

**Long Term Ecological Research Network Communications Office Mid-term Review
Report
03/08/2018**

Executive Summary

The NSF Long Term Ecological Research Program Working Group (LTER WG) conducted a mid-term reverse site review of the LTER Network Communication Office (LNCO) on January 17-18, 2018. The LTER WG consists of NSF Program Officers from the Division of Environmental Biology (Lou Kaplan, Doug Levey, John Schade, Colette St. Mary), Biological Oceanography (Dave Garrison, Dan Thornhill), the Office of Polar Programs (Jennifer Burns), the Division of Biological Infrastructure (Peter McCartney) and the Office of Legislative and Public Affairs (Cheryl Dybas). The principle authors of this report were John Schade, Dave Garrison, Lou Kaplan, Doug Levey, and Colette St. Mary.

The review team commends the LNCO leadership and staff for organizing an interesting and informative series of presentations. The overriding sentiment of this report is extremely positive, and the LNCO team deserves credit for a high level of productivity, good progress towards accomplishing most of the goals set out in the proposal, and strong overall management of a complex program. In addition, the review team was impressed by how well the LNCO has navigated the transition from the previous LTER Network Office (LNO), and acknowledges that this transition was fraught with challenges that required a higher investment of time and resources than anticipated.

Despite its overall positive assessment, this report provides constructive suggestions that the LNCO leadership team is already embracing, planning for, or should consider over the remaining years to continue making excellent progress. None of these issues is a major problem, nor do they require any significant mid-course corrections. The area in need of the most attention, as acknowledged by the LNCO team, is Education and Training; therefore it is recommended that the LNCO leadership pay special attention to that section of this report. There are also important comments about synthesis and diversity that should be considered. The review team totally understands that the LNCO leadership had to make difficult choices about priorities when faced with the extra efforts required to develop a new web site, manage the transition from the LNO, and strengthen internal network relationships. These efforts, combined with a personnel change at an inopportune time, largely explain shortfalls in progress on education and training. The review team encourages the LNCO to set priorities for efforts to improve in this area.

The report is organized by the four areas the LNCO was charged to assess in the self-study they submitted prior to the reverse site visit. Each section includes review team comments, strengths, concerns, and recommendations. The LNCO leadership is invited, but not required, to respond in writing to the findings of this report within 60 days. Any response should explain changes that the LNCO anticipates making and identify comments or statements that it considers inappropriate or inaccurate. A copy of the review report and response (if any) will be included in the award jacket as part of the review history of this project.

Body of Report

1. Communication and Outreach

Context:

The main goals for communications and outreach described in the proposal included building the LTER brand, highlighting network research activities, fostering a sense of community, increasing public engagement, and improving communication and outreach for the network and for individual sites. Overall, the LNCO has been very successful in achieving these goals, and in overcoming significant challenges that arose during the transition from the previous network office. Many of these challenges were either unanticipated, or required more effort than expected. As a result, the time required to reach these goals was, in many cases, longer than anticipated. We commend the LNCO leadership team for successfully overcoming these challenges.

Review Team Comments:

The work the team has done redesigning the website has paid off with a much-improved web design that is substantially more user-friendly and easier to navigate than the previous site. It is also much more informative and engaging, both for the science community and for the casual user. It will likely prove to be an effective tool for engaging new science collaborators, policy-makers, and the general public. The redesign took much longer than expected due to a range of technical challenges. We find the delay understandable and the final result worth the wait. Looking forward, a new challenge will be to evaluate whether the new website lives up to its potential to engage scientists and the general public, and to facilitate communication within the network. We are happy to hear the LNCO leadership acknowledge the need for metrics of success and look forward to the results of their efforts to track the reach and impact of the new website. In addition, we applaud the LNCO staff for making an early decision that successful communication and outreach to external audiences required transparency and strong internal communications within the network (they also recognized the importance of this for synthesis). This includes transparency about workings of the LTER, particularly to emphasize research over monitoring, and the relationship between LNCO, Executive Board (EB), and Environmental Data Initiative (EDI). To that end, the LNCO team has worked hard to engage the Executive Board, the Science Council, and the broader community through several activities described throughout this report. Clearly, this approach has helped create a healthy working relationship between the LNCO and the LTER science community that lays the groundwork for good communication and outreach to a broader audience.

