

Towns, Ecology, and the Land

Towns and villages are sometimes viewed as minor, even quaint, spots, whereas this book boldly reconceptualizes these places as important dynamic environmental “hotspots.” Multitudes of towns and villages with nearly half the world’s population characterize perhaps half the global land surface. The book’s pages feature ecological patterns, processes, and change, as well as human dimensions, both within towns and in strong connections with surrounding agricultural land, forestland, and aridland. Towns, small to large, and villages are examined with spatial and cultural lenses. Ecological dimensions – water, soil, and air systems, together with habitats, plants, wildlife, and biodiversity – are highlighted. A concluding section presents concepts for making better towns and better land. From a pioneer in both landscape ecology and urban ecology, this highly international town ecology book opens an important frontier for researchers, students, professors, and professionals including environmental, town, and conservation planners.

Richard T. T. Forman is Research Professor in Landscape Ecology at Harvard University, where he teaches urban and town ecology. Often considered a “father” of landscape ecology and road ecology, he helped spearhead urban ecology and has received honors, awards, medals, and honorary doctorates from universities across the world. His books include *Landscape Ecology* (1986), the award-winning *Land Mosaics* (1995), *Urban Regions* (2008), and award-finalist *Urban Ecology* (2014). He received an award for excellence in teaching, and has served for many years on boards for town planning and land-protection nonprofit organizations.

Books by the Author

Pine Barrens: Ecosystem and Landscape

Landscape Ecology

Changing Landscapes: An Ecological Perspective

Land Mosaics: Ecology of Landscapes and Regions

Landscape Ecology Principles in Landscape Architecture and Land-Use Planning

Road Ecology: Science and Solutions

Mosaico territorial para la region metropolitana de Barcelona

Urban Regions: Ecology and Planning Beyond the City

Urban Ecology: Science of Cities

Towns, Ecology, and the Land

RICHARD T. T. FORMAN

Harvard University



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**Dedicated to Brent Chandlee Forman
and his family
Maura, Trey, Colin**

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Foreword

Most ecologists live in towns and cities but study ecology elsewhere. Ecology's traditional focus was on the least altered or most "natural" systems that could be found, reflecting an underlying belief that these systems provide the best opportunity to examine how ecological processes work. Slowly, however, increasing numbers of ecologists realized two things. First, that humans are an important force shaping ecosystems and biological communities, and how humans manage and alter systems is a key factor in influencing how the systems function. Second, that truly pristine, unaltered systems are few and far between – this has been the case historically, but is even more obvious as human influences pervade the planet.

The fields of applied and landscape ecology, among others, have often incorporated this recognition of the importance of humans as actors in ecological systems. The emerging field of urban ecology goes furthest with this by turning the old order on its head – urban ecologists study the towns and cities where they live. And there is no escape from the obvious observation that cities are habitat for humans. Hence urban ecology has to consider the interactions between humans, other species, the patterns of urban development, and the ecosystem and landscape processes within these urban areas.

The field of urban ecology has grown rapidly in the past decade or so, and there are now several excellent books on urban ecology. Hence, I was initially somewhat bemused when Richard Forman contacted me to say that he was nearing completion on a book on town ecology. Wouldn't this just be another text covering pretty much the same ground? However, having known Richard for several decades now, I recognize that he has been at the forefront of thinking in landscape ecology for most of his career and has made many truly landmark contributions across a wide range of topics, including the fundamentals of the field.

True to form, he cited the reason for writing this current book, *Towns, Ecology, and the Land*, as being that this was "a subject that didn't exist." Indeed, taking a quick look at what is currently available, there is an increasing literature on cities but not much at all on smaller forms of human habitation. Towns (roughly 2,000 to 30,000 people), villages, and their interactions with the agricultural and natural land have really not received much scholarly attention. Although home to smaller populations than big cities, towns are far more numerous and are generally more intimately connected with their surrounding landscapes. And, from the material in this book, this all turns out to be much more interesting than I realized.

The book's goals are to gather, sharpen, develop, and integrate scattered relevant concepts and literature for advanced undergraduate students, graduate students, researchers, and professionals, and to provide building blocks to make better towns and better landscapes. Due to the lack of previous syntheses on the subject, Richard decided to visit and take notes on towns of diverse types and different sizes. He ranged widely and visited 55 towns on four continents, in 16 nations, and 14 states in the USA. The coverage in the book is thus truly international.

The approach is deliberately focused on ecology and hence does not delve deeply into issues such as planning, architecture, and the like. Nevertheless, the material is comprehensive and detailed and provides a wealth of insight into the ecology of towns and their interactions with the surrounding landscape. Richard builds on his lifetime of research and thinking in landscape ecology to provide a scholarly, thoughtful, and provoking book that will set people thinking about towns in ways they probably never thought possible. In an increasingly urbanizing world, smaller habitations remain surprisingly important, and this book provides not just a description of how towns are formed and how they work, but also pointers for how towns can be designed and managed better as part of the increasingly humanized future of the planet.

Richard J. Hobbs
Professor and Australian Laureate Fellow
University of Western Australia

Preface

Imagine a planet of water, farmland, and natural land, plus a few percent urban/suburban land. Like stars on a clear night, towns and villages in huge numbers, sometimes with hamlets and hermits, pepper the planet. Every day town residents disperse into the surroundings, growing our food, harvesting our fiber, and changing the land in myriad ways. These towns, each with some 2,000 to 30,000 residents, appear in countless forms – old and new, small and large, growing and shrinking, industrial and coastal, on and on. What do we know ecologically about these population centers, and their effects on the land? Amazingly little. Ecological *terra incognita* surrounding us ... beckoning.

