Hubbard Brook LTER project is a better understanding of the response of northern hardwood-conifer watersheds to large-scale disturbance. We continue to approach this goal through a coordinated program of long-term monitoring, whole-watershed manipulations, smaller scale experiments and surveys, and development of simulation models. Drawing upon continuous, long-term monitoring of the quantity and chemistry of precipitation and streamflow, as well as periodic measurement of forest composition, biomass, and chemistry for several watersheds with contrasting disturbance histories, we are quantifying changes in ecosystem structure and function over the time scale of several decades in a northern hardwood-conifer forest.

Increasingly, the Hubbard Brook program is seeking mechanistic explanations for the behavior of biogeochemical cycles in ecosystems. Integration of biogeochemical studies and assessments of ecosystem response to disturbance have long been hindered by difficulties in analyzing element-element interactions. Because virtually every pathway of element transfer is coupled to the H-ion cycle, proton budgets serve to couple element cycles through the stoichiometry of biogeochemical reactions. Thus, we are focusing our efforts on the development of proton budgets for contrasting watersheds in the Hubbard Brook Valley, utilizing process studies to quantify pathways and the small watershed approach coupled with intensive soil measurements to verify the internal proton budgets.

Our detailed program of process studies on reference and treated watersheds includes: (1) analysis of vegetation development using permanent plots, natural and experimental gaps, quantification of neighborhood competition, and ecophysiology and life history studies of dominant species; (2) organic matter processing in soils and streams, long-term decay of bole wood, and the formation and disruption of organic debris dams; (3) biogeochemical processes such as wet and dry deposition, stream channelization and outflow, and soil solution chemistry and weathering; and (4) hillslope hydrology and routing of rain and snowmelt to streams using field manipulations and monitoring as well as hydrologic models.

The Hubbard Brook LTER program also concentrates on the dynamics of certain critical heterotroph populations in northern hardwood-conifer ecosystems. Building upon long-term records of breeding bird populations in the area, we are seeking mechanistic explanations of fluctuations in population sizes of birds and phytophagous insects. We are investigating the complexities and controls of food webs in first- and second-order mountain streams, focusing especially on bacterial productivity. Finally, we are examining the controls on populations of an important pathogenic fungus and the nutritional ecology of a large herbivore--the white-tailed deer.

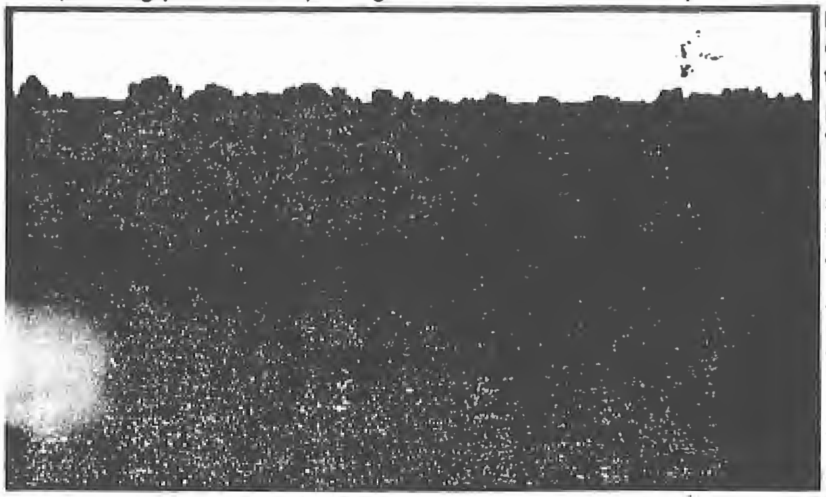
Major participants: Timothy Fahey, Cornell University; Charles Driscoll, Syracuse University; F. Herbert Bormann, Yale University; Breck Bowden, University of New Hampshire; Jon Cole, Institute of Ecosystem Studies; John Eaton, Institute of Ecosystem Studies; C. Anthony Federer, U.S. Forest Service; Stuart Findlay, Institute of Ecosystem Studies; Richard Holmes, Dartmouth College; Jeffrey Hughes, Cornell University; Arthur Johnson, University of Pennsylvania; Gene Likens, Institute of Ecosystem Studies; Gary Lovett, Institute of Ecosystem Studies; David Peart, Dartmouth College; Robert Pierce, U.S. Forest Service, William Reiners, University of Wyoming; Tom Siccama, Yale University; William Smith, Yale University; Louise Tritton, U.S. Forest Service.

