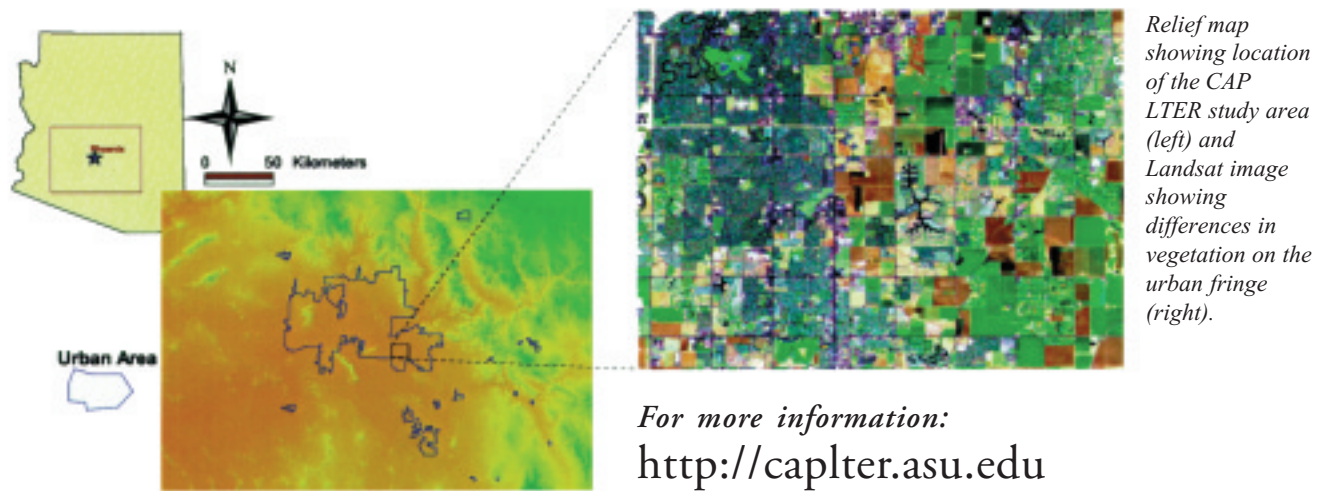


The Central Arizona - Phoenix Long Term Ecological Research (CAP LTER) project at Arizona State University was selected in 1997 by the National Science Foundation to be one of the first urban sites in the LTER network. CAP LTER provides a unique addition to LTER research by focusing upon an arid-land ecosystem profoundly influenced, even defined, by the presence and activities of humans. Investigations of land-use and ecological consequences in an urban environment also involves community partners and K-12 schools. Through these extended collaborations, CAP LTER:

- monitors and interprets the long-term impact of human settlement on the environment of the city and surrounding area
- enhances understanding of urban ecology
- studies the relationships between ecological and socioeconomic factors
- engages students at all levels in the enterprise of scientific investigation.

Our aim is to understand the changing urban fabric of our arid urban ecosystem and, because one-third of the world's land surface is arid, to offer applications to arid cities across the globe. By providing CAP LTER data over the Internet, we hope to enable community members and policy makers to make informed decisions about the future of their cities.



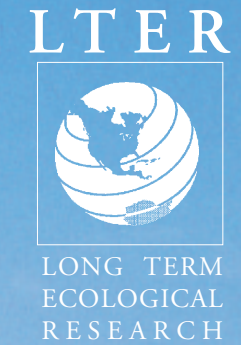
For more information:

<http://caplter.asu.edu>

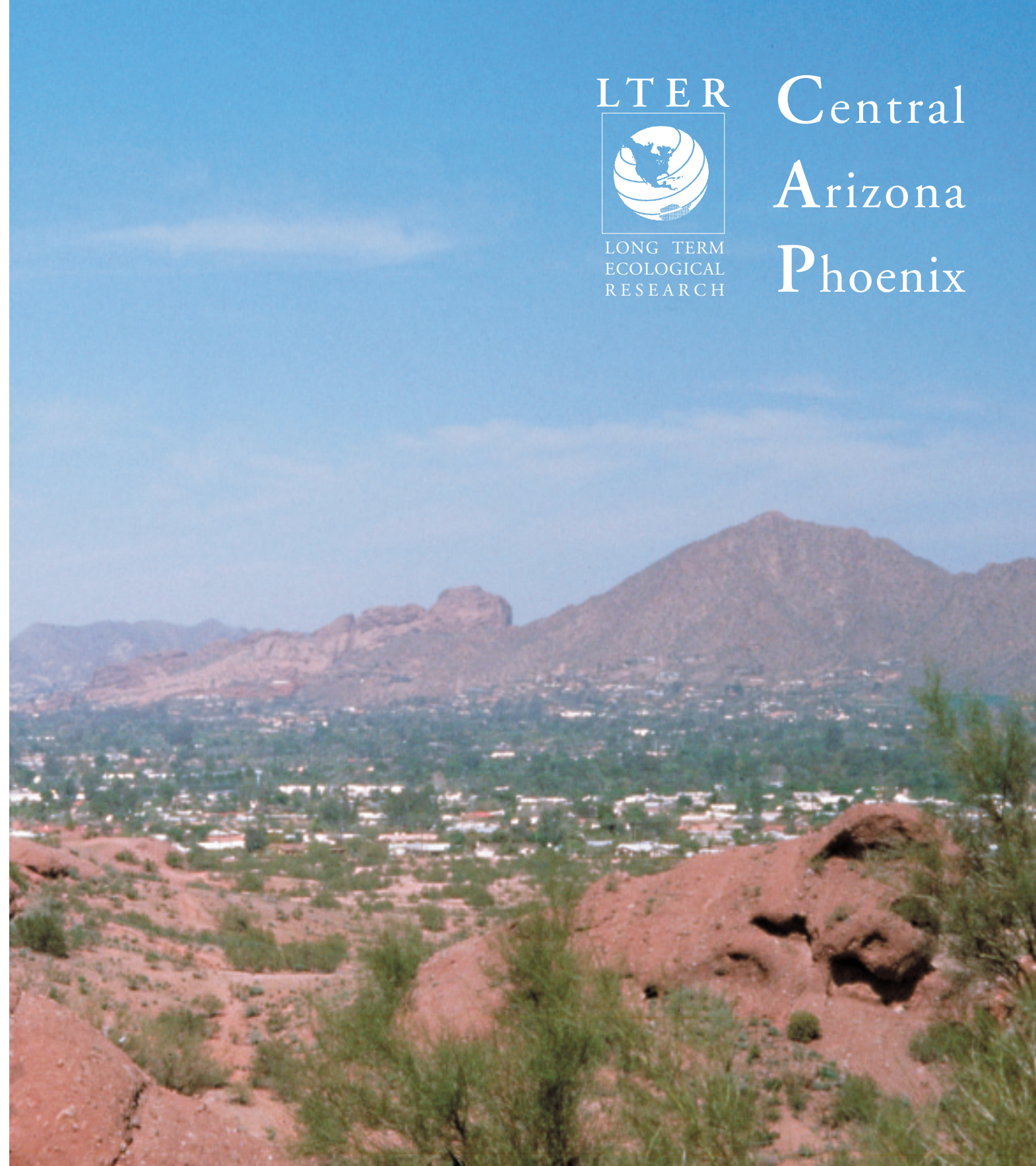
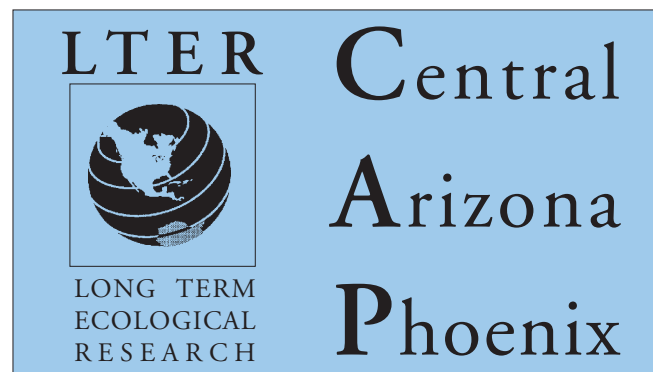
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Cover photo: View of Phoenix from Papago Park, looking north toward Camelback Mountain.



Central  
Arizona  
Phoenix



⟨ *How does urban development alter ecological conditions?* ⟩

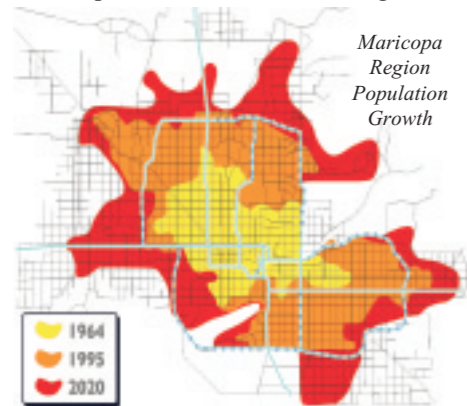
⟨ *How do ecological conditions affect urban development?* ⟩

To answer these questions social, physical, and biological scientists from Arizona State University are looking collaboratively at the Phoenix urban ecosystem. Researchers are carrying out long-term monitoring of urban and ecological variables. To study the effects of urban development on the Sonoran Desert ecosystem, scientists are focusing on five core areas:

- ⟨ human feedback and land-use change
- ⟨ nutrients and materials transport
- ⟨ modeling/GIS/remote sensing/database
- ⟨ primary production
- ⟨ plant, animal, and microbial populations
- ⟨ geosciences and engineering

**HUMAN FEEDBACKS AND LAND-USE CHANGE**

Socioeconomic factors and ecological characteristics combine to shape land-use decision making. CAP LTER research asks how human land use modifies the ecological features of the urban landscape and, in turn, how ecological features affect the human use of land.



