

SUMMARY AND OVERALL RECOMMENDATION

This report of the LTER Network Office (NET) review panel begins with an overall recommendation to NSF below, followed by six specific recommendations and a note about the process of proposal review. The eight panel members provided ad hoc reviews of the NET renewal proposal prior to a site visit by seven of the panel members for two days on October 16-17, 2002; the recommendations of this report have the agreement of all eight panel members. The Overall Recommendation and the six Specific Recommendations below are based on these reviews, on presentations by the NET staff, and discussions among the panel members.

The panel Summary and Overall Recommendation begins by acknowledging the apparently (see recommendation 2 below) excellent core work being performed by the NET in service to the LTER sites and network, and the strong view of the panel that such work should continue to be funded by NSF. Below we describe these strengths and accomplishments.

Strengths and Accomplishments:

The Network Office (NET) has used prior funding (both base and supplemental) to make substantial strides in their overall objective of improving the quality and quantity of science performed within the LTER Network. The list of activities and outcomes is formidably long; particular strengths that the panel team wishes to acknowledge include the following:

- Successful transfer of the NET operations from Seattle to Albuquerque and the exceptional continuing support (salary cost share, facilities, connectivity, high level administrative support) of the University of New Mexico;
- Coordination of meetings that succeed in creating and maintaining collaborative and synthetic interactions among diverse and dispersed LTER researchers (Coordinating Committee meetings, the annual science theme meetings, the periodic All Scientists' Meetings, the meetings of the Information Managers' Committee);
- Creation and maintenance of communication tools linking the scientists of the Network (email services, web-based information and portals, the LTER Intranet);
- Production of extremely high-quality publications in a variety of formats addressed to various scientific and external audiences (the brochures, the outreach materials, the newsletter);

- Building a qualified core of staff members in the Network Office who effectively serve as liaisons or links between the ecological research community and the Information Technology community, to facilitate the ability of scientists to find and use the tools appropriate to their collaborative investigations;
- Assisting the scientific communities of other nations in the creation of networks of long-term research sites, and assisting U.S. scientists in exploring opportunities for international collaborations.

Finally, the panel was impressed with the high level of dedication and energy contributed over many years by an exceptionally capable set of staff members, as evidenced by the flexible and smooth operation of the site visit, and the warm welcome enjoyed by all.

Questions and Concerns:

Despite the great strengths of the NET in the performance of core functions over the past six years, the Overall Recommendation of the panel has been greatly shaped by two areas of concern that will form the substance for six Specific Recommendations of the panel below.

- 1) The first of these concerns involves a number of key areas where critical information is lacking (i.e. evaluation of the NET from each LTER site; evaluation of existing educational activities; strategic assessment and plan for NET management structure and operations; UNM administrative changes for NET and the Sevilleta LTER site; user-needs assessment for information technology; clear priorities among NET activities). This absence is either because the information has not been gathered or because it promises to emerge from current or requested planning efforts by the NET and related organizations or agencies (the LTER Executive or Coordinating Committee, the LTER Education Committee, the NSF). As the coordinating office and “glue” for the LTER network, successful leadership at the NET depends critically upon these kinds of internal and external assessments as a beginning point and foundation for strategic planning.
- 2) The second of these concerns involves questions about the intellectual or tactical approaches proposed by the NET in undertaking new initiatives for which major increases in funding have been requested. Both LTER leadership and LTER committees (e.g. education, coordinating) have been developing strategic plans. The NET must also develop strategic plans that integrate the needs of the sites, NSF requests, and its own priorities into a programmatic vision that establishes overall priorities, action plans, and evaluations. Without these demonstrated measures of leadership, the NET will continue to “react” to external opportunities and requests rather than exert the leadership of which it is so capable.

These concerns about the absence of critical information and problematic approaches will be detailed below in the six Specific Recommendations.

Overall Recommendation:

The Overall Recommendation from the panel to NSF is that the cooperative agreement with the NET program be renewed for a period of one year at its current level plus a cost of living increase. During the coming year we recommend that NSF request a detailed addendum prepared by the NET, to be delivered to NSF by November 1, 2003; and to contain the information requested in the six Specific Recommendations below. We further recommend that NSF convene a formal panel prior to the end of the one year cooperative agreement on March 1, 2004 to review this addendum and the continuing operations of the NET. This second panel will provide a new recommendation to NSF for a longer-term renewal of the cooperative agreement and the level of funding to be provided for the operations of NET.