For additional information contact Tim Fahey, Department of Natural Resources, Cornell University, Ithaca, NY 14853.

Kellogg Biological Station LTER Site

LTER research at the Kellogg Biological Station (KBS) is centered on row-crop agricultural systems, with particular emphases on ecological constraints to agronomic productivity and on the environmental impact of agriculture in the larger landscape. KBS is located in southern Michigan; the site is thus broadly representative of north-temperate farming systems, in particular of those in the northern corn belt.

The overall aim of the KBS LTER project is to test the hypothesis that management based on ecological concepts can effectively substitute for reliance on chemical subsidies in production-level agronomy. By imposing a range of management treatments on a series of experimental plots, investigators will test specific hypotheses that follow from the general hypotheses that nutrient subsidies can be minimized by manipulating plant-microbe interactions; that herbicide subsidies can be minimized by manipulating crop-weed interactions; and that pesticide subsidies can be minimized by manipulating plant-insect-pathogen interactions.



The project's main experimental treatments are designed primarily to allow us to examine questions about how long-term interactions among populations in these systems affect system-wide attributes such as nutrient availability, herbivory and pathogenesis, plant competition, carbon allocation, and nutrient/pesticide outputs. Field treatment will include four main species levels with two management levels nested within each:

(1) Conventional corn/soybean cultivation. This treatment provides the most direct link to current agricultural practice; here we will follow typical management strategies for maximizing economic yield. Management treatments will include both (a) moldboard plowing and (b) no-till cultivation practices.

(2) Low-input corn/legume cultivation. Recent long-term experiments with organic-based farming techniques at Rodale and elsewhere are beginning to demonstrate that these management techniques can provide viable, production-level alternatives to subsidy-intensive conventional cultivation methods. Yet these systems are virtually unexplored from a scientific, process-level standpoint: it's not at all clear why they work, and without such information it will be difficult to generalize these low-input techniques to other types of cropping systems or to other areas of the country. Close examination of organic based systems will provide substantial insight into optimal cropping strategies and provide a unique ecological system in which to test hypotheses about SOM turnover, herbivory, C allocation, and other processes in systems that are driven primarily by organism interactions. At KBS the low-input management treatments will include both (a) low-input cultivation in which chemicals are used only to control outbreak pest populations and (b) zero-input cultivation in which no pesticide subsidies are used regardless of pest population status.

(3) Perennial biomass cultivation. The recent and rapid development of fast-growing, varietal clones of several woody species suggest the likelihood that perennial cropping systems managed for woody biomass production will become a significant part of the future agricultural landscape. Perennial biomass farms are managed for short-rotation (3-10 years) wood production; the biomass produced is used for pulp or fuel. From an ecological standpoint this type of cropping system provides opportunities for examining process and organism interactions in systems that maintain viable root systems from year-to-year vs. interactions in more typical, annual crop systems. Specific management treatments at KBS will include (a) a Populus sp. clone selected for strong above-ground production and (b) a Populus sp. clone selected for strong below-ground allocation. Both treatments will be harvested on a 4-5 year rotation cycle.

(4) Native successional community. An unmanaged, successional community abandoned at the time of plot establishment will be used to contrast organism interactions in a community of co-evolved species against the artificial simplified communities comprising our cropping systems. We expect this system to exhibit tightest temporal and spatial coupling of organism interactions several years after establishment when it reaches a midsuccessional growth state. A second native community on a nearby never-tilled soil of the same series as our main plots will be maintained as a long-term reference plot. This latter plot, with its undisturbed soil profile, will be used mainly to test hypotheses about long-term SOM fractionation and turnover.

Eighteen senior investigators are directly involved in the KBS LTER program. These include faculty from KBS and from campus-based Departments of Crop and Soil Sciences, Entomology, Botany and Plant Pathology, Microbiology, and Forestry. Co-PIs are Phil Robertson (Managing PI), Mike Klug, and Eldor Paul. Inquiries about the site should be directed to Phil Robertson at the W.K. Kellogg Biological Station, Michigan State University, Hickory Corners, MI 49060-9516.

