MINUTES

LTER Coordinating Committee Meeting

Trout Lake Station, Boulder Creek, Wisconsin

February 29 - March 1, 1992

NSF Changes

NSF Funding

James Edwards and Tom Callahan reported on structural changes within the division. Behavioral and Biological Sciences has been divided into two directorates, Biological Sciences and the Social, Behavioral and Economic Sciences. LTER is now under the Biological Sciences Directorate, Division of Environmental Biology (DEB; see attached sheet on program areas.)

US-Asian Environmental Program. Cooperative US-Asian research program

expanded to include the People's Republic of China and the Federation of

Independent States, Russia. Provides support for fellowship and training ($18

million/year in "new" money, $5 million for development of a regional

biodiversity conservation network). The cooperative relationship developing

between LTER and the Chinese Ecological Research Network (CERN) is a

model for potential relationships with other Asian countries. James Edwards

invRed ideas for proposals from LTER.

International Biodiversity Study Groups Fund provides an opportunity for

U.S. and foreign scientists to analyze biodiversHy, screen for products, and fund

studies. The first program, which will offer three LTER-sized awards of $3.5

million each, will commence in 1993 (descriptive flyer will be available in April).

Funding for undergraduate and graduate training and group coordination

of research in plant sciences through NSF, DOE, and USDA in an effort to

meet the need for ecologically-oriented activities. LTER urged to propose

studies. Consortia proposals will be favored.

Research Agenda for Aquatic Sciences (sometimes erroneously referred to

as the "Freshwater Initiative"). A proposal has been prepared for a workshop

headed by Robert Naiman, Center for Streamside Studies, University of

Washington, and John Magnuson to develop an agenda for aquatic ecological

research.

LTER-specific funding for field station/marine lab improvements.

Deadline for proposals: December 15, 1992, with a June-October 1993 award

receipt. Proposals should be decadal-scale, and will be evaluated externally.

1bYr. LTER Review

Meetinq Schedule

LTER/EXEC Election

Initiatives/lnternat'l.

Activities

Tom Callahan requested by July 1 a document from the LTER/CC providing

input to the design and execution of the long-term research plan. The document

should include overall tasks, a timeline for completion and idantification of

individuals to complete tasks. Callahan noted that this is a significant

opportunity for LTER to provide valuable and useful input; however, he stressed

that there are no guarantees this input will explicitly guide the final design. An

ad-hoc committee may be used. (See attached sheet for input from site

representatives.)

LTER/CC. Aug 14, in Fairbanks, Alaska, as previously announced.

Organizers need to know how many individuals per site will attend. Adrienne

Whitener in the LTER Network Office will send out a preliminary registration

request to solicit this information, as well as names of attendees.

LTER/CC. March or April, 1993. Bill Schlesinger offered to host the meeting at

Jornada, suggesting attendees fly into El Paso, Texas and then on to Las

Cruces. New Mexico.

LTER/EXEC. June 1S19, in Washington, D.C. James Gosz, in Washington

as Director of the new Sustainable Biosphere Initiative office, offered meeting

space. The meeting will be followed by a June 20 visit to the Smithsonian

Environmental Research Center, the long-term research site in Edgewater, MD.

All Scientists '93. September or October 1993. The Executive Committee

recommended the meeting should be near an airport in the center of the

country, or at one of the southern latitude research parks which have long-term

ecological research and monitoring programs. In initial talks at the 1991 Seattle

LTER/CC, it was suggested that the YMCA facilities at Estes Park, CO be used

again, but with attention paid to poster space and equipment in breakout

meeting rooms. Site selection and program committees will meet at Trout Lake

and will move ahead quickly with planning. Site selection committee: Carl

Bowser (chair), John Vande Castle, Tom Callahan. Program committee:

Caroline Bledsoe (chair), Dave Tilman, Tim Fahey, John Vande Castle, John

O'Brien.