Strengths:

- As mentioned above, the new website is a substantial improvement.
- The design of a new logo, which is itself an improvement, but perhaps more importantly, the transparent process of selecting it engaged the entire LTER science community. We agree that this effort paid off indirectly by ensuring a positive relationship between a new LNCO and a long-established LTER community.
- The monthly LTER Science Update and Newsletter.
- The new webinar series featuring members of the LTER Synthesis Working Groups is likely to be an effective and valuable tool to engage a broader audience.

Concerns:

- We have not identified any serious concerns that would require significant changes in effort or direction.
- One challenge has been defining the boundaries between the responsibilities of NSF and the LNCO in communicating the results of LTER-funded science. The solicitation for the LNCO competition provided guidance that has led to some confusion about who should be leading communication efforts at different stages of the publication process. Marty Downs and Cheryl Dybas (NSF OLPA) have agreed on a partnership that clearly defines their individual roles.
- There is still work to be done to ensure the LTER science community understands the value of communicating the results of their work broadly both via the NSF OLPA and the LNCO.

Recommendations/Suggestions:

- We are happy to hear the LNCO leadership acknowledge the need for metrics of success for their myriad activities and look forward to the results of their efforts to track the impact of the new website, and coming efforts to engage broader scientific, management, and public audiences.
- We encourage the LNCO team to better document the success of efforts to engage scientists outside the LTER network, in the Synthesis Working Groups and more broadly. It is very important that the value of the LTER network to a broader scientific community is communicated clearly.
- In addition, the LNCO team has acknowledged that the role of the office in facilitating public engagement by sites, as well as engaging policy and management stakeholders, needs further development.
- We recognize that there has been a significant opportunity cost of the large effort required to get the office up and running, complete the website redesign, and establish strong internal communication. It seems that many of these efforts are reaching a more sustainable stage, and the team is likely to have more time and resources to devote to proposed activities that have yet to be fully developed. A 40-year review of the LTER Program is being discussed and will likely involve the LNCO.

2. Synthesis

Context:

The LNCO has fostered synthesis primarily through funding and logistical support of synthesis working groups chosen via a competitive process, following the model and building on the infrastructure of the National Center for Ecological Analysis and Synthesis (NCEAS), which houses the LNCO. Funded synthesis working groups received data management and analytic support to foster the integrated analysis of a wide array of data. Two open calls for working group proposals were made. Both focused on the integration of data in the five core areas of LTER science and required that at least two data sets be synthesized as part of the proposed work. These calls also included an explicit charge for diversity within the groups. The proposals were reviewed by panels consisting of three LTER and three out-of-network scientists and involved an established rubric; panels generated a shortlist from which Frank Davis made final

funding decisions. A priority was placed on feasible projects that synthesized multiple data sets within the five core areas over the tenure of the working group.

The five funded working groups included both LTER and non-LTER scientists, although the LNCO staff observed that the vast majority of participants had had some prior experience with LTER sites. The participants were primarily junior scientists at the postdoctoral and Assistant Professor levels, and hence any prior experience with LTER is likely to have been as a student. The projects were highly integrative and incorporated the analysis of at least seven data sets, with the majority integrating twelve or more types of data. The data were primarily generated at LTER sites, but in some cases additional data from outside the network were incorporated. The complete results of these working groups are still to come, but findings to date are being disseminated in an ongoing series of webinars. These webinars are being widely advertised both within and outside the LTER network; they will continue to be available from the LNCO webpages thereafter. Although overall participation is broadly distributed across the network, as yet, none of the coastal LTER sites have contributed members to the working groups. However, data from these sites have been incorporated. LNCO staff were particularly struck by the degree to which workshop participants were already quite savvy in data management and analysis, even at the large level of data integration the projects entail.

Other Activities to Promote Synthesis:

The LNCO has taken the lead in making synthesis the theme of the 2018 All Scientist Meeting (ASM). They see the ASM as an ongoing source of new synthetic efforts. The LNCO has also coordinated with EDI to begin to establish standards for storage of LTER data to facilitate future syntheses. The webinar series is the first iteration of an effort to have ongoing intellectual exchange that involves a large fraction of the LTER scientists to foster future synthetic analyses. The LNCO also sees opportunities to forge links with other large scale NSF investments, such as NEON and CZO, and would welcome guidance on how to facilitate synthesis with these programs. They are working on how LNCO-based postdocs might be funded as a mechanism to provide greater coordination across working groups.