Virginia Barrier Island-Estuarine LTER Site

The Virginia Coast LTER Program of the University of Virginia is focused on the Virginia Coast Reserve (VCR) of the Nature Conservancy. Managed by the Conservancy for conservation, research, and education, the VCR extends 100 km along the seaward margin of the Delmarva Peninsula, from near Chincoteague Inlet southward to the mouth of Chesapeake Bay (latitude $37^{\circ}30'$N and longitude $75^{\circ}40'$W). The study area includes 13 barrier islands (14,170 ha), deep inlets, shallow bays, and vast expanses of mud flats and marshes. Elevation ranges from sea level to +9.1 m. Tidal amplitude is about 1.3 m.

The VCR is located in the coastal marine biome. The climate is dominated by extratropical fronts and tropical storms and hurricanes. Average annual temperature is 14.2°C. Monthly minimum land maximum temperatures are 3.2°C (January) and 25°0 C (July). Precipitation averages 105 cm/yr. Physical factors such as prevailing wind direction, depth to groundwater, and frequency of disturbance (e.g., overwash) exert profound influences on plant species distribution and abundance. Distinct communities include sandy intertidal, open beach, grasslands, shrub thickets, pine forests, mud flats, salt marshes, and estuarine lagoons. Terrestrial vegetation is conspicuously patchy, with sharp transitions and narrow ecotones between communities.

Both short-term, stochastic events (e.g., tropical storms) and long-term, secular trends (e.g., sea level rise) profoundly influence this barrier island-estuarine system. LTER studies thus employ a variety of historical data sources in conjunction with real-time observations and experiments to examine a broad domain of scales of space and time:

(1) Centenary- to millenial-scale changes in the landmass of islands and marshes are recorded in the sediments (5,000 yr B.P.). We are studying the interrelationships of secular climate change, sea-level rise, island formation and migration, and marsh accretion with data from sediment cores ($\pm$ 100-yr resolution).

(2) Decadal- to centenary-scale changes in insular and marsh landforms and vegetation are recorded on historical maps and remote imagery. We are studying the interrelationships of storm events and landscape processes such as primary and secondary succession with data from historical records dating back to 1933.

(3) Annual- to decadal-scale changes in the composition of the landscape, in the biota, and in the ecological and geological processes occurring on this landscape (i.e., productivity, decomposition and sediment deposition/erosion) are determined directly by current observations and experiments.

(4) Monthly- to annual-scale variation in the measured rates of processes such as primary production are extrapolated to larger scales. Three coupled simulation models, including a biogeochemical process model, a succession model, and a landscape evolution model, are used both to guide and to synthesize studies of processes occurring on different scales of space and time.

Senior staff of the Virginia Coast LTER Program include ecologists, climatologists, geologists, hydrologists, and environmental chemists. Key personnel are drawn from Old Dominion University (ODU) and the Virginia Institute of Marine Science (VIMS), as well as the University of Virginia.

Specific LTER projects include studies of Holocene barrier island and inlet geology, with emphasis on island formation and migration in response to sealevel rise (Robert Dolan, George F. Oertel [ODU]); coastal climatology, with emphasis on climatic variation and extreme events as driving forces for ecological and geological change (Bruce P. Hayden); wetlands ecology, geology, and hydrology, with emphasis on historical and modern rates of marsh productivity and accretion (Linda K. Blum, Aaron L. Mills, William K. Nuttle, William E. Odum); field studies of primary and secondary succession, with emphasis on the effects of disturbance (e.g., storm overwash) on observed patterns and rates of succession (Hayden, Raymond D. Dueser, H.H. Shugart, Jr.); modeling of primary and secondary succession, with emphasis on plant life-form, life history, and physical-environmental constraints (Shugart, Lenore Fahrig); modeling of dune aggradation, with emphasis on plant biology, organic matter, sediment supply, and groundwater (Dolan, Hayden, Shugart); modeling of biogeochemical processes, with emphasis on problems of system aggregation/disaggregation (George M. Hornberger, Richard L. Wetzel [VIMS], Joseph C. Zieman); analyses of terrestrial and aquatic productivity, food chains, decomposition, and nutrient dynamics, with emphasis on "source" and "sink" communities (Blum, Mills, Odum, Zieman, Michael Castagna [VIMS]); and ecology and evolution of insular vertebrates, with emphasis on the assembly of insular communities and the evolution of insular populations (Dueser, J.J. Murray, Jr., John H. Porter). Software and data management are coordinated by Porter.