A replacement for Keith VanCleve (BNZ), whose term on the Executive

Committee expires this year, will be selected by mail ballot. The newly elected

member will attend the June meeting in D.C. Jerry Franklin noted that the

Committee had begun to ask the alternate member to attend the meetings

regularly as well.

Subsequent election resu/ts: rm Seastedt (NWr), Fred Swanson (AND), alt

CERN Interactions. James Gosz reported that the World Bank will support

continuing scientific exchange with the Chinese research community (proposed

$20 million). A proposal is in to NSF which focuses on data management

training for the Chinese. The proposed program would involve an LTER trip to

China to identify sites and individuals for training in the United States, with a

possible followup training in China.

Initiatives/lnternat'l.

Activities, cont'd.

NIN New Direeinns

Climate Committee

Publications



LTER Research Coordination. Carolline Bledsoe's LTER research

coordination activities will continue under subcontract to the coordination grant.

She wili work in three areas with LTER: (1) NSF program staff (Edwards,

Roskoski, Penhale, Callahan, Reynolds, Wooley, Systematics, and Integrative

Biology.); (2) the LTER Network Office (developing a bibliographic database,

core dataset directory analysis, research capabilities, NSF communication and

planning; and (3) scientists at sHes (links to other networks, Network of

Networks, trace gas pilot study, pilot synthesis project, global change book).

The trace gas study involves a consortium of U.S. agencies (NSF, DOE, NPS,

NOM, ARS, IGAC/IGBP) who will arrange funding to start the project and hold

a workshoP~ Dr. Bledsoe asked sites to participate in the plannina phase.

Focus 2/GCTE Meeting, Trondheim, Norway. John Vande Castle reported

on the June 1991 meeting on Global Change and Terrestrial Ecosystems

(GCTE), which addressed global change research initiatives at the international

scale. The focus of proPosed research activities (with possible LTER

collaboration) wiil be on modeling to integrate a wide range of temPoral and

spatial scales, from patch through landscape to region, using remote sensing

and large databases. (A report on the meeting is available from the LTER

Network Office.)

A Focus 3 workshop on global change and forest ecosystems will be held

in Seattle next fall. The Network Office will assist with coordination.

Liz Blood reported on new research directions, restructuring and reorganization

reflected in North Inlet's renewal proposal. The proposed research links

regional to local and regional scale processes (including El Nino and La Nina

effects), and looks at the major terrestrial impacts of Hurricane Hugo, including

geological processes, soil and vegetation Patterns and salinity, and interannual

variation in sea-level rise. The significant difference in the proposed program is

the soil-based terrestrial component, gradients across the landscape to tidal

creek, looking at gas fluxes, vegetation patterns, soil dynamics, perturbation,

exchanges across the landscape, and the role of disturbance. With funding

from NOM, urbanization impacts are also being studied.

Bruce Hayden reported that storm data for all sites is now accessible over

LTERnet, and that the climate bulletin board, Climate Ecosystem Dynamics

Bulletin (CED), the first issue of which went out over LTERnet, has been

developed. Issues will be posted periodically. Hayden solicited contributions

and additional names of people, including non-LTER collaborators, who would

be interested in receiving the information regularly. David Greenland, Tim Kittel

and Bruch Hayden have submitted a proposal to update the climatic description

and synthesis monograph for LTER. The comparative analysis chapter will be

redone and the issue of climate change across LTER sites (including new

LTERs) will be addressed. The Network Office will publish the document.

Jerry Franklin introduced the development of policy for the LTER publications

program which, already in the works, was accelerated by recent requests of the

Network Office to quickly produce and distribute reports. He also noted that the

Executive Committee asked that a site distribution map, errata sheet, and an



Publications, cont'd. insert with an Executive Summary or statement of purpose, and a description of

the Network Office, be added to the current sHe directory with mailings, and

that these be included in future editions. Stephanie Martin reported that

publications capabilities at the Network Office have been upgraded to allow for

more compatible file exchange and more efficient production. She distributed a

draft publications program description including goals and objectives, types of

pubiications, author guidelines, status of projects, and a survey for feedback on

the Bulletin and the Network News. Also distributed at the meeting were the

technical report prepared by David Foster and Emery Boose (HFR), and a data

management survey by Scott Chapal (NIN) and Rick Ingersoll (NWT).

