

ILTER Working Group Proposal: Design Challenges and Solutions for Establishing a Network of Socio-Ecological Research Sites

Jess K. Zimmerman, Frederick N. Scatena, Chris Boone, Ted Gragson,
and J. Morgan Grove

The Decadal Plan for Long-Term Ecological Research (DP-LTER) in the United States calls for comprehensive studies of social and ecological systems (SESs) described as Integrative Science for Society and the Environment (ISSE; US LTER 2007). ISSE lays out a coherent theoretical framework for a series of questions linking the human and biophysical components of SESs. In the US LTER Network there are four sites devoted to SES research, Central Arizona Phoenix (CAP), Baltimore Ecosystem Study (BES), North Temperate Lakes (NTL) and Coweeta (CWT) and several sites have growing SES components. The DP-LTER calls for the development of SES research at all 26 LTER sites. Additional SESs have been funded by NSF in Seattle and other localities in the US and elsewhere. Meanwhile, USDA Forest Service has mounted plans for SES research at a number of urban areas through a program called Urban Long Term Research Areas (ULTRA). Research at the current set of SES sites exhibits a large diversity of approaches (e.g., Liu et al. 2007), underscored by the fact that sites sometimes use very different schemes for sampling their systems (e.g., a grid of sites spread over an urban area versus a focal watershed approach). Given the plans for substantial growth of LTER-SES research over the next decade, there is a clear need to examine the way biophysical and social scientists sample, analyze, and model SESs and to define the key elements of a unified approach to studying them.

The purpose of the proposed working group is to emphasize the practical. How does one design an SES research program that leads to a comprehensive, transdisciplinary understanding of how these systems function? The issue is not trivial. Couplings between human and natural systems vary across space, time, and organizational units, while exhibiting nonlinear dynamics (thresholds), reciprocal feedback loops, time lags, resilience, heterogeneity, and surprises. Furthermore, past couplings have legacy effects on present conditions and future possibilities. As emphasized by Liu et al. (2007), most of the previous work on SESs has been theoretical rather than empirical, and ISSE represents that theoretical maturity. Yet what the DP-LTER proposes is empiricism linking multiple, diverse sites. How can this be achieved? We propose a three day workshop of all LTER sites to discuss and analyze the methods and sampling strategies used in studying social-ecological systems and to develop a unified set of approaches for DP-LTER. The initial product of this workshop will be a set of recommendations developed by the workshop participants to be published online by the LTER Network Office (LNO). Additional publications on design challenges and solutions for SES research could be published in a special issue of *Ecology and Society* or advance the longer-term goal of producing a book on the topic.

The workshop will focus on the first of the three grand challenges identified in the DP-LTER: Land and Water Use Change. This should be plenty for a productive three-day workshop (future workshops can address the other grand challenges) and there is already considerable and widespread interest in this topic among LTER sites. Limiting the workshop to one theme will focus efforts on identifying long-term data sets, cross-site experiments, and modeling activities that will advance the DP-LTER and ISSE beyond conceptual understandings of socio-ecological systems. Consideration of sampling design and methodologies will necessarily grow out of these discussions.

Decisions on how to study SESs as a network will need to take into account the diversity of sites involved and the fact that SESs demonstrate complex behaviors (US LTER 2007, Liu et al. 2007). The task is daunting, but it is one LTER scientists must take on at the beginning if the DP-LTER is to lead to an understanding of SESs that goes beyond case studies or simple conceptual models (Liu et al. 2007).

We propose to hold the workshop in Puerto Rico using San Juan City and environs as a working example and reference for discussions. In Puerto Rico, highly urbanized systems occur within 30 km of wilderness areas, thus offering a compact continuum of human impacts to reflect upon. Puerto Rico hosts one LTER site (Luquillo – LUQ) and has been identified to host a NEON site. Several LUQ researchers currently have SES funding from NSF (through the Coupled Natural and Human Systems program). The University of Puerto Rico recently received an IGERT grant focused on urbanizing tropical systems and a conceptual approach modeled on ISSE. San Juan City has been discussed as a possible ULTRA site. As a tourist destination, there are direct flights available to the island from many North American cities. We have identified an inexpensive locality to host the workshop to keep on-island costs low so that we can maximize the number of participants. Participation can be rounded out from the large group of biophysical and social scientist on island who are in the process of organizing themselves for SES research. We request \$40,000 to cover the cost of travel, food, and housing for 25 representatives from off-island LTER sites. Additional funds for housing and for local and additional participants will come from the LUQ LTER. LUQ will also host an optional one-day field trip through the San Juan SES before the workshop.