Facilities include a headquarters building in Oyster, Virginia, with three dorm rooms (capacity 12), equipped kitchen, library, computer (enhanced PC/AT) and wet-lab facilities (555 sq. m). Dry-lab and storage facilities (450 sq. m), vehicles, boats, and general field and laboratory equipment are available on-site. Associated, staffed facilities include the VCR Hog Island Station (Hog Island), the ODU Barrier Island Research Station (Oyster), and the VIMS Eastern Shore Laboratory (Wachapreague). VIMS/ES has a sophisticated flow-through saltwater laboratory. Analytical labs, greenhouses, main-frame computers, and libraries are available at the University and, by prior arrangement, at ODU (Norfolk).

Contact Dr. Raymond D. Dueser, Department of Environmental Sciences, University of Virginia, Charlottesville, VA 22903 for additional information about the LTER program. Contact Mr. John M. Hall, Virginia Coast Reserve, The Nature Conservancy, Nassawadox, VA 23413 (804)442-3049 for information about the VCR.

The NASA FIFE Research Program on the Kansas State University LTER Site

In 1987 NASA began field studies called FIFE, the First ISLSCP Field Experiment (ISLSCP = International Satellite Land Surface Climatology Project). This experiment required a grassland with large seasonal variances in soil moisture and living and dead plant biomass. In addition the project required a pre-existing research infrastructure and database. Konza Prairie and adjacent lands were therefore selected as the site for this experiment. The project is out of the Land Processes Branch, Earth Science and Applications Division. FIFE is scheduled for [illegible]ve field season followed by two years of minor, [illegible]ld work in conjunction with data analysis and [illegible]ion.

THE MAJOR GOAL OF THIS PROGRAM IS TO PROVIDE AN UNDERSTANDING OF HOW THE BASIC PHYSICAL AND BIOLOGICAL PROCESSES THAT OCCUR AT THE LAND/ATMOSPHERE INTERFACE MAY BE OBSERVED USING SATELLITE REMOTE SENSING.

NASA's Land Processes program, in cooperation with ISLSCP, has as its main objective the development and validation of techniques that may be applied to satellite observations of the radiation reflected and emitted from the earth to yield quantitative information concerning land surface climatological conditions and the use of these techniques in the scientific study of the land-atmosphere interaction. Currently, NASA is supporting research in two main areas.

(1) The evaluation of existing and newly collected data from satellites to determine their usefulness in detecting climate related fluctuations or human-induced changes in the land surface.

(2) Development and validation of methods to convert satellite-observed radiances to variables related to land surface climatology.

Briefly stated, the objective of the experiment is to obtain the necessary surface and atmospheric data to verify the extraction of land surface parameters from satellite radiance measurements. The parameters of interest include surface spectral reflectance properties (including albedo and the vegetation index), surface temperature, and components of the surface energy balance such as radiation budget components and the latent and sensible heat fluxes.

Twenty-nine proposals were initially funded in addition to basic support for data collection, storage, and retrieval. These proposals were of two types: (1) investigations providing additional measurements beyond the basic data set, and the interpretation of those data in the context of the combined data set; and (2) analysis or interpretation efforts using the combined data sets. Investigations have also been divided into working groups, which include the planetary boundary flux, surface energy flux, soil moisture and biology/spectral albedo teams in addition to data management, correction/calibration, and integration/synthesis groups.

Investigators associated with three LTER sites were funded as part of the FIFE study. These projects are involved with research on soil moisture, biology/spectral albedo, and synthesis topics: (1) J. Tiedje and P. Groffman, Michigan State University--Denitrification, nitrous oxide, carbon dioxide and soil moisture dynamics evaluated at the landscape level using remote sensing techniques; (2) D. Schimel, W. Parton, R. Woodmansee, Colorado State University--Surface biophysical properties and trace gas exchange in the tallgrass prairie; and (3) T. Seastedt, Kansas State University, and M. Dyer, Biosphere Research Inc.--The influence of grazing on land surface climatological variables.

