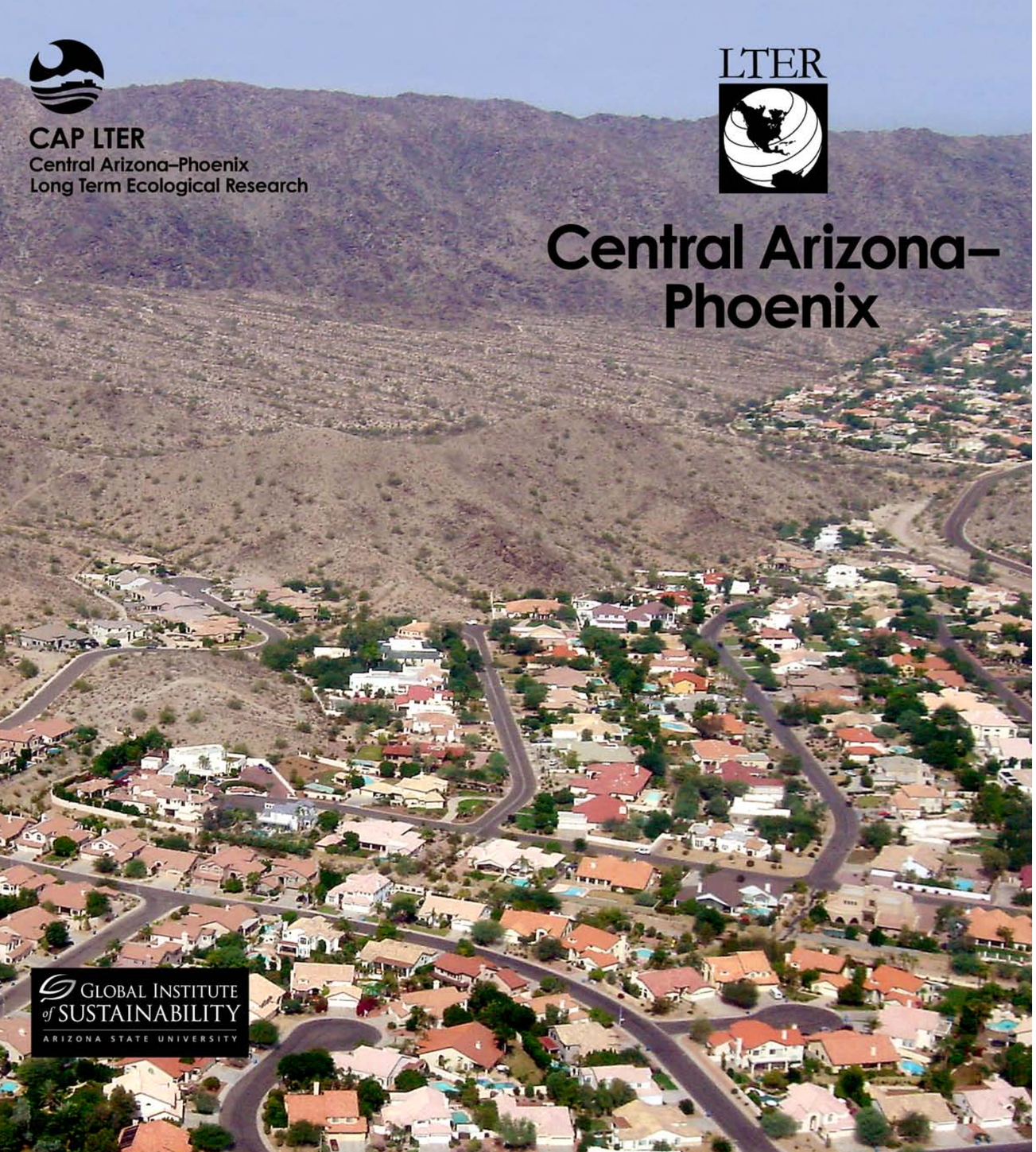

How does urban development affect an ecosystem, and how is development, in turn, affected by ecological conditions? CAP LTER investigates this question through interdisciplinary projects integrating natural sciences, social sciences, and engineering. The field of ecology developed over the past century with limited reference to human impacts upon ecological processes. Our study of the desert metropolis of Phoenix, Arizona, seeks to understand human-dominated ecosystems and find solutions to pressing environmental problems.

CAP LTER aims to:

- advance scientific understanding by developing ecological theory that includes human and societal drivers and responses;
- understand the structure and functioning of urban ecosystems and the ways in which they differ from wild lands ecosystems;
- construct ecological scenarios to guide urban development while sustaining ecological and societal values, and engage decision makers in this process through knowledge exchange; and
- improve public understanding of urban-ecosystem dynamics through education and outreach.

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CAP LTER

CAP LTER focuses on five areas of integrative, collaborative research. Long-term monitoring at 200 sites across central Arizona, short- and long-term experiments, historical analyses, modeling, and the investigation of phenomena at multiple scales are some of the methods we use to discover how urban ecosystems function.

Case Study: North Desert Village Experimental Suburb

The Human Perception and Valuation of Diversity project is one component of an unprecedented, long-term experiment at the neighborhood scale. At North Desert Village, a residential development for students with families on the Polytechnic campus of Arizona State University, four landscape design types were established in mini-neighborhoods of six households each to recreate the most common landscape types found in the region. The experiment studies how landscape design affects social and ecological functioning at household and neighborhood scales and how biophysical factors feed back into human decision making and behavior at the household scale. The experiment will contribute to understanding how biodiversity and ecosystem function relate in urban ecosystems with relatively brief co-evolutionary histories. For example, we will be able to determine how net primary productivity compares in natural and human-created plant communities.

How do land-use and land-cover changes alter the ecological and social environment, and how does human perception of these changes affect decision making? Ecologists, engineers, urban planners, and geographers incorporate human factors into models that will help us to project future growth scenarios. Research focuses on drivers of urban change, indicators of change, and understanding the complex interactions that comprise an urban ecosystem.

How does human activity affect the relationship between local ecosystem functioning and climate? CAP LTER climatologists and plant biologists investigate many facets of climate-ecosystem interaction, such as how carbon accumulates in whole vegetation canopies and communities and how human inputs into the ecosystem, such as nutrients, water, atmospheric CO_2, and heat, affect the productivity of urban vegetation. They also explore how qualitative human perceptions of environmental quality might change quantitative patterns of urban vegetation and net primary productivity in the future.

What are the ecological and economic consequences of water management and what institutional responses can best address vulnerabilities of a variable water system? Several interdisciplinary teams investigate the ecological consequences of, as well as human and institutional responses to, variability in the managed water system. They seek to identify key ecological and social processes, predict vulnerabilities, and improve capacity to withstand the hydrological perturbations of an arid environment.

How do urban element cycles differ from those of nonhuman-dominated ecosystems? How are toxins and pollutants distributed across the CAP ecosystem and what hazards result? Teams of biologists, chemists, geologists, and engineers investigate chemical fluxes from atmosphere to land in urban versus non-urban ecosystems. They also study how the mass balance of elements imported and exported into urban areas differs from that of non-urban ecosystems and the spatio-temporal distribution of contaminants in surface water and soils. These distributions form a basis for investigations of environmental justice and equity.

How do humans affect biodiversity and how do variations in biodiversity influence humans? Human activity in urban areas has dramatically altered abundance and distribution of native species. Several interdisciplinary studies tackle the question of how humans affect and respond to biodiversity change. These include long-term monitoring of arthropods, birds, and plants; measuring the effects of nonnative plant species on vertebrate and invertebrate communities; studying patterns of plant and bird community structure; and assessing human reactions to residential landscapes.