Stephanie invited regular feedback from the sites on the direction the

publications program is taking.

Data Managers

Report

Updated MSI

Robert Waide (LUQ) announced that the current issue of Biotropica, which

features LUQ and NIN. will be sent to each of sites.

James Brunt reported on the activities and achievements of the data managers

detailed in the proceedings of the August 1991 meeting in San Antonio, Texas,

which was recently distributed by the LTER Network Office. (Additional copies

are available.) The document includes information on current working groups;

outreach to groups such as OBFS-SAML, CERN, and LMER; a proposed

international symposium; the Databits newsletter; the data management history

file; SCS collaboration; the development of a data management slide

presentation; participation in the LTER review and panel process; and quality

assurance and quality control.

Future meetings: '93 (date undecided), to include representatives of OBFS,

SAML, LMER. The group will meet for three days in Madison, Wi in conjunction

with AIBS: '94 in Albuaueraue. NM (Paul Risser wiil be kevnote sPeaker).

Jerry Franklin reported that he had originally wanted an minimum standard

installation (MSI) document included in the technical report prepared by David

Foster and Emery Boose, but that it became clear the MSI would first need

updating and expanding with input from the Pls and data managers. Rudolf

Nottrott drafted and circulated an update for site input, including GIS,

LAN/WAN, and high-capacity data storage systems. Prices were not included

because they are too variable. Response so far from data managers is that full

implementation of the suggested updated version of MSI would require full-

time-plus data management personnel. Other feedback suggests that it is too

early to implement the structured query language (SQL) database standard

recommended in the document, so it wili not be included. The LTER/EXEC

recommended publication in a refereed journal, such as BioScience. Rudolf

reauested additional response from Pls.

SprintNet AccessDaniel Pommert, LTER Systems Analyst, described how LTER personnel may

now access the long-distance SprintNet connection to LTERnet while on travel.

This allows access to LTERnet functions, plus long-distance calling at no cost,

since the LTER Network Office picks up the tab.



Remote Sensing

Acquisition John Vande Castle reported that satellite scenes for several sites have been

rejected, but are being re-acquired. EOSAT is backlogged, a situation which is

delaying processing of the data. All but five of the SPOT satellite images have

been acceptable. SPOT 2 images have better resolution than SPOT 1. NDVI

(USGS) data are composited every two weeks and are available on CDROM.

Possible NASA/

EOS CollaborationSteve Running proposed that LTER consider an organized and mutually

beneficial monitoring effort, perhaps for ground truthing/monitoring in connection

with the development of the new Earth Observing System (EOS). He requested

both political and scientific input from LTER as this program deveiops, and

noted that this would be an opportunity for LTER to help shape the final EOS.

Major goals of EOS: understanding the Earth as a system, and supporting

national poiicy determination. Running noted that in the current design, "user

community" is not defined, except for universities. He hopes to have a

preproposal ready to test out within six months. Within NASA, the best people

to talk to initially in favor of the idea of a collaboration are Dickson Butler/EOS,

Diane Wickland/Earth Science and Applications Division, and Tony Janetos.

Possible areas of interchange: land-cover vegetation map; leaf area index map,

possibly done seasonally; net primary production; standing biomass; litterfall,

soil carbon/respiration; daily standard meterological data; seasonal snowcover

and snowmelt; soil structure and moisture depletion; hydrologic discharge from

gauged watershed, soil nitrogen, foliar chemistry; lake ice cover, temperature,

and chlorophyll.

What NASA wants: satellite-derived regional landcover maps defining biome

coverages and facilitating quantitative change detection; regional maps of

seasonally dynamic LAI, NP by biome type; regional maps of a variety of

ecosystem processes in conjunction with integrated remote-sensing-ecosystem

modeling projects; near real-time fire maps; regional databases of daily surface

meterology, cloudcover and aerosol corrections, temperature anomalies,

surface wetness, surface resistance, etc.; higher spectral resolution VIS-NIR

data researched for estimates of various nutrient cycling variables; radar and

microwave products for spatial soil moisture, snowpack, microtopography, etc.