SPECIFIC RECOMMENDATIONS

Specific Recommendation 1: A Strategic Plan for NET Management Structure and Operations.

In the number of sites and the scope of its work, the growth of the LTER program (and therefore the responsibilities of the NET) over the past two decades requires a new paradigm of management than that which has previously governed this program. The NET has operated under a model that grows staff or adds new responsibilities to existing staff without the benefit of a strategic plan for its management function and the appropriate administrative structure for the coordinating office. This model of operations is not sustainable.

The original 5 core functions of the office, along with the responsibilities identified in the Cooperative Agreement with NSF, provide considerable tension that must be balanced by the NET. Therefore clear goals and priorities must be articulated if the NET is to strategically meet and progress in those outlined responsibilities. In addition, new strategic LTER goals and increasing requests from the LTER Coordinating Committee further increase the need for a strategic plan that defines the operations of the Net, identifies its role with respect to new initiatives, and prescribes the most effective management structure. The report of the SRC in 2000 identified several of these issues, along with the need to develop tools for evaluation and assessment of the NET. It is unfortunate that the NET did not make progress in this recommendation; as now, two years later, these same issues are a core weakness at the foundation of the renewal proposal.

A strategic plan for management operations will provide a foundation to achieve goals of a strategic, scalable and programmatic nature. It is the view of this panel that an outside consultant with expertise in facilitating and leading organizational strategic planning efforts would be most advisable to assist in the development of a strategic plan. The Executive Director should also view his primary objective to be the operation and management of a NET office that effectively facilitates and enhances the goals of the LTER, NSF, and the individual sites. For the NET to be effective in its leadership role, the management of the NET must recognize the functional requirements of the site programs that it serves, and the importance of outreach to the larger relevant communities (in IT, Ecology, Policy, etc.). This broad perspective is the primary function of the Executive Director. Without a NET strategic plan, there is no clear justification for expanded activities; nor is there a clear delineation of goals, objectives, and strategies for NET operations. These management tools are critical for the proper evaluation of activities and the tracking of accomplishments.

For example, is it a goal of ILTER to develop a “social network” where the measure of success is the total numbers of international LTER sites? Or is it to facilitate collaborative global research? Or is it to transition ILTER to exist as a separate entity? The measures of success would be entirely different in each case. The NET has repeatedly expressed the view that its “only interest is in facilitating the development of an appropriate model” in several new areas. The models of NET function should have been developed as a strategic plan and included in the proposal’s request for expanded services and subsequent expanded support.

Future sustainability of the operations of the NET motivates this recommendation. The panel recommends that the NET engage in a strategic planning process, in close consultation with the LTER Executive Committee/Coordinating Committee, that focuses on the NET’s mission, its role in relation to other organizations, and the most effective management structure (both internal to Net and overall). We further recommend that a strategic plan focused on management of the NET be included in the addendum to be reviewed in one year. This plan should include: a) a mission statement, management organization chart, and defined scope of external relations; b) mechanisms of personnel evaluation; c) reporting structures and mechanisms of accountability; d) relations to NSF, UNM and the LTER leadership; e) processes for program evaluation, priority setting, and priority implementation; f) defined role in LTER-wide initiatives; g) defined role in LTER-related research; h) assessment of the most effective structures and activities for independent advisory groups.

In defining its management structure and role, the NET can call upon the strengths of existing agreements about core responsibilities, a broad user community and the LTER program goals in the 2000-2010 document. The NET will clearly require additional financial support in the actual strategic planning process. This is distinct from the concept of outside management consultant support.

Specific Recommendation 2: A Program of Assessment and Evaluation.

Many of the NET's programs are clearly responsive to the needs of the LTER network, and are clearly valued by the network. Almost without exception the evidence for this success comes from personal experience and the interactions that occur during the day-to-day operations of the NET. Such evidence, however, tends to be subjective and anecdotal; fails to include the views of all participants in the network; and, therefore does not provide the strongest possible basis for planning and resource allocation. Thus, although we have an excellent impression of the NET's fulfillment of its core responsibilities, our impression is incomplete (see below) because of the lack of formal evaluation and assessment of these responsibilities by the constituencies served by the NET – the LTER Network sites and scientists.