Review Team comments: The LTER Working Group found that synthesis activities are largely proceeding as proposed. With respect to the synthesis working groups, the focus on the five core areas is appropriate, the diversity of data types used in these projects has been high and the level of integration strong. The level of participation seems reasonable given the overall scope of what can be supported. Further, it was a good decision to open the competitions for synthesis working groups early in the award period so that they would have ample time to get their research projects underway. Unfortunately, only one distributed graduate seminar is likely to be offered over the course of the award, due to some of the challenges described in the Communications and Outreach section above. The LNCO staff made a compelling case that the efforts they have put into establishing a stronger LTER network and raising the profile of synthetic work overall, have not been misplaced.

Strengths:

- The synthesis working groups have involved approximately 115 individuals, and each team is using a wide array of data types from the LTER program and beyond.

- Both within network and out of network scientists have been involved in the synthesis working groups, although it is clear that most participants have had some prior experience with an LTER site.
- The results of the synthesis working groups will be publicized in a widely advertised series of webinars that focuses on team science and synthetic analysis of existing data. A particular value of this approach is that it will raise the profile of the work within the LTER network and stimulate future synthesis.
- The focus of the upcoming All Scientists Meeting will be synthesis.
- The LNCO leadership's decision to prioritize building stronger internal connections within the LTER program during the first two years of the award is likely to foster future synthetic work.

Concerns:

- Although the LNCO has put some effort into encouraging the participation of non-LTER scientists in the synthesis working groups, there is still room for improvement. It would be helpful to develop new mechanisms to enhance this beyond what the LNCO is already doing.
- Distributed Graduate Seminars have not yet occurred, although one on urban biogeochemistry and public health is planned. We understand the LNCO leadership has experienced some constraints on resources that have limited this activity.

Recommendations/Suggestions:

- We think it would be helpful if the LNCO could develop a better understanding of how to facilitate future synthetic activities, i.e. through communication with the EB, the Science Council, activities associated with the All-Scientists Meeting, or something else.
- Explicit plans for engaging non-LTER scientists in synthesis should be developed. The LNCO should consider whether targets for non-network participation levels should be set.
- Move forward with your plans to offer one Distributed Graduate Seminar.

3. Education and Training.

Context:

With respect to Education and Training, the proposal emphasized three themes: (1) *Training*, (2) *Information Sharing*, and (3) *Partnerships and Exchanges* (p. 8 of Project Description). Under *Training*, short-term communication workshops held "as frequently as at least one per year" would provide strategies and skill sets for engaging a wide range of audiences through multimedia (e.g., videos, and digital field trips). Likewise, the LNCO anticipated providing training to Working Group leaders in ways to facilitate collaboration. *Information Sharing* included training for early-career scientists in techniques that promote "open, collaborative, and reproducible synthesis research" (p. 9), assistance to the individual sites in disseminating education resources that meet Common Core State Standards, centralization of teacher professional development programs (RETs), and providing a framework for inclusion of citizen science projects across sites. *Partnerships and Exchanges* included plans to work with several organizations (e.g., ScienceLIVE, CLEAN Pathways, NEON, DataOne) to distribute LTER

materials and coordinate complementary activities. Additionally, the LTER Working Group noted plans outlined for broadening participation across LTER sites.

Review Team Comments: The LNCO is managing a staggering number of activities and a transition that was more time-consuming than expected. As a result, the LNCO has yet to accomplish several of the tasks originally proposed for Education and Training. The LTER Working Group acknowledges that priorities during the first two years of operation were necessarily placed elsewhere (e.g., organizing records from the previous office and making them available through a revamped website), and that departure of a key staff member, Carol Blanchette, occurred at an inopportune time. The LTER Working Group appreciated the candor with which these topics were discussed during the reverse site visit and agree with the PIs that the focus should be on the LNCO's path forward.

Strengths:

- The LNCO provided training in science communication by initiating an E-Connect Fellows program. This program, which was not specifically described in the proposal has clearly been a success, with 13 fellows thus far.
- The LNCO spearheaded development of a new, financially-viable model for the LTER Schoolyard Book series that was motivated by a desire to create a sustainable business model that will eventually be largely independent of NSF support. We agree that this plan has potential and look forward to a proposal. The LTER Working Group sees this as an especially valuable, yet time-consuming, activity that was not in the proposal.
- Several training courses and workshops have been offered, including 5-week and 8-week online classes in public engagement, a 1-day workshop on video production, and a 1-day workshop on use of LTER data in K-12 classrooms.
- The LNCO has worked closely with the Education and Public Outreach Committee, resulting in a stupendous online library of educational materials organized by site and intended audience. Dissemination of Data Nuggets on the LNCO website and coordination of their availability with other online educational sites is admirable.
- An online seminar series recently started to provide training and discussion of the "science of team science". Presentations are to be archived online and made available to anyone at any time.
- We applaud the creation of a new Communications Resources section of the LNCO website, which includes basic guidance on the use of social media and videos to engage diverse audiences.
- The LNCO produced an important and thoughtfully-crafted Diversity Strategy document that provides a roadmap for broadening participation within and across LTER sites.