Bruce Hayden reported that VCR was encouraged by the results thus far of

their collaboration with NASA in evaluating EOS. John Briggs (KNZ) and Tim

Seastedt reported that they got and may continue to get a lot out of the

NASA/FIFE experience. Phil Sollins (AND) suggested that a standing

commimee in remote sensing be set up to study the question, utilizing

specialists in the Network. Jerry Franklin recommended that as a beginning a

smaller group, perhaps at Trout Lake, meet to provide feedback to Running. He

took a poll of the sites, which revealed unanimous support for the proposed

collaboration. Bill Schlesinger suggested that the LTER/EXEC develop a

preproposal, including the conceptual argument and political justification; then,

personnel with the technical expertise could be brought in H the preproposal is

well-received. Jerry Franklin proposed that the LTER/EXEC and interested

individuals meet at Trout Lake to formuiate the basis of a preproposal.

Working group: Jim Gosz, Bruce Hayden, Bob Waide (LUQ), Phil Sollins

(AND), John Magnuson (NTL), John Aber (HFR), Tom Gower (NTL).



SYNTHESIS SESSION

Introdilction John Hobbie (ARC;) and John Magnuson (NTL), co-chairs. Goals of the session

were to consider: What synthesis work have we done so far? How can we

encourage Network science and synthesis? What are the promising topics and

opportunHies? What are the techniques/strategies for carrying it out? Brief

reports on intersite synthesis followed, including process studies, climate

forcing, spatial variability and temporal variability, and scaling up to regional

and continental scales.

PROCESS STUDIES:

Tilman & Zak/CDRSoil microorganisms along a gradient of climate on plant production. Donald

Zak and David Tilman studied C and N cycles in terrestrial ecosystems, scaling

up from old fields to entire biomes.The work included 10 LTER sites wHh

varying degrees of plant production, taking 10 samples along a transect.

Analysis of organic C and N was completed within 24 hours of sampling.Tilman

and Zak used multiple linear regression models to predict soil microbial

biomass, soii respired C and mineralized N.

Schlesinger/JRNSoil Warming Experiment. On September 27-28, 1991, an NSF-supported

workshop was held at Woods Hole to identify scientific questions and critical

research needed to improve understanding of the effect of warming on soil

processes. Ten recommendations for the initiation of a long-term, multi-site soil

warming experiment to understand the response of soils to global climate

change were developed by participants. These are outlined in a report on the

workshop available from Bill Schlesinger. A multi-site proposal to NSF is

currentily being developed toward meeting the June 15 deadline.

Gower/NTL Network litter decomposition project. Tom Gower reported for Mark Harmon

(AND) on the 1 Syear test of climatic and substrate quality control of fine-litter

decomposition involving 21 sites, 17 LTER sites. All sites participated in the

successful initiation by collecting litter, placing materials in the field, and

providing information about the sites. Modelers will predict C, N, and P

dynamics and validate models from the field study, and an analysis group will

perform chemical analysis, data management and preliminary data analysis.

Sollins/AND Nvtrient cycling comparisons using models. Phil Sollins and his collaborators

John Westall (OSU) and Paul Verburg (Wageningen Agricultural University)

compared acidification, nitrification, and pH values of soils at participating sites:

Cedar River, Solling (beech, spruce), Hubbard Brook, and H.J. Andrews.

Boone/HFR Intersite Detrital Inputs, Removal, and Trenching (DIRT) study. Richard Boone

reported that this study was an outgrowth of the LTER Decomposition

Workshop which draws on manipulation experiments conducted by Francis in

'50s at the University of Wisconsin and Knute Nadelhoffer's 30 year C/N study.

