



# Suburban wildlife: Lessons, challenges, and opportunities

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**Abstract.** The United States, as well as most developed and many developing nations worldwide, is becoming increasingly urban and suburban. Although urban, suburban, and commercial development account for less than one percent to just over 20% of land use among states, 50–90% of the residents of those states can be classified as urban or suburban dwellers. The population of the U.S. as a whole has risen from being >95% rural in the 1790s to about 80% urban-suburban today. With these changes in land use and demographic patterns come changes in values and attitudes; many urbanites and suburbanites view wildlife and nature differently than rural residents. These are among the challenges faced by wildlife biologists and natural resource managers in a rapidly urbanizing world. In 2003, we convened a symposium to discuss issues related to suburban wildlife. The papers presented in this special issue of *Urban Ecosystems* address the lessons learned from the early and recently rapidly expanding literature, the challenges we face today, and the opportunities that can help deal with what is one of the biggest challenges to conservation in a modernizing world.

**Keywords:** demography, land use patterns, suburban wildlife, urban wildlife

## Introduction

The United States, as well as most developed and many developing nations, is becoming increasingly urban and suburban and less rural in both the characteristics of its human population and in its land use patterns (Vitousek *et al.*, 1997; Cohen, 2003; Auch *et al.*, 2004). With these changes in demography and landscape come changes in philosophies and attitudes; suburban residents often view land and wildlife in a different light than rural inhabitants (Deblinger *et al.*, 1999). These changes in land use patterns, human demographic characteristics, and philosophies and attitudes present a challenge to ecologists, who strive to understand the relationships of the natural world, and natural resource managers, who attempt to balance the needs of people and wildlife.

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In the fall of 2003, we organized a symposium on suburban wildlife for the 10<sup>th</sup> annual conference of The Wildlife Society, the international organization of professional wildlife biologists, to discuss these concerns in light of what we see as major issues for the conservation and management of natural resources. We structured the symposium around three broad themes relative to the evolution of issues for wildlife and people in suburbia: lessons, challenges, and opportunities. We invited speakers who have had experience in the realm of suburban wildlife and human dimensions of wildlife to make research and conceptual presentations, and to follow their talks with manuscripts for possible inclusion in this special issue of *Urban Ecosystems*.

Our focus was on suburban, rather than urban, landscapes for several reasons (although there is often broad overlap between the two). First, the areas experiencing the greatest rates of development, and hence the highest loss of open space, are along the urban-rural fringe, in areas just beyond or within ever-increasing commuting distances from the urban edge, and further into the rural countryside (Heimlich and Anderson, 2001). The type of development (single-family homes with the support services [roads, power, water, sewerage] that go along with them) qualifies these areas as suburban landscapes. Secondly, the mix of suburban neighborhoods and the built environment with remnant wildlife habitats such as woodlots and abandoned fields, newly created habitats such as parks and landscaped backyards, and resources such as food and cover, attract or retain many wildlife species, creating a high encounter rate between humans and wildlife. Thirdly, these high rates of human-wildlife encounters often lead to high rates of human-wildlife conflicts; such conflicts demand large amounts of attention, time, and resources from local natural resource management agencies.

In this paper, we examine some of the trends in human population and land use in the U.S. that show society to be increasingly suburban. Our paper also serves as an introduction to the topic of suburban wildlife, and we provide a description and explanation of the symposium and this special issue of *Urban Ecosystems*, which draw their structure from the single-word themes of Lessons, Challenges, and Opportunities. Finally, we provide a backdrop for exploring the relatively recent increase in interest in urban and suburban ecology, wildlife, and human dimensions, and the emergence of these issues as major topics in ecology, wildlife science, and natural resource management.

## Lessons

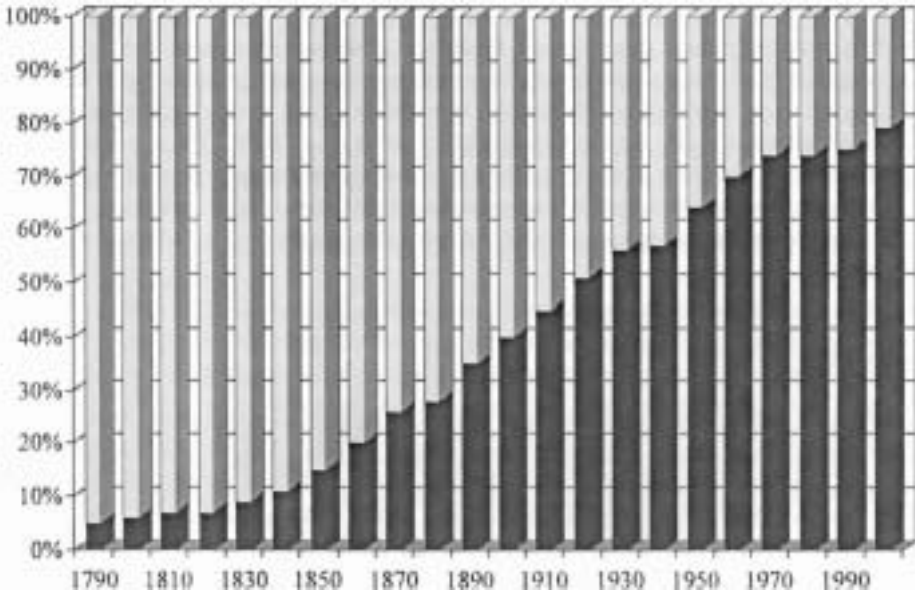
Lessons in the topic of urban and suburban wildlife come from a variety of sources, the first of which is literature that dates back to at least the early part of the 1900s, where pioneering researchers first published their ideas on wildlife living in close proximity to humans (see DeStefano and DeGraaf, 2003). Much of this early literature was focused on songbirds, and most of it emphasized the positive aspects of wildlife. During the 1960s and 1970s, however, several symposia were held to address issues and growing interest in urban and suburban wildlife (e.g., Noyes and Progulske, 1974; Euler, 1975; Kirkpatrick, 1978). Much of this information is available in published proceedings, and as such was not as intensely scrutinized or as readily available as peer-reviewed literature. Nonetheless, these proceedings are valuable documents for their insights, ground-breaking ideas, and early research. In the last two decades interest in urban ecology has been growing at a tremendous

