

## **SOCIOECOLOGICAL DYNAMICS OF RESIDENTIAL LANDSCAPES: A MULTI-SITE COLLABORATION**

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### **Objectives and Significance to Science and Society**

Although urban environments occupy a relatively small portion of the Earth's surface, their ecological impacts are far-reaching in scope and diversity (Vitousek 1994). For example, the conversion of agricultural and forested lands to residential land use drives habitat fragmentation and ecosystem change in the US. (Munroe et al. 2005). Although the management of agricultural lands has been well studied, far less research has focused upon urban or suburban areas where human choices affect ecological patterns and processes. Residential landscapes, including prevalent lawns, are increasing worldwide and are associated with high rates of water and chemical applications to terrestrial and, by extension, aquatic systems. Turfgrass in residential and other areas is now the largest irrigated crop in the US, covering 10–16 million hectares (Robbins et al. 2001). Yet research is needed to understand the human and ecological drivers, impacts, and feedbacks associated with turfgrass management in multiple locations with varying socioecological contexts. The LTER network is uniquely poised to contribute to this key area of integrated social-ecological research, especially given on-going site-level research and emphasis on cross-site synthesis and comparisons (Redman et al 1999). In particular, socioecological research on residential landscapes is underway at several LTER sites:

- At *Central Arizona–Phoenix* (CAP), Larson and Hall are investigating the sociocultural and structural drivers of residential land-management practices and associated ecological and biogeochemical outcomes, primarily at the household and neighborhood scales.
- In the *Baltimore Ecosystem Study* (BES), Grove and colleagues are linking hydrologic pulse events (hurricanes, droughts) to ecological and built structure, ecosystem function and services, and human outcomes and behaviors from the parcel to regional scales.
- At the *Plum Island Ecosystem* (PIE), Polsky and Hopkinson are leading a long-term study of how suburban land-use regulations in the Boston area modify hydrological flows and nutrient cycling, with feedbacks on policy, quality of life, and sense of place.
- In *Florida-Coastal Everglades* (FCE), Chowdhury, Ogden, and others are combining geospatial and ethnographic analyses to uncover how zoning, sociodemographics, and climate events (hurricanes) interact to impact land use-cover at the household to regional scales.

Each of these efforts is examining cutting-edge basic science questions, which are also of societal importance. The value of these projects would be significantly amplified if the projects were coordinated systematically, in the spirit of the recently produced Integrative Science for Society and the Environment (ISSE) guiding document. Our proposed workshop aims to lay the foundation for an LTER network-wide research agenda on the coupled human-environment dynamics of residential-landscape management. **Our two primary objectives are to:**

- share findings and research methods to coordinate current research on socioecological dynamics of lawns and residential landscapes across the LTER network, and
- develop a grant proposal to examine these dynamics, using a coordinated network approach, in the Greater Phoenix, Baltimore, Boston, and Miami regions.

These goals will further collaborations among scientists at these LTER sites, for example, joint sessions at the 2008 International Symposium for Society and Resource Management. Broader LTER network engagement will expand these synergies and cross-site comparative research.

## Workshop Approach and Relevance to the LTER Network and NSF

Our interdisciplinary, network-level research agenda proposes to compare, evaluate, and advance ongoing research using the ISSE framework and questions as a guide. For example, multiple sites are investigating *how perceptions, drivers, and impacts of human behavior interact with ecological structure and disturbances*:

- CAP on values-beliefs-norms, including the perceived consequences of residents' yard management, and how these influence landscape-management practices;
- BES on perceptions of ecosystem services and their effects on land-management practices and institutional arrangements;
- PIE on perceptions of water quantity as a major issue in a relatively rain-abundant study area;
- FCE on perceptions of zoning ordinances and environmental change and how those perceptions influence local and regional land-use decisions.

