Minutes of the LTER Executive Board Meeting
February 16, 2010; 1-3pm EST; Videoconference

1. Meeting called to order at 1 pm by Chair Phil Robertson; Members attending: Nick Brokaw, David Foster, Ted Gragson, Corinna Gries, Sarah Hobbie, Dave McGuire, Bob Waide, Mark Williams; Unavailable: Hugh Ducklow, Sally Holbrook, Steve Pennings.

2. Minutes for 27 January 2010 approved by consent.

3. Announcements and Updates
    a. NSF has announced the new DEB Division Director, Bette Loiselle, Univ. Missouri – St. Louis.
    b. Robertson noted that the CI/NIS portion of the LNO Operational was approved by email polling, as decided at the 27 January meeting; Bob Waide noted that the revised plan is now on its way to NSF in preparation for the 3 March reverse site visit in Arlington.
    c. Robertson noted that we have been approached by a group at UC-Santa Barbara to participate in their synthesis center proposal; no other contacts to date; we will discuss further when more information is available.
    d. Waide noted the ad hoc Communications Strategic Plan Committee is now formed and will be meeting over the next 2 month; members are Waide, David Foster, Peter Groffman, Dan Reed, Robertson, Marcia Nation, Karen Baker, Jonathan Walsh, Daniel Nidzgorski,and McOwiti Thomas. Kathy Lambert will serve as facilitator.
    e. Robertson noted the upcoming ISSE symposium at AAAS February 19, with presentations from Dan Reed (SBC); Mike Agar and Scott Collins (SEV); and Mary Cadenasso and Steward Pickett (BES); Robertson will introduce and moderate.
    f. The LTER Minismposium will be held March 4 and plans are to webcast, with an invitation to all LTER to join; Cheryl Dybas at NSF is preparing a press release; program attached.

4. Remaining post-ASM Working Group Proposals
   Robertson noted that 2 post-ASM Working Group proposals are still pending from the December competition. Waide reported that the Karen Baker (LTER Unit Registry) proposal will be funded now that IMExec has endorsed the proposal as requested by the EB. The proposal by graduate students Todd Robinson et al. (within season rainfall variability) has been revised as requested; Nick Brokaw, Mark Williams, and Waide have reviewed the revision and recommend funding, which was approved following discussion. Waide noted that the next competition should follow the steps set out in the Operational Plan for IM production and training workshops.

5. Strategic Implementation Planning (SIP)
   The SC has now been informed of plans for an SIP workshop at the May SC Meeting at PIE. Discussion centered on plans for the preparatory meeting in March. A meeting with Acting BIO AD Joann Roskoski is planned for prior to that meeting;

6. Legacy Data Prospectus
   The ad hoc Legacy Data Prospectus Committee (Peter Groffman, chair; Emery Boose, Ted Gragson, Don Henshaw, Dave McGuire, Debra Peters, and Wade Sheldon) have submitted a draft prospectus. The EB endorses the prospectus (attached) with the suggestion that funding be made less specific for now. The committee also suggests that the portion covering NIS/PASTA integration might be best omitted from initial external discussions. Robertson will prepare a revision without this section and with a less specific funding paragraph, solicit opinions from NEON, and then arrange to discuss with NSF program officers.

7. Earth and Sky Outreach Proposal
   We have been approached by the producers of the Earth and Sky radio network to participate in a proposal to NSF (Informal Science Education) to develop ~16 radio vignettes based on LTER research. There was general agreement that this should be pursued, and Waide will do so.

8. OSTP Grand Challenges Request
   The Network has potential to respond as an organization to the recent OSTP Grand Challenges Request, and Waide suggested that we might identify our Synthesis Prospecti as three parts to a general ISSE response. Discussion led to a consensus to pursue, and David Foster will work with Robertson to submit by the April 15 deadline.

