

**Response from the LTER Network Office to the Midterm Review**  
**Robert B. Waide and the LNO Senior Staff**  
**July 30, 2012**

The National Science Foundation (NSF) conducted a midterm review of the LTER Network Office (LNO) on May 29-30, 2012. The review team met with LNO senior staff in Albuquerque NM and also conducted phone interviews with selected LTER Principal Investigators and Information Managers. The report from the Review Committee commends the LNO for several accomplishments, listed below. A cover letter from NSF concurs with the Review Committee's commendations. We acknowledge and agree with the four areas singled out by the Review Committee as representative of the LNO's many significant accomplishments:

- **Effective promotion of Network cohesion and science synthesis through logistical support for meetings.** LTER scientists and information managers viewed the LNO as essential to the ability of the LTER sites to function as a network. The ability of the LNO to promote synthesis through smooth organization and support of various meetings and working groups was particularly praised.
- **Moving forward with development of the NIS (Network Information System) including PASTA (Provenance Aware Synthesis Tracking Architecture).** Once on-line and fully populated, the NIS will facilitate discovery and access of both historical and current data across the LTER sites. It represents a significant advance over the current system and addresses criticisms about inaccessible data while also providing an LTER-wide data archive and a foundation for derived data products for science synthesis.
- **Development of strong collaborative relationships with the LTER information management (IM) community.** The level of engagement of information managers in LNO activities is impressive and a clear success for the LNO team. This engagement has two-way benefit in that it both assists the LNO in development of the NIS and also provides the LTER sites with cross-fertilization of expertise between sites and from the LNO.
- **Development of an improved web presence.** The new, soon-to-be-launched website, with its modern feel and audience-specific content, is a substantial advance.

The Review Committee recommended six areas where adaptations to current priorities and practices would enhance the likelihood of success in meeting project goals in the future. The NSF cover letter commented on and in some cases added to these recommendations. We acknowledge and concur with the general tenor of these recommendations. However, as the cover letter from NSF points out, the difficulty of conducting a comprehensive review of a complex project over a short period can lead to missing important details or misinterpreting information provided. Our response addresses those areas of misinformation and misinterpretation as well as pointing out conflicting recommendations. One of the recurring themes in the report is that the LNO will need to prioritize among many possible activities to maximize the probability of success. We agree with this principle, and we point out areas where we may need to prioritize implementation of recommendations because resources are limited.

Our response addresses each of the six recommendations made by the Review Team.

- **NIS/PASTA Deployment timeline. Recommendation:** The committee believes that the NIS has reached a stage where transitioning current capabilities into production and emphasizing data ingest and use within the new system will be more valuable than continuing to develop advanced functionality. The rationale is three-fold: The LTER science community is eager to begin using the NIS and delays would potentially blunt their enthusiasm; experience demonstrates that large-scale delays would potentially blunt their enthusiasm; experience demonstrates that large-scale software deployments benefit from an incremental deployment strategy and real-world feed-back from active users; current focus of the LNO on development of detailed capabilities of the NIS detracts from their ability to address other pressing needs. **The committee therefore recommends that the LNO develop a specific, and near-term, timeline for releasing a production version of the NIS and PASTA for use** – this would entail freezing functionality at a basic, reliable level, proceeding through beta testing, development of deployment and support plans, and deployment within a production environment. Releasing version 1 to the community for data population and beneficial use by early fall would provide the NIS developers and the LTER scientists with valuable early experience with the NIS and would inform the NIS developers on priorities for next steps.

**Response** — We concur with this recommendation, and we have initiated steps to develop and release a production version of the PASTA framework. We plan to preview this production version at the LTER All Scientists Meeting in September, gather feedback, and release the production version by the end of 2012. We have adjusted the existing schedule for NIS development to reflect these revised priorities.

- **Coordination of Synthesis with the NIS. Recommendation:** The committee noted general appreciation for the NIS by LTER researchers, but a relative lack of understanding of its potential capabilities. Further, the committee did not uncover any detailed plans among LTER researchers for the use of the NIS to advance their science or enable synthesis. **Recognizing the potential of the NIS as a mechanism to advance science synthesis, the committee recommends that LNO reprioritize its efforts to emphasize proactive engagement of LTER scientists in development and use of the NIS for synthesis.**

**Response** — We believe that this recommendation can best be addressed by identifying a small number of exemplars of derived data sets that have already been identified by the LTER research community as high priority. Two possible exemplars are StreamChemDB and VegDB, both of which have LTER research groups that are actively developing designs for derived data sets. We will work with these research groups to identify suites of scientific questions that will inform development of derived data sets and encourage pursuit of these questions. Feedback from these research groups will also inform priorities for site data collection, preparation, and ingestion. Successful use of NIS derived data sets to address scientific questions will stimulate the formulation of other questions that can take advantage of data accessible through the NIS.