A second example is *interactions of biotic structure, ecological fluxes and ecosystem services*:

- CAP on nutrient fluxes and soil properties corresponding to structural and management factors;
- BES on land cover, soil, topography and built infrastructure in relation to ecosystem services;
- PIE on vegetative structure and hydrologic/nitrogen fluxes on residential parcels;
- FCE on surface permeability and carbon sequestration under diverse land covers.

Although all four sites are addressing specific aspects of the ISSE framework, coordination and standardization of approaches and additional funding is needed for cross-regional comparisons.

## Details of Workshop Goals and Structure

Hosted by the CAP LTER, the meeting would be held at Arizona State University - Tempe in Feb.-Mar. 2009. We propose a three-day workshop with two components to meet our goals:

**Days 1-2 - Proposal Writing** *to compare and integrate socioecological research at LTER sites* (8 participants from CAP, BES, PIE, FCE): The first component will continue the nascent collaborations among social and ecological scientists at the four sites with existing research on residential landscapes. Building on preliminary efforts and broader network initiatives, we will plan a November 2009 **NSF CNH grant proposal** to more fully explore socioecological dynamics of residential landscapes through integrated, cross-regional research for 2010-2014.

**Days 2-3 - Information Sharing** *to synthesize research and explore opportunities for further cross-regional studies across the LTER network broadly* (16-18 participants total). The second component will invite additional LTER sites conducting or developing residential landscape research (possible participants include CDR, CWT, KBS, BNZ, LUQ, NTL, SEV, JRN, GCE, and J. Kaye from PSU). Following a field trip to stimulate dialogue on residential landscapes, short presentations on the status of site-level and collaborative research will address research questions, results, data and approaches. Ongoing and potential research will be discussed in relation to the ISSE framework to identify gaps in knowledge and opportunities for advancing an environmental science network, as recently called for by prominent scholars (Peters 2008; Carpenter 2008).

## Outcomes and Products from the Proposed Workshop

The workshop will have **3 primary outcomes**: **1)** an electronic network of LTER sites for continued information sharing for inter-regional research, **2)** a brief summary of current research approaches and future opportunities for collaboration, and **3)** development of additional funding with an NSF Coupled Human-Natural (CHN) Systems proposal to study how human drivers affect land management and ecological outcomes at different scales and in diverse geographic contexts.

## Budget and Justification

We request support for costs associated with the workshop outlined above. These costs include airfare (\$8,500) and accommodation (\$6320) for 17 workshop attendees (40 nights in total) at a moderately-priced hotel near ASU. We will make use of hotel shuttles and CAP LTER vehicles for ground transportation in Tempe, but participants will need ground transportation from their home to the airport and from the airport to their home (\$680). We will also provide meals to workshop participants (\$1,920), which will include breakfast, lunch, and dinner during the first two days of the workshop and breakfast and lunch during the last day. During day two of the workshop, we will be taking participants on a short field trip of residential landscapes in the Phoenix area to spur discussion about socioecological drivers of these landscapes. We will be renting and fueling three vans (\$285) for this purpose. Finally, we anticipate purchasing a small amount of supplies for the workshop, as well as paying for photocopying costs (\$100).

<b>Workshop Expense</b>	<b>Amount</b>
Airfare	\$8,500.00
Accommodation	\$6,320.00
Ground transportation	\$680.00
Catering	\$1,920.00
Field trip	\$285.00
Supplies	\$100.00
<b>TOTAL</b>	<b>\$17,805.00</b>

## In-Kind Contributions to this Research Initiative

Two sources of in-kind contributions will assist this effort. First, FCE will provide funds from a Social Science Supplement Grant to support a pre-workshop meeting (primarily among the social scientists) at Clark University in fall 2008. The meeting will assist the PIs in preparing for the workshop, specifically through comparisons of ongoing land use-cover mapping efforts and field and social surveys. The outcome will be a paper synthesizing our research questions and methodological approaches on residential landscapes across sites, which we intend to circulate for the workshop and ultimately publish in a peer-reviewed journal. Second, the CAP LTER will provide administrative support in planning for the workshop logistics as well as meeting space.

## References

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