Concerns:

- As was acknowledged in the self-study, the multi-week online courses were poorly attended by LTER scientists, who constitute the intended audience.
- In spite of the efforts to date of the LNCO staff, diversity within the LTER network still needs improvement. We realize that this is a tough, long-term challenge for environmental science more generally, but also one the LTER program should be well-positioned to advance.

Recommendations/Suggestions:

- Continue shifting responsibility for data management training to EDI (as proposed in the self-study)
- Submit a proposal to NSF that provides a transition to sustainable support from private sources for the Schoolyard book series.
- . Given time and resources available for the remaining years, we recommend the LNCO leadership set clear priorities for which Education and Training activities are most important going forward, and be explicit about which activities are unlikely to occur. This is especially important if new activities (e.g., cross-site REU experiences) are being considered.
- Promote the development of stronger efforts to broaden participation across the LTER network by identifying and broadcasting funding opportunities to the network. We do not suggest that LNCO staff take the lead in writing proposals and starting new programs, but rather that they help make funding opportunities known to the LTER community.
- Focus on value-added activities. For example, rather than creating new materials for education and training, create "one-stop shopping" on the LNCO website for resources already available on the websites of individual LTER sites.
- To improve attendance for workshops and online courses, we suggest a more intentional consideration of who the intended audience should be and how to strategically target that audience.

4. Network Governance.**Context:**

The solicitation outlined the role of the LNCO in governance as supporting network committees and working groups and organizing regular meetings of the Science Council, LTER Advisory Board, and a tri-annual All Scientist Meeting (ASM). Specific budget guidance for these activities was also provided. There were some modifications to these expectations both at the time of the award and in the early phase of LNCO operation. NSF agreed that the award budget was not sufficient to support the tri-annual ASM, and agreed to support this meeting as a supplement. NSF provided more explicit guidance about the limit of support for "Governance" in a letter that was sent to the LNCO PI when the award was initiated, and there was explicit guidance that the Network needed to revisit the number of committees and reduce these to the essential ones. After discussion at one of the Science Council Meetings, NSF and LTER governance decided that an external advisory board was neither practical nor needed. The funds originally allocated for the advisory board were repurposed to re-initiate a half-day LTER symposium at NSF.

Review Team Comments: We were fully satisfied that the LNCO has accomplished (and in fact surpassed) the goals of supporting governance. They have supported two Science Council Meetings (also the venue for the annual executive board) and one NSF symposium. Preparations and planning are underway for the following 2018 network activities: Science Council meeting, NSF-LTER symposium, and an All Scientists Meeting. Although not a LNCO charge, the LNCO took the lead in developing a plan to reduce the number of committees. Overall costs for governance have been reduced, largely by facilitating virtual meetings for LTER committees.

The LNCO also undertook the job of examining, and eventually adopting, an alternative venue for the 2018 ASM.

Strengths:

- The LNCO has been able to reduce the costs of travel largely by leveraging resources for logistic support provided by NCEAS.
- The LNCO has been very effective in facilitating discussions with the LTER network to achieve governance cost reductions.
- The decision to provide a fixed budget for committee activities has successfully constrained costs in this area and motivated the LTER Network to set priorities. This simultaneously empowered committees to pursue those priorities more actively.

Concerns:

- Whereas, the specific costs of travel for governance activities have been reduced to modest, perhaps appropriate, levels the amount of LTER personnel time is still considerable.
- Determining the optimal number of committees may be a work in progress.

Recommendations/Suggestions:

- Although there has been one NSF-LTER symposium at NSF, the various roles and responsibilities of NSF personnel versus the LNCO for this symposium need to be clarified. Because this event is hosted in a Federal building, NSF must be the lead in this activity. This year we have appointed a small team from the LTER working group, headed by Cheryl Dybas (OLPA) to coordinate with Marty Downs (LNCO). This may serve as a model for future events at NSF.
- There are still questions about the symposium's effectiveness and audience. Metrics to evaluate this activity should be developed as a joint action by NSF and the LNCO.
- It will be essential to develop some estimates of LNCO personnel time required for governance as the travel expenses underestimate the actual budget allocations for this activity.