The NSF cover letter indicates doubt as to the LNO's commitment to produce derived data products as part of the Network Information System (NIS). This is a misinterpretation of the information presented at the midterm review. Development of the full NIS has always included development of

derived data products and continues to do so. Priorities for development of these derived data products will be based on LTER-wide scientific needs, some of which have already been identified by the LTER community (i.e., time series data) and others which have yet to be identified. The LTER Network has established a formal process for setting these priorities in the Strategic and Implementation Plan (SIP), and the LNO will aggressively encourage implementation of this process by engaging the appropriate scientific groups within the LTER Network.

NSF suggested that the absence of an LNO “research agenda” was an obstacle to successful organization and prioritization of activities. Subsequently, Saran Twombly clarified this comment and indicated that the LNO should be guided by the research priorities of the LTER Network and should not have a separate research agenda. At present, the research goals described in the LTER SIP guide research-related activities of the LNO. We will continue to work with the LTER research community to refine SIP research goals and identify means for the LNO to advance those goals.

- **Broadening Communication. Recommendation:** While the LNO is providing significant value in coordinating LTER Network communications and developing a coherent Network message, the committee noted a relative lack of emphasis on communication with the ecological research and synthesis community beyond the LTER sites. Additionally, the committee noted an apparent strong emphasis on communication with site IMs and the LTER Executive Board, but much less attention to reaching LTER PIs and other site scientists. **The committee recommends that the LNO identify and implement a small and strategic set of activities to broaden the audiences it serves and to improve communications within the LTER community.** Better coordination of NIS and synthesis activities requires enhanced communication with researchers.

**Response** — Communication with the LTER community will continue to be the LNO’s highest priority. At present, the LNO communicates its activities to the LTER community and beyond through 1) articles in the LTER Network News, 2) monthly e-mail updates to the LTER community on progress toward the NIS, 3) annual reports circulated to LTER sites, 4) annual presentations to the LTER Science Council, 5) a booth at the annual meeting of the Ecological Society of America (ESA), 6) monthly interactions with the LTER Executive Board, 7) news posted on the LTER web site, 8) a separate LNO web site, 9) a brochure describing LNO activities and services that is made available at the ESA meeting, 10) periodic webcasts on data management and cybersecurity, 11) maintenance of a separate web page with detailed information on the goals, timeline, and progress of the NIS (<https://nis.lternet.edu/NIS/>), and 12) periodic (but infrequent because of the number of sites) discussions with LTER scientists during visits to sites. To this suite of activities we will add: 1) an overview presentation at the All Scientists Meeting, 2) one or more posters on the Network Information System at the 2012 All Scientists Meeting and at future ESA meetings, and 3) annual joint telephone conferences with lead principal investigators and information managers at each site.

Measuring the effectiveness of communication efforts is a challenge. The most recent survey of LTER scientists indicated that only a small percentage of people were dissatisfied with LNO outreach efforts (see below). For those outreach methods with higher levels of dissatisfaction (e.g., the LTER public web site), we have taken successful corrective action. However, the Review Committee formed the impression that improved communication was a high priority since, according to the cover letter, “many LTER researchers have poor understanding of what the office does”. This impression was

based on a small sample of scientists reached by telephone. Given the disparity between the telephone survey and the externally-conducted 2011 survey of the LTER community, it is difficult to judge how much of the problem results from inadequate communication as opposed to the small sample size of the phone survey.

65. Thinking about the content of the outreach methods used by LNO to communicate information to network scientists, how satisfied are you with:							
	Haven't seen it	Very satisfied	Satisfied	Neither satisfied or dissatisfied	Dissatisfied	Very dissatisfied	Don't Know
LTER newsletter	16.1% (65)	21.3% (86)	<b>34.0%</b> (137)	13.2% (53)	1.2% (5)	0.7% (3)	13.4% (54)
LTER online newsletter	22.3% (90)	15.9% (64)	<b>32.8%</b> (132)	10.9% (44)	1.2% (5)	0.7% (3)	16.1% (65)
LTER Network Public Website	16.4% (66)	10.7% (43)	<b>35.0%</b> (141)	13.6% (55)	5.2% (21)	2.0% (8)	17.1% (69)
LTER Intranet Website	23.8% (96)	7.7% (31)	<b>29.0%</b> (117)	12.2% (49)	3.5% (14)	1.2% (5)	22.6% (91)
LNO website	<b>27.3%</b> (110)	8.2% (33)	25.6% (103)	11.7% (47)	3.2% (13)	1.0% (4)	23.1% (93)
LNO annual report	<b>34.5%</b> (139)	6.5% (26)	19.1% (77)	12.9% (52)	1.2% (5)	0.5% (2)	25.3% (102)
Visits to sites by LNO staff	<b>31.3%</b> (126)	9.7% (39)	15.1% (61)	14.4% (58)	0.5% (2)	0.7% (3)	28.3% (114)
Annual Presentations to the Executive Board by LNO staff	<b>36.7%</b> (148)	6.9% (28)	12.2% (49)	9.7% (39)	0.5% (2)	0.2% (1)	33.7% (136)
<b>answered question</b>							
<b>skipped question</b>							

- Basic Core IT Services. Recommendation:** The Review Committee identified some unmet needs for basic cyberinfrastructure and IT support. Three areas require particular attention: Enabling better access of site personnel (e.g., via web services) to administrative data that the LNO has centralized, including site personnel data and bibliographic databases; providing sites with more expertise, practical training, and general support for the wide range of information management technologies in use, including those associated with the NIS; and supporting central maintenance and availability of site-developed tools and capabilities that might benefit a wider range of LTER sites. **The committee recommends that the LNO address these three areas of**

**concern** as part of the effort to engage the LTER community in better using LNO capabilities and bringing the NIS into productive use.