Rather than proscribe participants and a particular format for the workshop, we identify here a Steering Committee that will guide the planning of the workshop. This will include Jess Zimmerman and Fred Scatena from LUQ and Morgan Grove, Ted Gragson, and Chris Boone from the BES, CWT, and CAP LTERs. Gragson and Grove have developed a methods course for studying socio-ecological systems (<http://coweeta.ecology.uga.edu/ecology/weblearning/intro.html>), so they are ideal members of the steering committee. Boone has substantial experience in SES research at both BES and CAP. The Steering Committee will be charged with identifying participants and workshops methods that have the right mix of “talking at” vs. “talking with” people that will directly lead to the desired product. Pre-planning can be conducted via a series of telemeetings. Participants will largely be those involved in LTER-SES investigations that address the first DP-LTER grand challenge but will also include individual participants representing the educational and cyberinfrastructure communities as well as a participant who can help with discussions about designing methodologies appropriate for a broad range of stakeholders and provide linkage to planning and policy. We will also make sure that at least one graduate student is involved in the workshop.

Literature Cited

Liu, J., T. Dietz, S. R. Carpenter, M. Alberti, C. Folke, E. Moran, A. N. Pell, P. Deadman, T. K. Kratz, J. Lubchenko, E. Ostrom, Z. Ouyang, W. Provencher, C. Redman, S. H. Schneider, and W. W. Taylor. 2007. Complexity of coupled human and natural systems. *Science* 317: 1513-1516.

U.S. Long Term Ecological Research Network (LTER). 2007. *The Decadal Plan for LTER: Integrative Science for Society and the Environment*. LTER Network Office Publication Series No. 24, Albuquerque, New Mexico. 154 pages.

Budget

We request \$40,000 to support a workshop for 36 participants to be held in the University of Puerto Rico campus in Río Piedras, Puerto Rico (a suburb of San Juan). The thirty-six participants will be drawn from the 26 LTER sites with ten additional slots provided for some mixture of participants representing education, infrastructure, planning, graduate students, and local researchers. The requested funding will be used to ensure that representatives from each of the LTER sites can attend the workshop. We have budgeted \$800 for each traveler, assuming a range of \$600 to \$1,000 for most participants (a quick check of ticket prices from Portland, OR and LA indicated that tickets now cost ~\$600 for a December trip, but prices will rise over time). Most of the participants (maximum 24, depending on the number who live around San Juan) can be housed at the UPR Guest House, which provides comfortable hotel-like accommodations on campus for \$15 per night (to be covered by the Luquillo LTER). Additional participants, organizers, and senior researchers will be housed at a nearby hotel (\$200 per night). The meetings will take place on campus, which offers a cost-free mixture of large conference rooms and smaller break-out rooms. We plan to meet in December 2008 or January 2009 when classes are not taking place, or over the MLK or Presidents Day weekends. Per diem at UPR is \$40; we have budgeted five days for each participant, assuming each will want to take the optional one day field trip in addition to the three day workshop and one combined day of travel. We have also budgeted \$3000 for workshop beverages and snacks and working lunches.

In addition to housing at the UPR Guest House, LUQ will provide per diem for additional participants and up to three additional air fares for the educational, cyberinfrastructure, planning, and graduate student participants (we are assuming that one or more of these will come from an LTER site or from among the local participants). We will also provide local transportation for the field trip, airport transfer, and transport to restaurants for those staying on the UPR campus.

Requested Budget:

	Days	Per Day	Cost per Person	Participants	Total
Airline Tickets			\$800	25	\$20,000
Hotel	5	\$200	\$1,000	12	\$12,000
Per diem	5	\$40	\$200	25	\$5,000
Breaks/ Lunch	3	\$1,000			\$3,000
TOTAL					\$40,000

Cost Share:

UPR Guest House	5	\$15	\$75	24	\$1,800
Per diem	5	\$40	\$200	11	\$2,200
Local Transportation					\$2,000
Additional airline tickets			\$800	3	\$2,400
TOTAL					\$8,400