

RESEARCH, TEACHING, AND SERVICE ACTIVITIES

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For more than a decade now, my career has been motivated by humanity's need to maintain critical environmental functions while improving quality of life for its less privileged members, including those yet to come. I firmly believe scientific analysis has a crucial role to play in helping achieve such gains. In particular, scholarship that treats humans as integral and integrated parts of environmental systems (rather than as absent or as exogenous perturbing forces), and that elucidates the different ways in which human-environment interactions can play out across scales of space, time, and social organization, is essential.

Such research requires an interdisciplinary and collaborative approach. It is simply beyond the capacity of any one scholar to unpack both the intricacies of human and ecological dynamics. While my own research is currently centered in ecology, I am conversant in several other disciplines, including anthropology, climatology, and economics. From the ecology core, I regularly engage in collaborative research that crosses the natural- and social-science divide.

I have followed a relatively non-traditional pathway in reaching this point. I began my graduate studies in Physics, but ultimately decided that such a background wouldn't allow me to effectively address the environmental problems of greatest concern to me. I therefore transferred to a Ph.D. program that required coursework in economics, political science, natural science, and energy systems and technology; from this mix I chose ecology as a field from which I could make compelling contributions. I completed a dissertation focused on theoretical ecology, and pursued post-doctoral work in this area at Princeton University. I also understood, however, that better understanding and management of the Earth's ecosystems would eventually require integrating ecology with anthropology, economics, and political science. Therefore, when the opportunity arose to take an Urban Ecology position at Arizona State University, I seized it, though it represented a fundamental shift from my work in theoretical ecology. I welcomed the opportunity to study humans as an integral part of an urban ecosystem, as the job description suggested. The position also carried an expectation of linking ecological research and other environmental research on campus through collaboration—an atypical condition for an Assistant Professor position, but one that I welcomed given my interests in interdisciplinarity. As a result, my time at ASU has largely been spent making a transition away from theoretical ecology and towards the collaborative study of coupled social-ecological ecosystems, including urban systems.

Research Activities

Theoretical Ecology

I continued some of my theoretical ecology work at ASU while laying the foundations for a shift to urban ecology. I have worked with John Harte (UC Berkeley) on species-abundance distributions and the implications for species loss under land conversion; this has resulted in three ASU publications (Harte and others, 1999; Kinzig & Harte, 2000; Ostling and others, in press). I have also co-edited, with Stephen Pacala and David Tilman, a Princeton University Press monograph entitled *The Functional Consequences of Biodiversity*, which has become the seminal book on this topic. In addition to being the lead editor of the volume, I was the lead author on 3 of the book's chapters, and a contributing author on 2 others. Additional work involves examining the use of models in ecosystem management and predictions, and I have one journal article (Sala and others, 2000) and two book chapters (Harris and others, in press; Kinzig, in press) on this topic.

The Dynamics and Resilience of Human-Dominated Systems

This is now the main thrust of my research, with three major projects under this umbrella. These are: (1) "The Parks Project"; (2) "The Spatiotemporal Aspects of Resilience in Complex Urban Systems"; and (3) "Agrarian Landscapes in Transition". While I regularly engage in interdisciplinary analysis in these projects, my main role in these collaborations is as an ecologist.

THE PARKS PROJECT

The primary motivation of the parks project is to examine the ways in which human social, cultural, and economic attributes influence human interactions with ecological systems, and thus affect ecological outcomes. We are studying 16 neighborhood parks in 3 different neighborhood types—high income White; middle income White and Hispanic; and low income Black and Hispanic. This research is funded through the Central Arizona—Phoenix Long-Term Ecological Research Project (CAP LTER). I am the project leader, but my collaborators include faculty members in geography and botany, and post-doctoral associates in avian ecology and sociology.