**Response** — We concur that the development of web services to provide better access to administrative data is overdue, and we will reallocate resources to address this problem over the next 12 months. Likewise, we have already planned to provide additional support to sites lacking the expertise or practical training to take advantage of the available range of information management technologies. However, we believe that there is a limit to the support that the LNO can supply to sites and still fulfill its primary function of developing and implementing the NIS. Moreover, the report emphasizes support to sites that “lag behind in IT skill levels and are adversely affected by this lack in skill”. The report does not address the responsibility of sites to recruit and retain skilled information managers. The lack of balance in this section of the report creates a difficult choice for the LNO. If the emphasis is on accelerating the flow of data into the NIS, then our priorities need to be on the majority of sites that are prepared and eager to take advantage of the NIS. If, however, the primary emphasis is on remedial training of sites with low IT skill levels, then the flow of data into the NIS will be affected.

The recommendation to support central maintenance and availability of site-based tools and capabilities is too vague for a concrete response. The LNO already supports a number of tools that were developed at sites including the Controlled Vocabulary and the Unit Dictionary. LNO is planning to support some developing tools (e.g., Metabase, DEIMS), but it is not clear if these are the tools mentioned in the recommendation. Although we agree with the general spirit of the recommendation, the key point is that tools must “benefit a wider range of LTER sites”. The LNO does not have the resources needed to support tools that are specific to a single site. Likewise, the suggestion that the LNO needs to gain additional expertise to provide fundamental technical support will be difficult to implement at current resource levels. However, by employing existing expertise within the data management community and compensating sites for time expended by their information managers, we can at least address issues fundamental to the operation of the NIS such as improving expertise on EML.

NSF’s cover letter suggests that the LNO should re-focus training activities to include basic skills. However, the topics of training activities are determined by the LTER information management and scientific community, as described in the Operational Plan. It does not seem appropriate to work against the consensus decisions of this community to satisfy individual needs.

- **Metrics for Assessment and Evaluation. Recommendation: The committee recommends that the LNO develop specific substantive goals and metrics with which to evaluate its progress and effectiveness.** These metrics will aid in more clearly articulating and communicating goals and timelines to help track progress and will assist in educating LNO stakeholders regarding the plans and timelines of complex activities, such as development and use of NIS services. The LNO assessment and evaluation must include a formal **risk assessment and risk mitigation plan for the NIS activities.**

**Response** — We accept the need to develop additional metrics beyond those described in the LNO proposal and the Operational Plan and to communicate more clearly the metrics and outcomes for

all activities. Since this problem is recurrent, we plan to seek external expertise to help us define and implement appropriate metrics, as suggested in the report. As part of this effort, we have already sought external expertise on the development of a formal risk assessment and risk mitigation plan for NIS activities.

NSF also indicated dissatisfaction with the degree to which LNO communicates metrics of progress towards its goals. Despite the fact that we made aggressive efforts to identify metrics of progress both in our 2006 proposal and subsequently in the LNO Operational Plan, there was a breakdown in communicating results from these metrics in the midterm review. We will address this issue in three ways: 1) we will make an additional effort to include measurement metrics in our annual reports, 2) we will develop partnerships with other research entities (e.g., NESCent) that have successfully addressed the challenge of developing metrics of progress, and 3) we will seek out and engage individuals that have assisted in developing performance metrics for other networks (e.g., GLEON).

- **Advisory input. Recommendation;** It appears that the LNO interacts relatively little with professionals outside of the LTER Network community and could benefit from a formal structure that brings outside opinion and expertise to the office. **The committee recommends that the LNO develop an external advisory structure** to strengthen their ability to learn about, incorporate, and interface with developing approaches, needs, and technologies.

**Response** — We do not agree that the LNO interacts relatively little with outside expertise as evidenced by our close ties with professionals at NCEAS, NESCENT, DataONE, InCommon, Oak Ridge DAAC, etc. We do however concur with the spirit of this recommendation, and we propose two approaches that will provide external advice to the LNO. The LTER Network already has an external National Advisory Board (NAB), which provides independent review and advice to the LNO. However, the membership of this group no longer includes expertise of the sort required by the recommendation. Therefore, we will request that the NAB add members that will provide a broader range of advice on new approaches and technologies. In addition, we will request that the LTER Network Information System Advisory Committee, presently comprising LTER scientists and information managers, be expanded to include two scientists from outside the LTER community. This will provide additional input on how the NIS might serve the needs of the broader scientific community.