HFR study treatments: control; no litter; no roots; no liter/no roots, double litter;

organic and A horizons replaced with B horizon soil. Boone suggested that the

study is a good model for intersite work: DIRT plots may provide a relatively

easy, low-tech way to determine the relative contributions of root respiration

and soil organic matter decomposition to C02 flux from the soil. A proposal to

NSF is currently being developed toward meeting the June 15 deadline.



Discussion/Summary

John Magnuson asked the group to cite examples of synthesis work with data

collected under the LTER Program. Jerry Franklin cited tree demography work,

Magnuson's variability work, and the iitter decomposition experiment. To the

question of why more synthesis hasn't been done, Magnuson suggested that

perhaps the measurements at the sites are often site specific and that more

general approaches are needed for synthesis among such diverse site and

straight data comparisons.

CIJMATE FORCING

Hayden/VCR

John Kuabach

UW Madison

Rastetter/ARC

Further discussion addressed the usefulness of the Network database, the

standardization of measurement techniques, and whether there are holes in the

measurement and analysis program rather than in data management. He noted

that it is in the nature of the sites that each has its biases. What process-level

questions, given the structure of LTER, can be answered? The litter decay

study suggests a possible synthesis approach, continuing to build in more

standardization, comparability and sample exchanges. There are no measures

to go along with the diversity data to expand from local to cross-site/regional or

global scales. More examples: hydrological modeling, integrated forest sites,

biogeochemical models.

Synthesis in climate study. Bruce Hayden The proposal to NSF (see "Climate

Committee," page 1) includes an update of the LTER climate monograph, and

a time-series analysis of temperature and precipitation and climate change at

AGlNh of thA | TFR RitAR

Climate global simulation models. John Kutzbach pointed out that climate

model outputs will be at a scale useful to ecologists within two years. He

presented examples of grid-scale/computing time simulations; nested (problems

at boundaries), fine-mesh models and; statistical hnest-scale structure models.

The kinds of experiments to which these are suited include: present climate;

past climate; ZXC02, 4XC02 (equilibrium/transient); surface winds (temp and

precip); predictions of how circulation winds wouid change; paleoclimatic data

(over last 18,000 years): pollen, lake-level, midden, marine. With such models,

climatic, topographic, precipiation grids from 5ø x 5ø to 1/2ø x 1/2ø can be

generated. There have been modest improvements in resolution already; for

example, the NCAR model (GCM2) which will be available to NSF users in

October '92. Computing time to process the 1 00-fold increase in data is the

only problem. One solution Kutzbach suggested LTER should consider having

a dedicated: parallel computers could be built for about $100,000 each to work

at 1 ø-resolution.

Biogeochemical models and climate forcing. Atmospheric Carbon Budget, PCC

Scientific Assessment. Bob McKane (CDR) reported for Ed Rastetter. Using

MBL GEM model (1/2ø x 1/2ø scale), studied N input, temp, CO2 vegetation,

soils and litter, GPP, NPP, NEP, and soil respiration measurements at nine

sites (temperate deciduous forest, consferous forest, temperate prairies, high-

latitude ecosystems). Observed changes in N storage, soil and vegetation with

temperature increase. All participating sites (AND, ARC, KNZ, CPR, others)

were LTER sites except Brookhaven.



Summary John Magnuson asked the group to consider whether there are obvious climate

experiments/comparisons of interest to LTER sites; for example, temperature

records, "retrospective" simulations, limnolos.cal ice-cover, surface water

temperature, trend data (for next climate monograph), paleoecological data

(pollen, cores)?

TEMPORAL and SPATIAL ANALYSES

Mever/CWT

Intersite comparison among streams. Judy Meyer reported that as an outgrowth

of the 1990 LTER All Scientists Meeting, Network stream researchers

formulated a questionnaire to compile basic information on the types of streams

found at LTER sites, with the goal of identifying commonalities and stimulating

and facilitating intersite stream research. Participating sites: CWT, AND, ARC,

BNZ, HBR, KNZ, LUQ, NWT, NIN, NTL and SEV. Included are physical,

chemical, and biologicai characteristics of streams.The information will be

produced in May 1992 as an internal research report at the Network Office.

