

Preface

Most of us call urb our home. Today's giant urban areas grow upward in population, with a fast-march outward. Now urban footprints, the agricultural and natural lands needed to sustain us, more than cover the globe. This great urban enterprise thoroughly interacts with ecology, reflecting a yet more powerful force. Nature molds our urban world, from "natural disasters" and resource scarcities to treasured plants and wildlife around us. Even pollutant and waste accumulation, green marketing, and natural landscapes pictured on our walls and in our dreams highlight the ecological dimension. The clashing and collaborating of these two giants – urb and ecology – lead to this book.

My lens focuses on spatial pattern, how it molds and responds to flows/movements, and how they all change. The pattern and process of mosaics, now a centerpiece of ecology from which most other components nicely follow, are central. Indeed, spatial pattern emerges as an especially useful handle for planners, engineers, landscape architects, park managers, pollution experts, architects, transportation specialists, hydrologists, and more. All can easily use the principles of urban ecology to build more-promising futures.

Although other sciences underpin cities – chemistry, soil science, meteorology, microbiology, and more – ecological science fills the core. Indeed, ecology incorporates key features of these fields. Ecology as metaphor, marketing, sociology, or motherhood receives bare mention. Ecologists use the central concept of ecology – interactions among organisms and the environment – to study and understand the ecology of forests, lakes, populations, ecosystems, soils, whole landscapes, even regions. Tying this core theme to urban areas produces the highly useful concept of urban ecology used in this book:

Interactions of organisms, built structures, and the physical environment, where people are concentrated.

Plants, animals, and microbes are the organisms, roads and buildings the predominant built structures. Soil,

water, and air comprise the physical environment. Cities, towns, and adjacent built areas are the prime human concentrations.

Of course, many other interactions highlighted in sister disciplines, professions, and human activities are important in urban areas. For instance, public health, urban agriculture and bird watching emphasize human-organism interactions. Architecture, engineering, and construction link humans and built structures. Water supply, flood disasters and meteorology link humans and the physical environment. Sociology, employment, and retail shopping highlight human-human interactions. Adding "interactions with built structures" and "where people are concentrated" to the traditional core of ecology pinpoints urban ecology as a basic science, promising a diversity of highly useful applications. This intriguing subject offers challenge, discovery, and societal solutions now.

The perspective is global. Limiting our view to a single nation or region feels like a Mozart symphony with most of the orchestra missing. But using models, data, examples, and figures from a breadth of cities worldwide, we gain understanding, and discover great patterns for our own places. I have lived in urban regions of ten nations, and while writing, visited numerous US cities, five Chinese cities, five Spanish cities, four Brazilian cities, three English cities, two Mexican cities, Calgary, Dublin, Berlin and Paris. To feel my subject, I lived temporarily in a balconied old-narrow-street apartment at the heart of several million people, observing street trees change, birds in a courtyard, successional habitats, scores of industrial sites, soil under streets, plenty of parks, water flows, restaurant wastes, spatial patterns galore, even cracks underfoot. I became a keen city watcher.

For convenience, the general term "urban area" is used for all scales, from megalopolis and city to neighborhood and housing development. The chapters ahead include parks and other greenspaces, but ecologically explore essentially the entire urban area – streets, walls,

lawns, industrial sites, sewer systems, artifact-rich soil, aerial components, roofs, commercial centers, parks, dumps, and much more. Also, rather than outlining the newest hypotheses, I emphasize patterns and processes with reasonable evidence and broad application. Together, these approaches open up frontiers of insight and provide dependability for users.

High winds, scorching sun, frigid nights, big floods, insect outbreaks, and the seasonal flower explosion periodically highlight the power of nature. Meanwhile, the day-to-day expression of urban nature – pleasant temperatures, pouring rain, tree shading, venerable trees, birds singing, flies flying, soil growing grass, stormwater running off, microbes decomposing, clouds moving over us – permeates the city. People and nature are thoroughly intertwined in cities.

Most urban residents like the nature around them. In contrast, most ecologists consider urban nature and ecological conditions to be severely degraded, bulging with bad contaminants, invasive weeds, waste sites, sewage overflows, traffic pollutants, pigeons, pests, and pathogens. While I cannot eradicate my own tiltings, cities and ecological conditions are inherently neither good nor bad. Rather than judging urban nature, I attempt to objectively analyze and portray the distinctive ecological dimensions. Occasionally, urban areas are compared with natural or agricultural landscapes mainly to enhance our understanding of urban patterns. The book is urbanocentric rather than natural-land-centric.

Urban ecology has roots in many related fields, and benefits from the obvious goal of improving conditions for people packed together. Two recent salutary trends have been especially important. In one, a few integrated studies, notably in and around Berlin, Baltimore, Phoenix, Melbourne, Seattle, and Sheffield/London, have combined multi-investigator, multi-disciplinary, and relatively long-term study. In the second, several edited books and an occasional authored one on urban ecology have appeared, each containing useful information and insights, and together suggesting a rich promising picture. Publications with strong applied dimensions provide additional perspectives.

The time has arrived to pull the science together in a coherent and comprehensive form, pinpointing synergies where pieces of the picture are juxtaposed. The pages ahead attempt to catalyze urban ecology as accessible and appealing to students who will carry the field to greater heights, to research scholars pushing exciting frontiers,

and to professionals improving the built areas around us. Moreover, the informed public can gain “eurekas,” while pursuing a better future in ever-more-crowded urban living space. Discovery and delight pop off the pages.

In 1992 I began teaching a Harvard course on urban and suburban ecology. From the outset we attempted to discover or develop an intellectual core of urban ecology. Landscape ecology emerged as a key integrative ingredient, along with fine-scale urban pattern, process and, change. Gradually that core coalesced. Urban ecology principles, traditionally adapted from natural-area ecology, now increasingly emerge from the distinctive features of cities.

Broadening the perspective from city to urban region, another key step, was catalyzed by an analysis-and-planning project for the Barcelona urban region (*Mosaico territorial para la region metropolitana de Barcelona*; Forman 2004b). That challenge convinced me, an ecologist, that urban regions are really important globally for natural systems and their human uses, and especially as cities expand outward in the years just ahead. So, to help jumpstart our understanding of urban ecology, I analyzed the spatial ecological and human patterns in urban regions of 38 small-to-large cities worldwide (*Urban Regions: Ecology and Planning Beyond the City*; Forman, 2008). Using scores of spatial analyses, this effort highlighted patterns and principles, plus the importance of the ring-around-the-city to the city, and vice versa.

The book in your hand is the essential complement to the urban region work. In effect, peeling back our familiar human layer reveals the fundamental natural and built patterns of a city, how it works, and how it changes. Lots of lucid patterns and processes appear. The world of eternal flows, especially in urban networks, emerges. Plenty of principles based on these are articulated. Worldwide forms of repeated spatial patterns, such as road network, city center, building plot, even cracks in a surface, are compared ecologically. Lacunae and research frontiers galore are evident. Scores of solutions for human application are mentioned, but left for applied experts and professionals to develop and use.

Today urban regions are the place for most of us, “*Homo sapiens urbanus*,” and for many more in the years just ahead. Cultural and natural resources within the region enrich us. It is our annual home range; over years we become familiar with and care about it. Our sense of place is increasingly the urban region. Here ecology is in our heart, and on our lips. The pages ahead move urban ecology to the forefront of our mind.