Missing from the past activities of the NET, and from the proposal for future activities, is a systematic program of assessment and evaluation. Such a program could inform and direct many important parts of the NET operation. It could provide the kinds of "golden nuggets" that demonstrate the success of the NET in facilitating significant new discoveries by the network. It could provide numerical assessments of the use and value of NET activities that are much more useful for directing planning than the kinds of data available from counting web hits and dataset downloads. Most importantly, it could allow the NET to prioritize its activities based directly on its goals to facilitate science and present the LTER network to the outside world.

A systematic program of assessment and evaluation would be an essential basis for strategic planning in many of the new initiatives described in the proposal, including, synthesis, education, and information technology. In the area of information technology, for instance, an assessment of the functional requirements of network researchers would be a vital first step in developing a plan that addresses the impediments that currently prevent network scientists from realizing their full potential for new discoveries. As it stands, the proposal can be criticized as presenting a technical solution (the new technologies that will likely result from the ITR project) to problems that may or may not be among the most critical to LTER network scientists; in the absence of a comprehensive assessment of need and of alternative options, we have no way of knowing whether this technical solution represents the best possible investment of NET resources. Retrospectively, it would be very useful for the NET to be able to point to specific ways in which its services enabled substantial discoveries. This assessment of functional requirements should directly inform the development of the strategic plan for information technology in Specific Recommendation 3 below.

We note that previous reviews of the NET have pointed to the need for such a program: "The SRC notes, in particular, the lack of any formal mechanism for evaluating or providing feedback to the NET. Absence of such feedback necessarily makes our review of the NET incomplete. We strongly encourage such a mechanism to be established and in operation well in advance of the submission of the NET renewal proposal." (Report of the Site Review Committee on the LTER Network Office, May 2000). We missed evidence in the proposal that the NET responded to this recommendation

We request that the NET design and complete an evaluation by the LTER community of the activities of the staff of the NET within one year of the date of this site visit and to be submitted for review in the addendum. Such an evaluation should include, but not be limited to, an assessment of the functional requirements of LTER scientists (e.g., technical research support needs that are not currently met by site or NET services) and the effectiveness of the NET in responding to those requirements. It is critical that this evaluation distinguish between NET activities and LTER Network activities.

This evaluation process should be “institutionalized” as part of the regular interaction between the NET and the LTER Network. Included in this process would be an annual report by the NET to the LTER Network describing the activities of the NET, particularly as it fulfills the needs of the LTER Network distilled from the previous evaluations and assessments.

Specific Recommendation 3: NET Information Technology and Information Management Plan.

The NET has shown great ingenuity in building its informatics program with a small staff and budget. They have shown leadership in informatics training and in bringing the LTER sites to consensus on informatics infrastructure issues. In addition, participating in the ITR funded projects that use LTER as an application testbed for advanced research in data and metadata management demonstrates both value to the IT oriented program and leadership in the LTER informatics community.

The primary weakness of the information management program at NET is that it has no plan for the future. An architecture concept has been formulated to support future data discovery and access needs, based on collaboration with the San Diego Supercomputing Center. This is clearly a useful and valuable collaboration, and should be continued. However, implementation of the architecture appears to be linked to the success of the ITR funded activities, and there was no plan presented for how that task would be accomplished, mitigating all risks, in a manner that will provide the community with a reliable data management environment during the term of the award. In addition, the architecture was focused on data discovery, data storage and data access, but did not include, for example, grid-based collaboration tools that would improve community use of the data sets made available. Further, advances at other leading academic programs in grid systems, data repositories, data management and analysis techniques did not appear to be included in the planning efforts.