Kratz/NTL Comparisons of variability among sites-on-site measurements. Tim Kratz

described the variability work done at NTL which, starting with 12 sites as data

points, combined a total of 448 datasets in a melting pot approach to finding

commonalities. The data sorted into four types of comparisons as influenced by

variability: (1) aggregation, (2) biotic vs. abiotic, (3) spatial vs. temporal, and (4)

landscape position.

SYNTHESIS and SCIENCE

Scaling Up: Continental & Global Scales

Coffin/CPR

John Hobbie cited various examples of larger-scale models: land-use change,

CO2, and country-by-country scale models that would interact with GIS and can

operate on several different scales, utilizing vegetation, soils, temperature,

precipitation, and cloud data (1/2ø x 1/2ø cells). One can interact that model

1,000 times on a monthly time-step. Because these are process-based, one

can chanqe the factors: annual NPP, NDVI, etc.

Cross-Biome Modeling Project. Deborah Coffin described CPR's analysis of the

response of the central Great Plains to climate variability over short and long

temporal scales using ecosystem simulation models (CENTURY and STEPPE).

A spatial database for the central Great Plains and adjacent areas of the

Central Lowlands was developed and stored in a GIS. Long-term climate data

for more than 400 weather stations in the region from the CLIMATEDATA

database, and soils data from the USDA Soil Conservation Service STATSGO

database, were overlaid in the GIS to produce a polygon map of input

variables. Model output was then mapped for analysis of sensitivity to short-

term climate variation. Found that the region is susceptib,e to significant

reductions in primary production in response to short-term variation in climate.



Discussion/Summary

After some concerns were expressed that synthesis is being presented as a

requirement at LTER sites, and that its value is being oversold, John Magnuson

stressed that, to the contrary, synthesis should be viewed as an opportunity,

not a requirement. He noted that the National Science Foundation is interested

in seeing synthesis activity stimulated because of the research opportunities

that exist in commonalities among sites: common data, common process,

common forcing, common question, common models, common tools

(approaches, methods), and common funding. Some synthesis would require

going beyond LTER, but would not necessarily require that all LTER sites be

included. Introducing the next activity, Magnuson and Hobbie asked the group

to consider: What synthesis will LTER propose to do? Who is going to lead it?

Working Groups Participants were divided into five subgroups to generate one to two questions

each on the scope of intersite synthesis. John Hobbie challenged participants to

explore the feasibility of each synthesis activity proposed, as well as the

interest of potential collaborators. Spokespersons for each group reported the

following:

Synthesis Questions

1. Influence of animals on ecosystem processes, terrestrial/lake/ocean. The work would involve

measuring stable isotope (nitrogen) signature and detritus, looking at year-to-year temporal variability.

2. Belowground processes, "Soil Ecological Health." How can site degradation, soil ecological health,

be measured? What are the legacies of past land use on belowground function/health? This actifity

would have three steps: (a) a survey of soil parameters; (b) a workshop in which participants bring data

and work with a simple root model, predict production and compare to actual values; and (c) new data

on soil ecological health.

3. Climate hydrology. This work would continue climate comparisons already completed, including El

NiPo phenomena (how they relate to process and controls at the sites), early-killing frosVperiodic

resetting events, snow and under snow conditions, cyclone frequency, and other climate datalstorm

impacts, as well as the occurence of rare events. The comparison would include hydrology (rates,

gradients, interannual variation, microbial diversity); waterflow and environment (rates and resident

times of lake, stream, and qroundwater); and the effect of snowpack and viability of orqanisms.

4. Microbial diversity in soils. This would be a comparison of different climatic regimes across aquatic,

terrestrial, and marine sites, looking at microbial diversity from different scaies. Samples would be

collected using chemical signatures. Measuring methods would include carbon oxidation (bioplate), and

FAME analysis ffatty acid content in soil, unique to certain microbial communities).