Population densities of over 1,500 persons/square mile, Maricopa County. Source: Maricopa Association of Governments

One study examines the value that people place on environmental amenities such as open spaces. In addition, objective analyses of change in property values and shifting demographic patterns in the urban landscape are assessed as indicators of ecological and other values. Another study identifies current boundaries of the urban area and studies factors responsible for the spatial pattern of new development on the urban fringe. An analysis of land absorption and consumption, as well as municipal and county development policies, provide a historical, current, and future understanding of the dynamic urban fabric. Partnerships with agencies, municipalities, and businesses enrich these research efforts.

# Central Arizona – Phoenix LTER

**NUTRIENTS AND MATERIALS TRANSPORT**

CAP LTER is developing a preliminary mass balance for nitrogen and salts in the CAP LTER watershed. A field sampling program involves regular measurements of nutrients, major ions, salts, and metals being imported to and exported from the study area in surface water (rivers and canals) and groundwater.



CAP LTER graduate research assistant collects water sample from the Salt River.

**MODELING/GIS/REMOTE SENSING/DATABASE**

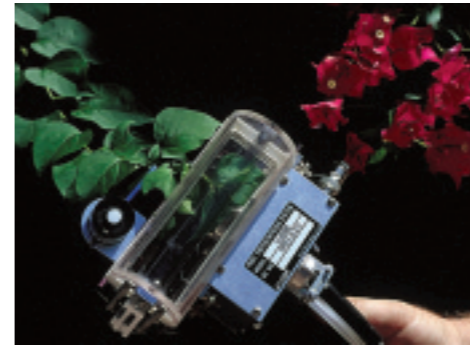
We are developing a GIS simulation model to predict both ecological consequences and dynamic change in size, arrangement, and abundance of different patch (land cover) types across the study area. Our GIS database contains up-to-date information on natural resources, land use, and socioeconomic variables. The different patch types that comprise the Phoenix metro area and surrounding desert are defined with the help of remotely sensed data (e.g., aerial photographs, satellite imagery). These categories are used to structure field sampling and monitoring activities, as well as develop a computer model of the urban system.



CAP LTER social and biological scientists select sample monitoring sites.

**PRIMARY PRODUCTION**

This study concentrates on the rates of net primary production exhibited by vegetation associated with different land-use patches and how rates at larger scales depend upon patch size, shape, location, and configuration. We are monitoring residential, undeveloped Sonoran Desert, and agricultural sites to measure their net above-ground primary production; measurements include net CO<sub>2</sub> exchange and biomass/biovolumes of selected plant species, and soil respiration.



Plant biologists collect primary productivity data using an infrared gas analyzer.

**PLANT, ANIMAL, AND MICROBIAL POPULATIONS**

CAP LTER monitors the spatiotemporal characteristics of organisms in four groups: humans, arthropods, birds, and plants. The plant survey is compiling a list of native and exotic species and resurveying plant communities censused 20 years ago. The study also examines factors affecting plant species diversity. A lichen resurvey compares the concentration of trace metals in current lichen tissues with those from the original survey, as a method of assessing ecological change wrought by urbanization.



ASU students conduct vegetation survey.

With arthropod sampling, we monitor the species diversity of insects inhabiting different types of patches in the study area (e.g., desert remnants, agricultural fields, suburban yards, industrial properties). Our bird survey documents changes in avian richness and abundance over time and space, and determines the socioeconomic and biotic factors that cause these changes in four key habitats.

**GEOSCIENCES AND ENGINEERING**

We are studying how the geomorphology of the Salt River channel has changed over the last 100 years and how factors such as the

damming of the Salt and Verde Rivers and gravel mining have contributed to these changes.

This study promises improved understanding of the dynamics of arid-land rivers, especially how and why they are impacted by urban development. It also involves many disciplines, as the river integrates the influences of hydrologic, geomorphic, biotic, abiotic, and human technological systems. We are also compiling a digital geological map of the study area and examining what geological changes have taken place in the landscape.



Southeast view across Papago Park and the Cross Cut Canal.

**K-12 CLASSROOMS AND THE PHOENIX COMMUNITY**

The CAP LTER has an explicit commitment to engage the broader community in our research effort, both in K-12 education and in the general public's understanding of science. Through our Schoolyard LTERs and Scientist/Teacher Partnerships, students are actively involved in real-world scientific investigations—collecting, analyzing, and interpreting ecological data. We are working with our community partners, such as Motorola and the Southwest Center for Education and the Natural Environment, to facilitate collaborations among LTER scientists and K-12 classrooms.



Elementary school students examine an arthropod pitfall trap.