The pages ahead introduce the scientific ecology of towns and villages, how they affect surrounding farmland and natural land, and vice versa. Empirical insights and examples are gathered internationally, developed, and integrated with models, providing a foundation for the growth of town ecology. Promising ideas appear for making better towns and better land.

Nearly half the world's population lives in towns and villages. Overwhelmingly, the people surrounded by farmland or natural land reside, shop, go to school, socialize, govern, and work in and around rural or remote communities. We all depend on town residents, not just for food and wood products, but for freshwater, air quality, flood control, biodiversity, recreational opportunity, and glorious landscapes. Towns are distinctive and diverse; few want to be a city, fewer still a village.

Urban scholars and now ecologists address urban areas as scientific frontiers, highlighting solutions for stubborn societal problems. Yet towns (and villages) display countless characteristics distinct from city-centered urban areas. The literature highlights important social, economic, cultural, and aesthetic dimensions of towns, often mentioning key interactions of towns with surroundings. But town syntheses are mainly pre-1970 Earth Day; newer studies in diverse fields may mention ecological issues.

Noticeably scarce are manifold environmental dimensions in the forefront today, to wit: freshwater shortage, environmental sustainability, ecological footprints, greenhouse gases and climate change, sea-level rise, extreme weather events, impervious surface cover, solid waste recycling, constructed stormwater basins/ponds/wetlands, biodiversity, connectivity/corridors for wildlife movement, large natural vegetation patches/areas, protection of prime agricultural soils, groundwater recharge, road ecology, habitat restoration, solar arrays/wind turbines, and ecosystem services. These features all play important roles in the land of towns and villages.

Ecologists traditionally avoid research sites where human effects are conspicuous, though doubtless numerous research graphs contain points, or an outlier, produced by town or village effects. Often, while analyzing a research site, I've considered the nearest town as simply a convenient place to get lunch or fill the car's tank. I do not recall ever meeting an ecologist whose research focused on town or village, or its interactions with farm land and natural land.

Built areas expand and slice up the land, while natural lands shrink and become more remote. Moreover, food-producing land degrades, and seems increasingly inadequate. Of the global land surface, desert and tundra cover about 33 percent, forest 30 percent, pastures 24 percent, cropland 11 percent, and urban areas 2–3 percent. Essentially, all cropland, much pastureland, some forest, and bits of desert surround, and are directly affected by, towns and villages. Therefore, town ecology focuses on about half the global land surface. The cumulative effect of these small places somewhat regularly spread across the land must be enormous.

This book does not highlight architecture, aesthetics, or culture, nor social structure and economic dimensions, nor suburban towns, nor planning (regional, urban, town, town-and-country, countryside, rural), nor landscape architecture, nor the panoply of promising applications of ecology for society. Yet morsels of each rightfully appear, strengthening the presentation.

As an ecological scientist, my recent background is mainly landscape ecology (e.g., *Landscape Ecology*, 1986; *Land Mosaics: Ecology of Landscapes and Regions*, 1995), road ecology (*Road Ecology: Science and Solutions*, 2003), and urban ecology (*Urban Regions: Ecology and Planning Beyond the City*, 2008; *Urban Ecology: Science of Cities*, 2014), plus lots of good interactions with ecologists, geographers, planners, landscape architects, foresters, wildlife biologists, engineers, and experts in other fields. For several years I've taught a Harvard class on urban and town ecology. Apparently not a single book or major article on town ecology has yet appeared, though I accumulated a valuable pile of detailed indirect studies.

So, for this book, I visited and took notes on towns of diverse types, different sizes, and wide distribution: 55 towns (some are villages, some small cities) visited on 6 continents, 16 nations, and 14 US states. These examples, referred to through the text, revealed key features, as well as commonalities and differences. In addition, I learned from research scholars, students, and the insightful people who showed me towns. With these diverse foundations, the text identifies patterns, processes, and changes, often tying town ecology themes into spatial models or principles. Town ecology coalesced, while intriguing research frontiers appeared.

As a pioneering subject, sometimes only a single relevant study exists, and occasionally an urban/suburban example is used. Town population sizes, mostly cited from Wikipedia online, are rough, mainly due to different areas and years considered. In the pages ahead, twenty types of towns are explored, and hundreds of specific places mentioned. Few conclusions apply to every town, and thus many statements technically require: normally, usually, generally, typically, or often/frequently/commonly – with nuanced meanings to be clarified by researchers.

This highly international book is tailored to: (1) ecologists and environmental specialists; (2) geographers; (3) landscape ecologists and conservationists; (4) town, town-and-country, and rural land planners; (5) agriculture specialists; (6) foresters and wildlife biologists; (7) designers; and (8) urban and regional planners. The well-illustrated readable text with ample references will attract advanced undergraduate and graduate students, researchers, and professionals. Town ecology courses will open a frontier of scholarship and solutions for half our global land. Researchers pushing the town ecology frontier at the beginning will be long cited by subsequent scholars. Professionals may help mold better towns.

The rapidly changing global future, with people packed in cities, increasingly depends on the land of towns and villages. Yet on every continent, too many of these communities and lands are shrinking, degrading. It's time to highlight the core values of towns and villages inexorably tied to their surroundings, the natural and agricultural land.

As the old proverb says: "When the camel gets its nose under the tent, the importance of camel inside will quickly grow." Town ecology is launched.

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