The following text is a description of the strategic partnerships proposed in the LTER Network Office renewal proposal prepared in 2008.

3.4.3 Development — *Build and maintain strategic partnerships and collaborations that benefit science, cyberinfrastructure development, and education in the LTER Network, as well as the broader community of scientists, students, and educators.*

Background — Following recommendations made in the 10- and 20-year reviews of the LTER Network and responding to directives in the CA with NSF, the LNO has participated in a number of partnerships and collaborations that have benefited LTER and the broader community. Partnering activities have included developing or sharing research resources and cyberinfrastructure, creating informatics research and training opportunities, and designing and coordinating efforts among environmental observatories, organizations and societies to improve efficiency and cost-effectiveness of the LTER scientific enterprise. *Table 1* provides examples of past activities, collaborating institutions, and key outcomes that have benefited LTER, partnering institutions, and others.

Specific activities supported — Development encompasses two activities. First, LNO staff will facilitate communication between the LTER Network and other scientific, cyberinfrastructure development, and education enterprises and disseminate information regarding pertinent activities and opportunities to LTER sites and scientists. Second, LNO staff will participate in cross-site, LTER Network, and collaborative research, education, and training proposals that complement the LTER planning effort, provide new research opportunities for LTER scientists, and build or leverage cyberinfrastructure for the Network. LNO personnel will participate in specific collaborative activities that are identified, evaluated, prioritized, and approved according to the procedures documented in the LNO Strategic Plan **[77]**. Coordination and communication with partners and collaborators encompass a range of activities that are necessary to build and maintain a collaboration including: email, phone and videoconferences among the collaborators; reports of activities and results to participants and the broader community; and reports and contracts that meet the requirements of funding agencies and Memoranda of Understanding that may exist among the partnering institutions.

Important ongoing collaborations beneficial to the LTER Network and its partners will continue. These collaborations include: (1) the LTER—NBII Partnership that supports Iñigo San Gil and his efforts to upgrade metadata management systems across the LTER Network (central activities include support and enhancement of the metadata editor/entry tool, outreach efforts to promote adoption of the metadata editor, training sessions, editor usability tests and focus groups to improve the tool, continued help-desk support for assisting LTER sites with data and metadata management, designing protocols for QA/QC and metadata content enrichment, and creating tools that facilitate data integration and synthesis); (2) LTER and NCEAS support of www.ecoinformatics.org—a community web portal that provides access to open source cyberinfrastructure for ecologists and information managers; (3) LTER engagement in the Kepler Core Project—a follow-up effort to the SEEK Project that is providing free and open access to powerful scientific workflow software (i.e., Kepler) for use by LTER scientists; and (4) partnering with the Organization of Biological Field Stations in development of mutually beneficial research, cyberinfrastructure development, and training activities such as those supported in the recently completed Research Coordination Network project (see Results of Prior Support).

The LNO will continue recently initiated partnerships and pursue new collaborative opportunities that benefit the LTER Network, including:

1. Participation in proposals and strategic planning sessions with the Internet2 and National Lambda Rail to enhance high-bandwidth connectivity across the Network and to add new, powerful collaboration technologies to LTER sites.

2. Collaboration with the Oak Ridge National Laboratory Digital Active Archive Center, the two major synthesis centers supported by NSF-BIO (NCEAS, NESCent), the digital library community, NSF-funded supercomputer centers (e.g., SDSC, NCSA, NCAR), NBII, and the

Global Biodiversity Information Facility to enhance LTER archive and preservation capacity and to promote interoperability across related research networks and archives.

3. Communication and coordination with research networks (and their supporting agencies) that overlap to some extent in membership and mission with LTER, for example, the USGS National Phenology Network, NEON, WATERS, OOI, the USDA-FS experimental forest network, the Urban Long Term Research Areas (ULTRA; USDA FS), and the Long Term Agricultural Research network (LTAR; USDA Cooperative State Research, Education, and Extension Service).

<u>Products and outcomes</u> — Products include participation in at least two proposals annually. Outcomes of successful proposals are projected to include increased opportunities for training of LTER scientists, CI staff, and students; increased numbers of LTER personnel engaged in collaborative research and CI activities; increased funding for cross-network and cross-agency activities; and increased leveraging of partner contributions (e.g., CI interoperability) to achieve LTER goals.

Table 1. Selected key activities and outcomes supported through strategic partnerships and collaborations.

Strategic Partnership	Activities	Key Outcomes, Products, and Publications[#]
The Knowledge Network for Biocomplexity • LNO staff – Brunt, Waide • Collaborators – NCEAS, SDSC	• specified the Ecological Metadata Language content standard for ecological metadata • developed *Morpho* and *Metacat*—two software tools that support entry and management of ecological metadata records • held multi-institutional graduate training	1) EML adopted as the metadata standard by all sites in the LTER Network; 2) all databases documented using EML-compliant metadata; 3) Metacat is used nationally (LTER, etc.) and internationally for metadata management. http://knb.ecoinformatics.org [13]
Resource Discovery Initiative for Field Stations • LNO staff - Michener and Brunt • Collaborators – OBFS, NCEAS, SDSC, SEV/CAP/VCR LTER sites, California Natural Reserve System (CaNRS)	• created several new databases that are used by both OBFS field stations and LTER sites (e.g., summer courses, site descriptions, personnel, administration, bibliography) • revised the OBFS web site • implemented OBFS Data Registry • held two week-long training activities annually	1) EML-compliant Data Registry adopted by ESA, PISCO, CaNRS, and OBFS; 2) thousands of data sets now easily discoverable by scientists, students and educators; 3) 13 LTER sites are OBFS members and benefited from having new information managers trained in ecoinformatics and ArcGIS. http://www.obfs.org/ [12, 14-16]
Science Environment for Ecological Knowledge. • LNO staff - Michener, Brunt, Waide • Collaborators - NCEAS, SDSC, CAP LTER (ASU), U. North Carolina, U. Kansas, U. Vermont, UC-Davis, Napier University	• created cyberinfrastructure for ecological, environmental, and biodiversity research • provided education and outreach to the ecological community (especially, under-represented groups) about ecoinformatics • state-of-the-art ecoinformatics training lab developed	Created an integrated data grid (EarthGrid) for accessing a wide variety of ecological and biodiversity data and analytical tools (including Kepler—an open-source scientific workflow solution developed as part of SEEK; see http://seek.ecoinformatics.org/ and http://kepler-project.org/). [17-31]
USGS National Biological Information Infrastructure (NBII) • LNO staff - Michener, Brunt • Collaborators - NBII	• provided direct metadata and data management assistance to all 26 LTER sites • achieved interoperability between EML (the LTER metadata standard) and the USGS Biological Data Profile • participated in the new ISO standard working groups for the Biological Data Profile	1) Exposed 6,090 LTER metadata documents through the NBII & ORNL clearinghouses; over half contain information that enable automated data retrieval and integration; 2) co-developed a metadata entry tool that facilitates metadata creation and storage.
Environmental Observatory (EO) Design. • LNO staff – Michener, Waide • Collaborators: NEON, CLEANER, WATERS, NPN, IndoFlux	• served on teams involved in planning environmental observatories • completed planning activities for a continental scale-environmental science research agenda • completed a National Research Council publication focused on linking space-based and ground-based observing networks	1) Completed NEON design documents; 2) designed an environmental monitoring network in India; 3) organized a Special Session at ESA (Annual meeting in San Jose) focused on Decadal Science Planning for the Ecological Sciences. http://neoninc.org [32-40]