We have gathered data on perennial plant and avian diversity in these parks and their surrounding neighborhoods; on neighborhood socioeconomic status; on park use; on park preferences and neighborhood satisfaction; and on park history. We are finding a significant impact of human socioeconomic status on ecological outcomes, even after accounting for more traditional correlates such as park area, park age, population density, and distance from urban center. After two years of intensive data collection, we are now in a position to be publishing, and have produced three draft manuscripts (see CV) with several others planned. I have also co-authored three manuscripts on urban ecology more generally (Collins and others, 2000; Kinzig & Grove, 2000; Hope and others, 2003).

SPATIOTEMPORAL ASPECTS OF RESILIENCE IN COMPLEX URBAN SYSTEMS

The ways in which humans perceive and respond to environmental change may vary by culture, and these perceptions and responses may themselves change as human systems 'evolve' or complexify. A 'deep time' analysis, funded by the McDonnell Foundation, concerns perception of and responses to changes in water availability in the Phoenix basin from pre-history (circa 500 A.D.) to the present day. Charles Redman (ASU, CES and Anthropology) and I co-direct the Phoenix portion of the project; Sander van der Leeuw is a collaborator examining similar questions in the Rhone basin of France. Our pre-historic and historical analyses involve compilation and synthesis of existing archeological and historical datasets, while present-day management practices and perceptions are being examined largely through interviews with water-management personnel. Our analyses will culminate in simple agent-based models of the hydrologic system and human decision-making, allowing us to examine alternative human-environment trajectories over long time scales.

Resilience theory serves as an organizing conceptual framework for this work, and Redman and I have convened several workshops on archeological and anthropological contributions to resilience theory (see CV). One article on this topic has recently appeared (Redman & Kinzig, 2003), and I am a co-author on a book chapter on resilience (Walker and others, in press). I have also given several invited national and international talks on resilience (see CV).

AGRARIAN LANDSCAPES IN TRANSITION

This is a relatively new, NSF-funded project to trace the ecological and social effects of the introduction, spread, and abandonment of agriculture at six LTER sites across the United States. Of particular interest are the ways in which these dynamics might vary across biogeographic regions, each with different cultural perceptions of landscapes. The analysis will be cross-scale, with an

examination of patterns and dynamics from the level of the farm, to townships, irrigation districts or watersheds, and regions. Such a cross-scale comparison allows identification of potential “critical scales” or critical cross-scale interactions, and elucidates the ways in which processes at one level of an organizational or ecological hierarchy can constrain or influence processes at another.

This research has only recently begun, with an inaugural meeting of all partners in December 2002. The first year is focused on data gathering and production of narratives describing critical agricultural transformations at each site; Kinzig and Redman are scheduled to present two talks on the Phoenix narrative at national meetings in Summer and Fall 03.

The three projects taken together thus allow examination of (1) the influence of human social, cultural, and economic characteristics in shaping human-environment interactions; (2) the influence of long time scales and legacies in influencing ecological outcomes; and (3) patterns in the dynamics of coupled social-ecological systems when viewed at different spatial or organizational scales.

Teaching and Training

Undergraduate

I draw on research from all of my core areas in my teaching. My main undergraduate teaching assignments have been in Introductory Biology (187, 182) and Fundamentals of Ecology (320). My theoretical ecology background allows me to guide the students in understanding the theoretical and quantitative dimensions of evolutionary or ecological phenomena. My interdisciplinary research interests in human-dominated and urban systems allows me to illustrate the consequences of human activities on the ecological processes we cover in class, and permits me to draw examples from the human-modified ecosystems students experience everyday. My science-policy experiences allow me to inform the students of the impact of Federal programs and policies on natural-resource dynamics. I do not merely lecture on these topics, however; I conduct my classes to promote participation and inquiry-based learning, largely through group and classroom discussions focused on difficult ecological questions (e.g., no single correct answer). I also use a variety of approaches (slides, videos, in-class exercises, and skits) to convey information, even in the largest (400+ students) classrooms. I have consistently received high ratings in student evaluations.

I regularly have undergraduates conducting research in my laboratory, either on the Parks Project or with respect to water issues in the Phoenix Basin. I have supervised a total of 10 undergraduate independent research projects during my tenure at ASU.