9. NAB Charge for March Meeting
   The LTER National Advisory Board (NAB) will meet in Washington following the minisymposium on March 4. Robertson will be working with chair Carol Brewer to prepare the agenda. Discussion elicited suggestions to use the group to help plan for the strategic implementation plan, provide feedback on plans for the legacy data prospectus, and on developing relationships with other environmental observatories.

10. Upcoming meetings
    a. March 3-5, 2010 (Washington DC)
    b. April TBD
    c. May 11, 2010 (prior to May 12-13 SC Meeting; Boston)

Meeting adjourned 2:40 pm

Ecosystem Services in a Changing World:
Perspectives from Long-Term Ecological Research

9th Annual LTER Mini-symposium
March 4, 2010 (Thursday, 8:30 am – 12:30 pm)
National Science Foundation, Room 110 (no security check-in required)
Arlington, VA (Ballston Orange Line Metro Stop)

Organizing Committee: A. David McGuire (University of Alaska, Bonanza Creek LTER), Jess Zimmermann (University of Puerto Rico, Luquillo LTER), and J. Morgan Grove (USDA Forest Service, Baltimore Ecosystem Study LTER)

Moderator Phil Robertson, Chair, U.S. LTER Science Council (Michigan State Univ)

8:30	*Welcome and Opening Remarks*; Todd Crowl, NSF/BIO, Division of Environmental Biology
8:45	*Overview of Ecosystem Services;* Steve Carpenter (University of Wisconsin, North Temperate Lakes LTER)
9:10	*Ecosystem Services and Agricultural Systems*; Scott Swinton (Michigan State University, Kellogg Biological Station LTER)
9:35	*Ecosystem Services in Temperate Forest Systems*; Barbara Bond (Oregon State University, H.J. Andrews LTER)
10:00	*Changing Preferences for Ecosystem Services Over Time*; Chris Boone (Arizona State University, Central Arizona Phoenix and Baltimore Ecosystem Study LTERs)
10:25	Break
10:40	*Ecosystem Services in Residential Landscapes: Perceptions, Tradeoffs, and Cross-Site Research Opportunities;* Kelli Larson (Arizona State University, Central Arizona Phoenix LTER)
11:05	*Changing Urban Water Supplies in a Tropical Context*; Frederick Scatena (University of Pennsylvania, Luquillo LTER)
11:30	*Social and Ecological Impacts/Implications of Marine Reserves on Trap Fisheries*; Hunter Lenihan (Univ of California, Santa Barbara, Santa Barbara Coastal LTER)
11:55	*Ecosystem Service Impacts/Implications of Fire Regime on Human Subsistence*; Terry Chapin (University of Alaska, Bonanza Creek LTER)
12:25	Concluding Remarks
12:30	Adjourn

PROSPECTUS
(Jan 27, 2010 Draft)

Legacy Data from the Long-Term Ecological Research (LTER) Network to Support the National Ecological Observatory Network (NEON)

Introduction

Long-term ecological data are critical in providing temporal and spatial context to data collected by existing and emerging national observatories, such as the National Ecological Observatory Network (NEON) and the Ocean Observatories Initiative (OOI). State and federal agencies have been collecting ecological data at some sites since the early 1900s. However, the first coordinated data collection, standardization, curation, and accessability effort among a network of ecological sites was the Long Term Ecological Research (LTER) Program, which began in the early 1980s. This network of 26 sites represents the major ecosystem types of North America, and includes deciduous, coniferous, and boreal forests; arid, semiarid, and mesic grasslands, arctic and alpine tundra, freshwater lakes and streams, coastal and land-coastal interfaces, and urban and agricultural areas. In addition, most LTER sites have expanded regionally to include satellite sites; thus a broad range of variability within each ecosystem type has been captured by LTER data. A variety of different kinds of data have been collected from these sites through time, ranging from primarily climatic and human demographic data since the 1800s to more recent quantitative assessments of plant, animal, and microbial populations and communities, hydrological and biogeochemical cycles, biodiversity, and disturbance regimes. These detailed site-based data from experiments and monitoring studies provide a critical foundation for emerging observing systems such as NEON that are designed for national-level comparability and, by necessity, must tradeoff depth and richness of sampling at a site for breadth of sampling across many sites. Complementarity between “drilling down” by LTER sites and the standardized national sampling strategy by NEON will provide ecologists with the data and tools to make significant advances of importance to society. A critical need for this complementarity to work is the digital capture of the wealth of legacy data collected by LTER sites, and coordinated information management efforts among networks. This need would be addressed by this proposal.

