

UC SANTA BARBARA

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## **SCIENTISTS TACKLE ECOLOGY OF CITIES**

The complicated, messy and uncharted ecosystems of cities are finally getting their due, as scientists plunge into the study of how they work, according to the publication of a leading group of ecologists.

"A New Urban Ecology," published in the September/October issue of *American Scientist*, explores the idea that the study of ecosystems of cities is just as important a pursuit as analysis of "pristine" ecosystems found far from human activity, which until now have been the main areas for the study of ecology. In fact, the authors assert that the study of the ecology of cities is urgent and long overdue.

The article raises many questions. Elizabeth T. Borer, graduate student in biology at the University of California, Santa Barbara and a co-author, called it a "challenge" paper asking for an entire rethinking of the role of humans in the field of ecology.

"Should humans be accountable for our influence?" she questioned.

She explained that the study of the ecology of cities raises such important but thorny issues as "Do we need to be stewards of the environment of cities, or are we just another species?"

The article resulted from meetings and research by a group of scientists working under the umbrella of the National Center for Ecological Analysis and Synthesis (NCEAS), a think tank affiliated with the University of California, Santa Barbara and

funded by the National Science Foundation.

The authors note that only .4 percent of all the 6,157 papers published in the nine leading ecology journals in the past five years dealt with cities or urban species. Up until now, said Borer, humans were considered a "disturbance" in a natural system.

Yet, they point out, "Cities are some of the most profoundly altered ecosystems on the planet; within their boundaries are also found some of the most diverse ecological conditions. If there is a laboratory where ecological change can be viewed at close hand, it is the city."

Cities, they explain, are energy intensive systems. Viewed in traditional ecological terms they are more unbalanced than most other ecosystems. While natural ecosystems are self-powered by photosynthesis or chemosynthesis, cities are "heterotrophic," depending on external sources of energy.

For example, Chicago's pizza is made with "wheat from Kansas, tomatoes from California, anchovies from the Mediterranean and cheese from a Wisconsin dairy farm. The pizza oven may be fired with fuel from the Middle East and made of steel forged in Pennsylvania or perhaps Japan."

Such heterotrophic systems are rare in the natural world, although they do exist in some marshes, the deep ocean, and streams, but these are less extreme systems.

The authors explain the concept of "ecological footprint," which is the total area of productive land required to support the activities of a city in a sustainable way. The land must produce resources that equal the sum of the resources used by the city and assimilate the city's total waste as well.

Cities in low productivity land such as arid or semi-arid land would have a huge ecological footprint, according to this type of analysis, which the authors say is a controversial one.

There are many ways in which human activity alters the natural world in and around cities, including the weather, explain the authors. An Arizona State University scientist discovered that the weekday commute changed precipitation on the East Coast, making rain more likely on weekends than weekdays.

Borer said there is a slow shift in the field toward recognizing the human role in such large and important changes as species invasions and global warming.

According to the authors, an increasing number of ecologists are looking to the study of cities and they have the support of the National Science Foundation which recently set up the first urban long-term Ecological Research (LTER) sites in Phoenix and Baltimore.

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