

Incorporating Social Elements into the Long Term Ecological Research Program: Institutional Lessons from the LTER Network

Tischa A. Muñoz-Erickson



Introduction

Incorporating the social sciences in the LTERs has become a **priority for the LTER Network** and was a central aspect in the funding planning workshops held at the recent All Scientists Meeting in Estes Park, Colorado.

Numerous LTER sites, concerned over increasing human influences within and around their sites, are also taking the initial steps in engaging social scientists into their long-term research programs. This poster was initially motivated by an interest from the Luquillo LTER (LUQ-LTER) to incorporate social sciences into their site but seeking guidance as to how to begin this process.

The **objective of this poster** is to draw on lessons from LTERs conducting social science research and assess the institutional challenges and opportunities for other LTERs interested in engaging social sciences in their research program.

Research Objectives and Methods

I conducted a **qualitative review** that expands on the lessons of four LTER sites presented in a recent issue of *Society and Natural Resources* (Gragson and Grove 2006), including the Central-Arizona Phoenix (CAP), Baltimore Ecosystem Study (BES), Coweeta (CWT), and the Northern Template Lakes (NTL) (summarized in Table 1).

The **results** of this poster aim at recommendations for integrating social sciences into the long-term research goals of LTERs, using the LUQ-LTER as an example.

Results

Key institutional characteristics of LTERs engaging in integrative research that are relevant to the LUQ-LTER:

- Social sciences are institutionalized in the leadership of the LTERs - **all four LTERs reviewed have social scientists as Co-PIs.**
- Two of the LTERs have an explicit **conceptual model** to guide their socio-ecological research. The other two have an implicit model reflected in their proposal objectives and research questions.
- All sites include a range of social sciences in their research team. Although economics is prominent in all LTERs, **sociology, anthropology, geography, and political sciences** are also represented.
- While analysis of human actions (e.g. resource use) are a central focus of environmental social science research, analysis of **human perceptions and attitudes, institutional changes, and cultural interactions**, are also key factors addressed in the LTERs.
- **Characterization of the socio-ecological system** is an important activity for creating context and future integrative analysis. The LTERs use a combination of data collection methods for this purpose, such as social surveys (e.g. Phoenix Area Social Survey), U.S. Census data (e.g. NTL), and GIS data (e.g. BES social differentiation index, CWT land-use mapping).

• All have **published synergistic articles** with integrated ecological and social data. There does not appear to be an impediment for the LTERs to publish interdisciplinary studies, however, this requires in-depth study into the publishing process.

	Coweeta (CWT) LTER	Northern Temperate Lakes (NTL) LTER	Baltimore Ecosystem Study (BES) LTER	Central Arizona Phoenix (CAP) LTER
Human context of the LTER	LTER in rural-urban interface. Human land use pressure increasing in southern Appalachian region.	LTER in rural-urban interface. Human pressure increasing on shorelines of northern temperate lakes.	LTER within an urban system - Baltimore Metropolitan Area	LTER within an urban system - Phoenix Area
Role of social scientist in LTER - are they institutionalized?	Yes - 2 PIs (one is a Lead PI)	Yes - 5 PIs	Yes - 5 Co PIs	Yes - 4 PIs (one is a Lead PI)
Explicit conceptual framework of human-environment integration?	Somewhat - characterizing socio-natural template with humans as drivers	Somewhat - although integrative activities between ecological and social sciences present	Yes - Human-ecosystem framework based on social ecology	Yes - Urban ecosystem framework (see Figure 4)
Social sciences represented in the LTER	Anthropology Economics Policy	Rural sociology Economics Geography	Social ecology Sociology Geography	Anthropology Sociology Economics Geography
Key social science activities	Social organization analysis of changing markets, institutions and land-use decisions; cost-benefit of land use decisions;	Economic value of water quality (value of farming; housing and recreation); public perceptions toward shoreline development and water quality; disproportionality of social behaviors	Spatial heterogeneity of social variables and vegetation; modeling of social groupings and land use decisions; housing economics	Spatial heterogeneity of social variables and vegetation; value of ecosystem services; public perceptions toward the urban environment.
Is ecological and social data integrated and how?	In process - objective of current proposal to integrate ecological and social initiatives using models and forecasting methods	Yes - looking at disproportionality through interactions of biological and social variables at multiple spatial and temporal scales.	Yes - under theoretical framework (i.e. social ecology), statistical and computer modeling and GIS techniques	Yes - under theoretical framework (i.e. urban ecology), statistical and computer modeling and GIS techniques
Spatial extent of social data collected	Forest to watershed scale; disturbance in an environmental gradient	Watershed, landscape integration of multiple lakes	Multiple scales: household; neighborhood; urban-rural watershed	Multiple scales: household; neighborhood; watershed
Temporal extent of social data collected	Historical characterization of land uses choices; forecast decision-making	Long-term data of economic value of farms and ecosystem services.	Historical changes in demographic data; long-term trends of demographic and socio-economic data	2 years of Phoenix Area Social Survey.
Synergistic publications?	Yes	Yes	Yes	Yes
Cross-site social science research with other LTERs?	NA	Yes - with CAP (e.g. environmental justice)	NA	Yes - with Baltimore (e.g. environmental justice)
Funding for integrative research	Yes, supplemental from NSF in 1994	Yes, supplemental from NSF in 1994	Yes, from initiation as an urban LTER	Yes, from initiation as an urban LTER