The NET is encouraged to visit the National Center for Supercomputing Applications and the Pittsburgh Supercomputer Center to discuss their approaches to data management and use of grid technologies to build community-based problem solving environments. NET is further encouraged to visit the Futures Lab in the Mathematics and Computer Science Division at Argonne National Laboratory, and the Collaboratory for Research in Electronic Work in the School of Information at the University of Michigan. These two

visits will provide the NET with an understanding of how web and grid technologies are being used to build collaborative environments in support of science and engineering research. While the NET has made a good start in developing partnerships with the IT community, additional partnerships would strengthen the program considerably. In addition to providing insights and information relating to advances in computer and information sciences, partnerships might provide the LTER network with advanced capabilities that are not feasible for the NET office to provide directly. These might include access to high performance computing, large-scale data storage, and high speed national and international networking infrastructure.

The panel specifically recommends to NSF that the NET develop a five year plan for advancing the information infrastructure and informatics capabilities of the LTER network, to be included in the addendum. The plan should consider: 1) a system overview describing approaches, technologies and benefits to the LTER community; 2) specification of a system architecture for the NET system including its linkages to LTER site systems; 3) a description of the informatics tools or other capabilities that currently exist and that will be added during the 5 years; 4) an implementation plan; and 5) a five year budget. The implementation plan needs to include specifications for HW/SW required to build the architecture and provide the NET services, staffing required to develop and maintain the systems and tools, strategic partnerships necessary for implementation, and timelines for completion of tasks for incorporating new capabilities into the system.

Specific Recommendation 4: A Plan for the De-accession of the ILTER Program.

The panel acknowledges that the ecological research community is global and that ecological research topics transcend national boundaries. Therefore, the International LTER program is an important activity for the scientific community. The NET and LTER network have shown leadership in developing a collaborative global network of research sites and researchers. However, based on the rapid expansion of the ILTER network, the panel believes that management and development of the ILTER program will inevitably compete for NET time and resources that should support the US LTER program. We conclude that ILTER now falls outside the scope of the NET. The ILTER operation should be transitioned to another program or organization (possibly international in origin and funding) whose defined mission will be more consistent with the growth of international scientific collaboration. This transition should not cause the ILTER program to be discontinued. The panel recommends to NSF that, during the next year, the NET develop a plan for this transition that acknowledges the international goals of NSF, and submit it to NSF for review and action. This plan should also be included in the addendum. Management of the ILTER program should not be a component of the NET in any future renewal of the NET cooperative agreement.

Specific Recommendation 5: Educational Evaluation and a Strategic Plan.

The education theme has always been a part of LTER network. In fact, most of the site scientists are associated with academic institutions and have had graduate students and undergraduate students involved in research at the LTER sites. However, more recently (1998), the LTER sites were invited to apply for a \$15,000 supplement to establish K-12 projects (SLTER) that capitalized on the inquiry-based nature of science done at the LTER sites. Beyond the establishment of the LTER Graduate Committee (seemingly inactive), the involvement of NET has consisted of arrangements for meetings of the education committee and SLTER personnel. The positive impacts of these activities seem to be at the site level, with professional scientists and science educators partnering with teachers and impacting numerous students. The programs at the LTER sites have been successful in leveraging funds beyond the \$15,000; and the web site created by the NET with support from an NSF supplement (for a meeting of the SLTER principals) is excellent.

The weakness of the education activities under LTER is the lack of formative or summative evaluations of these programs. A second weakness is the lack of an assessment to highlight the educational successes of graduate or undergraduate student accomplishments, and related grants associated with the use of LTER sites for research experiences. The NET has no clear role in these educational activities, although the education committee has considered the merits, accomplishments, problems and possibilities of evaluation over the years.

The successes lauded by the Assistant Director of the Biological Sciences, Mary Clutter, are a strong statement that such activities are important to NSF. However, there exist perceptions that the SLTER initiative in education is not peer-reviewed, is not evaluated, and is an under-funded NSF mandate. This needs to be addressed by the LTER education committee based on data and input from the successful sites. This group should decide if the SLTER initiative is to be continued, or if the funding pattern should be modified. Sonia Ortega from NSF has been brought to the NET office on an IPA assignment; and, in collaboration with the education committee, she may be in a position to implement the following action.