LTER personnel are uniquely poised to take advantage of the power of legacy datasets, and to link with data to be collected by NEON. LTER scientists have intimate knowledge of the datasets, and are the experts needed to decipher legacy data. Information managers at LTER sites have led the development of metadata standards, data dictionaries and software for data integration. LTER sites have made great strides in bringing legacy data sets online over the past decade, but limited resources for data curation and information system development have hindered progress. Consequently, many valuable legacy data sets are stored in non-parsable file formats without comprehensive structural and semantic metadata, preventing access through federated database systems and centralized repositories. Even when legacy data are stored in modern information systems with detailed metadata, variations in methodology, attribute names, units, measurement scales, code lists and quality control annotation complicate data integration, preventing automated approaches to data synthesis.

The LTER Network Office is currently developing a software framework for advanced data integration and synthesis (PASTA - Provenance Aware Synthesis Tracking Architecture) as part of a Network Information System (NIS), which will provide dynamic, centralized access to LTER data for NEON and the broader ecological community. However, this framework will not meet its full potential without a corresponding investment in LTER data curation and information system development. Important advances in data standardization and comparability have been made for a small subset of LTER data sets, primarily climate and atmospheric deposition, in the EcoTrends Project (http://www.ecotrends.info). However, significant effort is required to decipher and standardize legacy data formats for most biotic data, develop consistent code dictionaries, harmonize attribute names and scales, and produce comprehensive syntactic, structural and semantic metadata to facilitate computer-mediated integration. In many cases, biotic legacy data exist only on datasheets in non-standard formats with limited metadata; a large investment is required to capture these data digitally in a format that allows access by many users. In addition, investments in computer hardware and software development will be required to modernize LTER site information systems to support database federation, web services and grid-computing protocols needed to interface with PASTA and NEON informatics centers.

Priorities for Legacy Data

Ready access to LTER data by the scientific community would advance the mission of the NEON program: to enable understanding and forecasting of the impacts of climate change, land use change, and invasive species on continental scale ecology. Though extensive, the NEON measurement suite is necessarily limited in time, space, and object of study. The LTER Network could provide scientists with essential complementary information (historical and contemporary) to make the best possible use of NEON data. Though the two programs are different in design and purpose, there are nevertheless important points of contact. For example:

(1) LTER data currently include up to 30 years of intensive measurements (observational and experimental) at individual LTER sites, augmented in many cases by extensive historical, archaeological, dendrochronological and paleoecological records and observations covering the Holocene and in some cases further back in time. These data could provide a critical temporal context for the development of models and the interpretation of trends arising from NEON observations. In particular, land-use and land-cover data from pre-historic to early historic settlement periods, gained with great effort at many LTER sites and difficult to obtain (or unobtainable) from other sources, would directly inform the NEON Land Use Analysis Package.

(2) LTER and NEON sites are partially co-located in the current NEON design. Roughly half of existing LTER sites will be NEON sites; other LTER sites may serve as relocatable sites in the future; and some non-LTER sites that participate in LTER projects such as EcoTrends are also NEON sites (e.g., Santa Rita Experimental Range, Walker Branch Watershed). Where sites coincide, LTER data could directly complement NEON measurements. Where sites do not coincide, LTER data would extend the geographic coverage of measurements in individual NEON domains (each of which has a maximum of three NEON sites). Most LTER sites have a long history of intensive regional studies that could further extend this spatial coverage. Finally, proposed LTER Network activities (such as the future scenarios study) will explicitly include NEON sites and so increase the overlap and complementarity of LTER and NEON data.