Table 1. A recent issue in *Society and Natural Resources* brought together results and experiences of LTERs that engage in integrative research with the social sciences. The four LTERs featured include two that have incorporated social dimensions to their current research program, the Coweeta LTER (CWT) and the Northern Temperate Lakes LTER (NTL), and two that were created with the explicit purpose of conducting integrative research in human-dominated systems, the Central Arizona-Phoenix LTER (CAP), and the Baltimore Ecosystem Study LTER (BES) (Gragson and Grove 2006). This table reveals some of these overlaps and differences but also adds institutional factors for comparison among the LTERs with information obtained from site documents and websites.

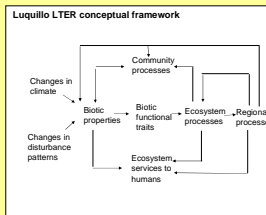


Figure 3. The LUQ-LTER traditionally focused on community and ecosystem responses to climate change and disturbance and has now expanded to address regional processes and their effects on regional and local climate, tree species composition, stream ecology, and ecosystem services. At the moment, no social factors are explicitly included in the model. The LUQ-LTER could consult other models that explicitly include social factors, such as the CAP-LTER in Figure 4.

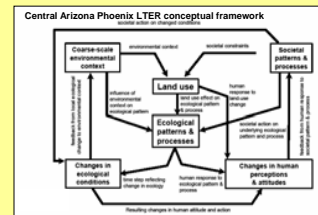


Figure 4. The CAP-LTER was originally conceived as an urban LTER, thus social factors were explicitly incorporated in its conceptual model. This model expanded the ecological focus to include understanding of societal patterns and processes and changes in human perceptions and attitudes.

Relevance to other LTERs

Institutional factors and research activities of the LTERs highlighted in this poster provide guidance to other sites beginning to incorporate social science, such as the **Luquillo LTER (LUQ-LTER) in Puerto Rico.**

Traditionally focused on understanding factors driving long-term change in tropical forest ecosystems, the **LUQ-LTER is experiencing increases in human influences**, with urban encroachment and recreation use having local and regional impacts on forest cover and quality of ecosystem services, such as water (Figure 1 and 2) (ITES and IITF, 2006).



Figure 1. Map of the Luquillo LTER. The gray in the upper map show urban regions, and the green outlines the Luquillo Experimental Forest, site of the Luquillo LTER. Source: ITES and IITF, 2006.



Figure 2. View of the Luquillo Mountains showing increasing coastal development and urbanization in the fringes of the forest. Source: ITES and IITF, 2006.

While each LTER is unique, their experiences offer a starting point for the LUQ-LTER. Specifically, the socio-ecological and research context of the CWT is most similar to the LUQ-LTER (i.e. research evolution from forest to watershed management to land-use trends in urban/rural interface). Nonetheless, the urban ecology research by the BES and CAP can provide hypotheses and key insights into urban processes useful to the LUQ-LTER in the future.

A recommendation from this study is to conduct an internal assessment of LUQ-LTER scientists as to what challenges and opportunities they see with engaging social sciences into their guiding research framework. Other suggestions include:

- Develop a **conceptual model of the socio-ecological system**. Consult a general model as developed by Redman et al. 2004, or a site-specific model of another LTER (see Figures 3 and 4 as an example). Conceptual models have been proposed as a useful tool for LTER scientists to communicate across disciplines (Heemskerk et al. 2003).
- **Characterize the socio-ecological system** through historical and present descriptive data. This will help establish baseline socio-ecological conditions and facilitate the monitoring long-term changes. Consulting methods and data used by other LTERs could promote **cross-site research collaboration in the future.**
- Develop **integrative research hypotheses** with *a priori* participation of social scientists. Inviting social scientists in the early stages of research development ensures their long-term involvement in the LTER (Social Science Committee Meeting-LTER All Scientists Meeting, 2006).
- Studying changes in **human values and perceptions** is just as important as human behaviors and actions, but these are not necessarily addressed the same way as they pose different challenges (i.e. difficult to predict).

Literature Cited

Please see list attached to poster.

Acknowledgements

Thanks to Dr. Kelli Larson and Elizabeth Larson of the CAP-LTER for reviewing this poster. I would also like to thank the LUQ-LTER team, especially Nick Brokaw, Fred Scatena, and Jorge Ortiz-Zayas, for their input in this research. This study was supported with funding by the IGERT (Integrative Graduate Education and Research Training) in Urban Ecology Fellowship.