While the panel acknowledges the importance of education, we believe the NET has not presented sufficient justification in their proposal or in site-visit presentations to justify the assumption of a leadership role for NET in LTER education. The panel recommends that a formal evaluation of the SLTER and its activities should be conducted in collaboration with an advisory group from the LTER education committee (perhaps coordinated by Dr. Ortega in her second year at NET). NSF should provide the education committee with the funding required to carry out this evaluation, and the NET may have a role in facilitating the logistics. The evaluation needs to include a clear assessment of past performance of the program, recommendations for how the program can be improved and/or expanded, and the appropriate role of the NET in supporting any expanded program. Based on the evaluation results, the NET should prepare and submit a strategic plan and budget for any NET operations to support LTER education efforts. This plan and the results of the evaluation should be included in the addendum.

Specific Recommendation 6: A Leadership Plan for Synthesis

Designating this third decade of LTER activity “The Decade of Synthesis” is timely and laudable. As the NET proposal states, “the principal mechanism by which the NET achieves this goal [of facilitating synthesis] is the facilitation of scientific exchange at all levels of LTER activity.” Coordinating Committee science theme meetings, All Scientists’ Meetings, and related followup activities have been effective; we appreciate the addition of a peer review element to the selection of science themes and synthesis activities for the annual meetings.

The key information missing in the synthesis portion of the proposal is a clear identification of the existing barriers to synthesis and a clear strategy for addressing them. The Coordinating Committee directed NET to build synthesis facilitation into its activities. However, the primary current constraints to synthesis have not been identified, so we do not know how the proposed activities will serve to remove them.

Possible barriers include:

- the lack of standardized data, and the difficulty of making data from different sources compatible;
- lack of knowledge of appropriate potential collaborators, partners, or data sources;
- limited dollars, time, or personnel to carry through a synthesis effort.

Some elements of the proposed work address each of these, but there are no priorities and no data to confirm which is the most severe problem within the LTER Network (or in ecological science in general).

Beyond taking these steps toward facilitation, NET (in consultation with the CC) might potentially play a greater leadership role by providing intellectual guidance for some specific major synthesis activities. This effort would require science-driven identification of major problems, such as those being carried out by the Coordinating Committee; and the clear identification of NET as the appropriate organization to lead the effort.

We recommend that existing levels of synthesis activity be maintained, including meeting planning and follow up activities. We request that NET provide in the addendum a strategic, and specific, plan for creating high-level leadership and facilitation in this domain.

Summary

The panel wishes to reaffirm our confidence in the NET and its capacity to coordinate, support, and lead core LTER activities with the highest standards of excellence. We believe that the NET would greatly benefit from a one year period of time focused on strategic planning and reorganization as its first priority. We are confident that the NET

can emerge as a more effective organization to provide leadership and serve the long-term goals of ecological research.

NOTE: Thoughts about the Review Process.

The panel congratulates the NET on the arrangements it made for the site visit. The meeting ran smoothly, thanks to the efforts of many NET staff. We were particularly appreciative of the IT support.

The panel believes that the process could have been improved; attention to these concerns would lead to a more productive future site visit. First, we repeatedly requested that the presentations differentiate clearly between NET activities, the network, and the sites; but we remained frustrated by what we identified as a tendency to confuse these activities. There is a danger that the NET will be perceived to be claiming credit for things that it has little role in, and that the panel's attention will be distracted to activities that are not directly relevant to the NET. At times the attention given to activities not directly connected to the NET proposal seemed excessive. Second, while the presentations were generally informative, at times they dwelled too much on past achievements, and repeated information that was in the proposal which the team could be expected to know. Lengthy presentations reduced the time available for the panel's questions and discussions, and led to occasional frustration. Third, we missed clear responses to the issues raised in the reviews. One or more sessions devoted to analysis and response would have been useful; instead, responses were often implicit and hidden in lengthy presentations.

Finally, we sensed at times that the NET staff were expecting the panel to perform the role of a strategic planning committee, rather than act as assessors of a proposal. This was particularly evident in the presentation on education which ended with a series of fundamental questions directed to the panel, giving the impression that the NET had no clear plan of action. NET staff should surely have resolved such questions prior to the submission of a request for renewed funding and major increases for new initiatives.

If NSF follows the overall recommendation of the panel, we strongly encourage the NET to evaluate these concerns in formulating its future presentations.

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