5. LNCO Management Plan.

Context:

Solicitation NSF 15-535 contained a section on the structure and management of the LNCO office that stated the following: “NSF anticipates that successful operation and management of an LTER National Office will require a senior-level scientist (the proposal PI) who is familiar with the LTER program as well as with ecological and ecosystem science or environmental biology across habitats, ecosystems, and biomes. This individual will have a part-time appointment as the office Director, with responsibility for oversight and management of all office activities. Additional personnel may include part- or full-time positions for office management, an education and outreach coordinator, and staff who will maintain websites and provide logistical and administrative support.” Further guidance in the solicitation was provided on the form of information the Project Description should contain, and for management, specified the following: “Demonstrate institutional capacity for the proposed efforts” and “A management plan for the office.” The proposal from the LNCO was fully responsive to the

solicitation and envisioned a management approach that would be based on the successful NCEAS organizational design.

Review Team Comments: The present management structure of the LNCO (i.e., Fig. 6 of the self-study) closely follows the structure in the funded proposal (i.e., Fig. 3 of the proposal). This is a horizontal, team-based, management structure that is modeled after, takes advantage of, and is integrated into the NCEAS management structure and administration. This team-based management structure provides the coordination and distribution of responsibilities needed to manage the broad range of activities at the LNCO, including synthesis research, communications and outreach, education and training, and governance. The LNCO relies upon NCEAS for administrative and accounting support, uses the NCEAS building for offices and meetings, and makes NCEAS cyberinfrastructure expertise available to assist the synthesis working groups.

The primary changes to management have occurred when individuals left the LNCO, and as the management needs of the LNCO evolved during the transition from the LNO in New Mexico to the new LNCO. This process is largely completed, and the LNCO staff has begun a “transition out of a start-up phase”, as stated in the self-study. The major differences in the management structure over the past two years have been the creation of a Deputy Director position, filled by Marty Downs, the hiring of a new Communications Director, Kristen Weiss, and the shift in computing, informatics, and scientific programming support from Mark Schildhauer to Julien Brun, Nick Outin, and Matt Jones.

Within the constraints of their budget, the LNCO prioritizes use of funds to support LTER synthesis research. There are significant, but necessary, costs to keeping even this lean management team structure in place. Plans to bring in lower-level assistants to help carry out the day-to-day office activities should help with the operations, but will not relieve the budget expenditures for personnel.

The LTER working group acknowledges the challenges of supporting the LTER network across a diverse range of activities and how the opportunity costs associated with all of those activities have stretched personnel resources to the limit. We were fully satisfied that the LNCO is well-managed and making good use of NSF funds. Indeed, from a management standpoint, it would be difficult to imagine how what has been accomplished could have been done without the supporting role of NCEAS.

Strengths:

- The LNCO has successfully transitioned from the LNO.
- They have worked closely with EDI to parse out the appropriate role for LNCO cyberinfrastructure support of Synthesis Working Groups.
- They have developed a strong partnership with the LTER network, based on seeking input from the LTER community and delivering results in the form of improving upon the services that the previous LNO had provided to the LTER network.
- These achievements are noteworthy given the challenges of shifting away from an entrenched management system resulting from the decades-long operation of the LNO, resistance from some LTER scientists to change, and the legacy of an LNO office that answered to the LTER network. Frank Davis and his team are to be credited for the mix

of sensitivity and determination brought to the tasks of forming a full partnership with the LTER network while responding to the directives of the NSF LTER Working Group.

Concerns:

- The coming year will bring new challenges to the LNCO. It will require deft leadership to continue LNCO efforts without overtaxing personnel as planning for the ASM, a 40-year review of the LTER Program, and adjusting to a change in the leadership of the executive board chair will be added to the existing activities.
- Management of lower-level employees brought on to assist with the day-to-day operations will add another layer of responsibility.

Recommendations/Suggestions:

- There may be an opportunity to reduce the efforts associated with the monitoring of governance committees or to shift this responsibility to lower level employees who would report back to the management team.
- It may also be necessary for the LNCO to increase its dependence on the LTER network to provide intellectual support for the ASM, Science Council, and mini-symposium. Such community input is likely to be essential for the 40-year review of the LTER Program, which will require additional resources from NSF.