5. Chihuahuan desert. This three-site (SEV, JRN, CPR, possibly to include CDR as a fourth site)

analysis of species distribution from desert to grassland would relate to diversity and ecosystem

processes. The work would include a team search both in libraries and the field for common datasets,

sampling along a gradient from Mexico to Colorado, and possibly Michigan, and would contribute to

NSF's activities in biodiversity and systematics.

6. Trend Analysis of Lake Ice, Surface Temps, Thermoclime Depth. This analysis, which will follow a

workshop planned in conjunction with the ASLO '93 meeting, proposes to use existing long-term

datasets from ARC/NTL/CanadalSoviets/UK to look at trends in warming which are greater in terms of

latitude, and coherence in pattern as a function of lake size and latitude. Organizers expect to produce

a publication in a peer-reviewed journal.



10wYear LTER Program Review

On Saturday, James Edwards had requested input for the upcoming 1 0-year review of the LTER

Program NSF is undelvaking. ile had asked that the sites consider the following questions for

discussion: (1) Why is LTER more than the sum of its parts? (2) What about LTER Network resuRs is

greater than individual site results? He noted that synthesis wouid be of paramount importance as the

evsillstinn ic IJndertsken.

Jerry Franklin chaired the session, and asked the group to provide input for NSF. He noted that LTER

participation in this process should also help to idenufy goals of the Network for the next 10 years,

revealing issues of continuity and appropriate levels of standardizing measurements. He began by

posing possible questions for consideration during such a process: How has LTER made use of long-

term records? What use has been made of the five core areas, how well have they served us? What

has LTER done differently, working collectiveiy as a network as well as doing very good individual site

science? What use have we made of the Network Office? How have we advanced information

management? How have we advanced basic ecologicai knowledge? How productive have we been

compared to our non-long-term peer groups?

Ouestions/Suggestions from participants:

(1) Stress the long-term nature of funding support (detaii the financial base), and the unique

Product(s).

(2) What trends would we have seen withouVwith this long-term support, what societal gains?

(3) What societal gains have been achieved?

(4) Include federal agency participation in the review process, since they use LTER material and

participate in LTER science.

(5) How has LTER research influenced government decision-making?

(6) How well have links between the science and feedback worked?

(7) In what ways have LTER approaches assumed a leadership position/provided successful models?

(8) How well have we developed standards/guidelines?

(9) What has been LTER's role in educating future ecoloXqists/our legacy in terms of students?

(10) What has been the value of having sites in place to capture results of episodic phenomena?

(11) Document programs that have tried to emulate LTER.

(12) How has LTER used existing data?

(13) Balance of short-term results versus longer-term charge.

(14) LTER technological innovations/new technoiogies.



1bYear Review, continued

(15) Development of interdisciplinary interactions/social and economic sciences.

(16) How well has the database served us?

(17) How well have we approached the synthesis objective?

(18) "Network of networksU idea.

(19) Management of LTER, how well has it served the science?

(20) Sites as local nuclei, attracting science and developing relationships with non-LTER scientists.

(21) LTER workshop approaches.

(22) Early efforts at cross-site analysis/comparisons.

(23) Extent to which we've been able to set up experiments for long-term use, the legacy of our

experiments.

(24) Compare what we offer versus the alternative, in a positive sense.

(25) Has age profile of researchers changed over the decade?

(26) Relationship to Long-Term Studies Section of ESA.

(27) What has been the role of mid-term reviews?

(28) How well does LTER Network cover essential systems and processes?

(29) What has been the effect of continuity on understanding systems?

(30) Is the character of the latest cohorts different?

(31) What is the measure of enthusiasm for scaiing up?

(32) To what extent is LTER representative of the broad field of ecology?

(33) How has LTER closed links between the physiological and biological sciences/the terrestrial and

aquatic?

(34) What effect has LTER had (service, education) on other entities/agencies, both the explicit intent

and the unanticipated results?

(35) What have we contributed to larger earth-system science/global scientific issues?

Minutes rerorsbd by Stephanie Martin