(3) Some LTER measurements will align closely with their NEON counterparts, especially in the areas of meteorology, hydrology, and atmospheric exchange to be addressed by the NEON FIU (Fundamental Instrument Unit). But a great strength of the LTER program is the range and diversity of its studies in organismal ecology, biodiversity, phenology, biogeochemistry, and invasive species. These areas will be addressed by the NEON FSU (Fundamental Sentinel Unit), which is necessarily limited in scope and extent to substrate measurements and indicator species. The breadth of LTER data would prove critical as scientists seek to confirm trends emerging from NEON observations and explain underlying mechanisms.

Structure of the Program

We envision an effort where the LTER Network Executive Board establishes a "legacy data" committee charged with providing scientific direction, oversight and evaluation of site activities and coordination with NEON personnel and activities. The committee will have a mixture of LTER scientists and information managers and will prioritize specific cross-site legacy data efforts, develop protocols for making data compatible with PASTA and ensure that sites comply with agreements to provide formatted and standardized data and metadata in a timely manner. Experience with the EcoTrends Project has shown that it is essential that scientists familiar with the collection, analysis and interpretation of specific data types be involved in this effort to ensure that high quality and compatible cross-site data are produced.

The vast majority of funding would go directly to LTER sites for use in multiple ways; hourly help for data entry, support for informatics professionals to make data compatible with PASTA standards, and scientist time for oversight and direction. Sites would be required to provide annual reports to the LTER Executive Board and NEON personnel on progress towards achieving specific objectives.

We recommend that each LTER site receive funds equivalent to 2 or 3 full time equivalent positions over a three to five year period (200 – 300K per site). Funds should also be allocated to support the time and travel of the Legacy Data committee (150K/year). Total funding for this effort could thus range from $5 – 15 million over a three to five year period.

Mechanics/integration with NIS and PASTA

NIS is an infrastructure to enhance the flows of data, synthesis and knowledge about ecological systems to support research collaboration across LTER and partner sites. It consists of information technologies and information products resulting from research activities across LTER and partner sites, and consequently depends on the quality, integrity, and comparability of site data repositories achieved by the implementation of shared standards, software tools, training, and support. The PASTA framework will provide critical cyberinfrastructure components to accomplish the stated objectives for the NIS and is currently under development at the LTER Network Office (LNO).

A fully functional NIS will place considerable demands on personnel resources at individual sites, particularly on site information managers, to assure 1) creation of well documented and

quality data products for harvesting into the NIS, and 2) development of standardized approaches and best practices to both improve the quality of LTER data and to facilitate data synthesis and integration. As LTER research transitions from individual, site-based science to broader, more integrative research platforms, so must site information systems evolve to produce the comprehensive structural metadata and quality legacy data now required for participation in a federated database system such as the NIS. Task forces of site personnel will be assembled to develop best practices for information management including quality of LTER metadata documents, data quality assurance techniques, controlled vocabularies for keywords and units, and standardized attributes for common dataset parameters. These efforts will aid preparation of site data for dynamic, metadata-driven loading into the PASTA framework and thereby facilitate the development of derived and other value-added data products. Standardized approaches for such issues as sensor network management and observational data models will be necessary to take full advantage of the PASTA architecture. Successful implementation will be dependent on site expertise and accomplished through both local site efforts and site participation in production workshops.

LTER information managers and scientists will also participate in NIS development through an integrated approach with the LNO by 1) informing the development of the PASTA framework components through transfer of expert knowledge and experience to NIS developers, and 2) participating in the development of NIS tools and applications including those that specifically support site information management needs. Information managers will participate in use-case development to determine the functional requirements for PASTA components. The coordination of site and network development efforts will require personnel resources at the sites to ensure that operational steps meet the time-sensitive milestones for NIS implementation. Concurrent development and improvement of site information systems and databases to match the operational development of the NIS at the LTER Network Office is critical to the overall success of the network-wide system.

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