Graduate and Post-Doctoral

My main activities in graduate education have been through the Integrated Graduate Education, Research, and Training program in Urban Ecology (IGERT). This IGERT program has nearly 20 students from 6 different disciplines. One of their requirements is to participate in a semester-long collaborative research workshop, and I have co-taught three of these workshops. In addition, I obtained funding for, and oversee, an IGERT international exchange program that will allow 6 IGERT graduate students to spend a semester or summer abroad with one of three institutions (in Australia, Sweden, or France) over a three-year time period.

The interdisciplinary and collaborative nature of my research means that I interact with and advise many graduate students not in my lab or my department. While I currently serve as chair for two graduate students in the School of Life Sciences, I serve on the committees of 5 other students—2 in SoLS and 3 in Anthropology. I have also supervised 2 anthropology students as graduate research assistants. I have supervised or co-supervised (with Redman) 4 post-doctoral

researchers during my time at ASU—one in avian ecology, one in sociology, one in history, and one in remote sensing. I have also participated in several national and international graduate workshops at other institutions (see CV).

Service

National

I was granted a leave during the first year of my ASU appointment to work as a AAAS Science-Policy Fellow in the White House Office of Science and Technology Policy (OSTP). My portfolio there included energy policy and technology, climate change, and carbon cycling. I received additional training in science leadership and policy through the award of a 2000 Ecological Society of America Aldo Leopold Leadership Fellowship.

Since leaving OSTP, my primary activity in science policy has been to encourage more support and funding for interdisciplinary environmental research, and I organized and led a National Science Foundation workshop on this topic. The workshop—attended by 45 scholars from a variety of different disciplines and overseen by an 8-person steering committee (of which I was chair)—resulted in a report delivered to the NSF that contributed directly to the establishment of a program on the Dynamics of Coupled Natural and Human Systems under NSF's Biocomplexity Initiative. In addition, Jim Collins (ASU) and I convened a one-day workshop at the National Science Foundation in April 2003, involving administrators from several universities (from Presidents to program directors) and high-level personnel of NSF, to discuss strategies for institutionalizing interdisciplinary programs. A paper in a leading journal is planned as an outcome of that meeting.

In addition to the NSF report and planned paper, I have published one journal article (Kinzig, 2001) and have one book chapter in press (Kinzig and others) articulating the need for further interdisciplinary research, and making policy recommendations for overcoming institutional barriers to progress. I am also the lead author on an article in *Ambio*, on the need for a more effective science-policy interface to deal with uncertainty (Kinzig and others, 2003).

My combined interests in interdisciplinary ecological studies and in science policy have led to my appointments on the Science Advisory Board for the National Center for Ecological Analysis and Synthesis (Sep 01 -), the Research Committee for the Ecological Society of America (Aug 01 -), the Editorial Board of *Ecosystems* (Jan 00 -), the Editorial Board of *Frontiers in Ecology and Evolution* (Aug 02 -), and the Science Board of bio-era (Dec 02 -).

University

I have served on several University search, advisory, and curriculum committees (see CV). My main service activities at Arizona State University, however, have been devoted to increasing and integrating the University's urban environmental research and outreach activities. I have acted as a liaison between the Department of Biology and the Center for Environmental Studies, serving as a Biology representative on multi-departmental working groups, research initiatives, and proposals. I was instrumental in securing ASU's membership in the Resilience Alliance—a prestigious international consortium of universities, NGO's, and research agencies—and serve on its Board of Directors and Executive Committee. I have participated in the planning process for the newly launched Consortium for the Study of Rapidly Urbanizing Regions, and am engaged in the planning for a multi-investigator project on environmental monitoring of 100 cities globally—designed to advance our conceptual understanding of urban growth as well as to provide crucial information to policymakers struggling with rapid urbanization. ASU is poised to become a leading institution in the study of urban regions, and I hope my work will continue to contribute to securing that position.