This program presents the opportunity to link concepts and models of watersheds or landscapes with remotely sensed properties of the site. Specifically, mechanistic models of ecosystem phenomena (e.g., nitrogen cycling or net primary productivity) can be linked with GIS (geographical information systems) to provide robust biological interpretations to remotely sensed spatial variations. NASA will benefit from the LTER program because of the presence of (a) extensive pre-existing data on plant, soil, and water characteristics; (b) a data management system capable of providing these data; and (c) considerable biological expertise to interpret these data. We obviously believe that biologically mediated processes will have a large influence in modifying regional climatic characteristics, and that knowledge of these interactions will be useful when considering future measurements or models of regional and global climatic change. In turn, the LTER site and investigators will benefit because of (1) additional measurements on climate and microclimate, plant, soil, and water characteristics; (2) training in remote sensing procedures; and (3) a state-of-the-art assessment of the value of remote sensing in measuring and interpreting biological phenomena.

The NASA-LTER interaction presents an opportunity for real advances in the areas of scaling, landscape ecology, ecological modeling, and innovative technologies designed to measure and/or integrate large-scale spatial variation in ecological processes. The program is both a preliminary experiment and a prototype for subsequent programs interested in landscape ecology and regional and global biological monitoring.

Portions of this article were taken from "The FIFE Handbook" by Piers J. Sellers and others. Additional text was provided by T.R. Seastedt of the Konza Prairie LTER Site (Division of Biology, Kansas State University, Manhattan, KS 66506).

Long-Term Studies Section for Ecological Society of America

J.F. Franklin

A petition to form and by-laws for a Long-Term Studies Section were accepted by the ESA Council at their August meeting in Columbus, Ohio. This was followed by an organizational meeting attended by about 40 individuals. There was considerable discussion about the desirability of interfacing the Section and its activities with management agencies, such as the National Park Service, Forest Service, and The Nature Conservancy. The objectives of this Section will be to encourage research on long-term processes in ecological science, facilitate communication of the results, and enhance public understanding of the relevance of long-term ecological data to identification and resolution of societal problems. Establishment of the Section will be voted on by ESA members at the annual meeting at Davis, California, in August, 1988. Individuals interested in long-term research and establishment of the Section are encouraged to attend this meeting. Assuming a positive vote, the first official meeting of the Section would be held later that week to elect the officers and discuss proposed Section activities. Individuals desiring more information on the proposed Section should contact J. Franklin, College of Forest Resources AR-10, University of Washington, Seattle, WA 98195.

Cary Conferences

J.F. Franklin

The Institute of Ecosystem Studies (IES) (address: New York Botanical Garden, Mary Flagler Cary Arboretum, Box AB, Millbrook, NY 12545) is making a major contribution to the ecological community with its Cary Conferences and related studies. The second Cary Conference was held in May on "Long-Term Studies in Ecology: Approaches and Alternatives"; it was designed to bring sustained ecological research to the forefront of current scientific investigation. Topics addressed included importance and justification of long-term studies in ecology, the role of direct long-term observational studies, alternatives to long-term studies including retrospective and modeling approaches and space-for-time substitutions, and use of direct manipulations. Director Gene E. Likens of IES plans for publication of the proceedings.

Contributing to the discussions at the 1987 Cary Conference was the study published by IES in 1986 on "Long-Term Ecological Studies: An Illustrated Account of Their Design, Operation, and Importance to Ecology" (IES Occasional Publication 1). This report, which is available on request from IES, provides valuable history and perspectives on long-term studies, particularly factors that have contributed to their success. Not surprisingly, leadership has been a key element in most successful long-term studies, although other factors, such as simple and robust experimental designs, have also contributed. This report is recommended reading for individuals who are or plan to become involved in long-term ecological studies.

A synopsis of the first Cary Conference on "Status and Future of Ecosystem Science" in 1985 has also been published by IES as their Occasional Publication 3. Topics considered by conference participants included the importance of scale, evaluation and prediction of anthropogenic stresses, integration of population and ecosystem approaches, and opportunities to advance ecosystem science.

RECENT PUBLICATIONS

Below are listed a few of the recent publications written by LTER, or LTER related, scientists. If you wish to obtain a copy of one of the publications, contact the related LTER site (address given below each group of publication citations).

H.J. ANDREWS

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