rate, as evidenced by the numbers of scientific publications on all topics of urban and suburban ecology (Adams, this volume). Synthesis documents are also beginning to appear (e.g., Marzluff *et al.*, 2001), adding greatly to the knowledge base of suburban wildlife and management. And importantly, information from the practical, on-the-ground experiences of wildlife managers is also becoming available (Decker *et al.*, 2004). Thus, lessons abound in the foundation literature from symposium proceedings and early published papers, from the rapidly growing recent scientific literature, and from the numerous experiences of every wildlife and resource management agency in the country who deal with these issues on a daily basis.

## Challenges

The biggest challenge to conservation is the growing human population. As the global human population continues to increase exponentially, a higher proportion of people become urban and rural residents, with fewer people living a rural lifestyle. In the U.S., the Bureau of the Census (BOC) ([www.census.gov](http://www.census.gov)) defines urban areas as those areas with at least 500–1,000 people per mi<sup>2</sup> (193–386 people per km<sup>2</sup>); this includes metropolitan areas and suburbs. Rural areas would be those areas with <500 people per mi<sup>2</sup> (<193 people per km<sup>2</sup>). According to BOC data, <5% of the nation's population was considered urban in 1790; today about 80% of U.S. citizens live in cities and towns, with only 15% living in rural communities (figure 1). The proportion of U.S. residents who can be classified as urban versus rural has thus increased to the point where the population is overwhelmingly urban. The same is true for the rest of the world: only about 2% of people lived in cities in 1800; today about half the world's population lives in cities, and this is growing (Cohen, 2003). With this increasing urbanization of humans, cities are reaching extraordinary sizes. In 1900 there were no cities with 10 million people. New York City passed this mark in 1950. By 2000, 19 cities throughout the world had 10 million people or more, but only four of these—Tokyo, Osaka, New York, and Los Angeles—were in industrialized nations (Cohen, 2003). As cities get bigger, they expand outward, claiming more space and requiring additional resources for their continued existence. The issue of accelerated resource consumption goes hand-in-hand with the rapidly increasing human population, especially in developed nations.

Land use patterns in the U.S. are another critical issue. To examine the proportion of urban and suburban development by state, we derived land cover statistics from the National Land Cover Database (NLCD) (<http://landcover.usgs.gov/nlcd.asp>). For each state, we summed the land coverage for low intensity residential (NLCD category 21), high intensity residential (22), commercial-industrial-transportation (23), and urban-recreational grasses (85), and divided by the state's total land area to arrive at a percentage of urban-suburban land use. All other categories (e.g., forests, agriculture, wetlands, open water) made up the remaining proportion of each state as nonurban-nonsuburban land cover. We then categorized each state as <1%, 1–5%, 6–10%, and >20% urban-suburban (there were no states with 11–19% urban-suburban land cover). Many western states have <1% of their lands in urban, suburban, or commercial development (figure 2). California, Washington, and the states throughout the Midwest and southeast have <5% of this kind of development. The Northeast



*Figure 1.* Proportion of U.S. residents classified as rural (light-colored portion) versus urban (dark-colored portion) dwellers from 1790 to 2000. The U.S. Bureau of Census classifies urban-suburban regions as areas with >193 people per km<sup>2</sup> (>50 people per mi<sup>2</sup>). Urban-suburban residents have increased from about 5% in 1790 to about 80% by 2000. (Data derived from U.S. Bureau of Census.)



*Figure 2.* Proportion of urban-suburban-commercial development by state: light gray are states with >20% of their land base in development; medium gray is 5–10%; dark gray is 1–5%, and black is <1%. (Data derived from the U.S. Geological Survey, National Land Cover Database.)



*Figure 3.* Proportion of urban-suburban residents (versus rural residents) by state: light gray are states with >90% urban-suburban residents; medium gray is 81–90%; dark gray is 51–80%, and black is <50%. (Data derived from the U.S. Geological Survey, National Land Cover Database.)

is the only region of the country with some states with significant proportions of their land base in urban-suburban development. Most states in this region are in the 6–10% range, while four states—Massachusetts, Connecticut, Rhode Island, and New Jersey—have just over 20% of their land base in urban and suburban development.

The proportion of residents of each state that can be classified as urban or suburban dwellers gives a different picture to the country, however. We used BOC data to determine the proportion of urban-suburban to rural residents for each state. The percentage of urban-suburban dwellers is high, >50% for all but 4 states, and, surprisingly, those 4 states are east of the Mississippi River (Mississippi, West Virginia, Maine, and Vermont) (figure 3). States like California, Massachusetts, Rhode Island, New Jersey, and even Nevada have >90% of their population as urban/suburban dwellers. These demographic patterns represent significant challenges and have important implications to conservation and wildlife management. In addition to where people live, it is how we live that is helping to redefine our society as largely suburban: 66% of U.S. residents live in single-unit housing and 76% drive to work alone, averaging about half an hour of travel time (U.S. Bureau of Census, <http://www.census.gov>).

The preponderance of the U.S. land base not currently under urban, suburban, or commercial development has led some pro-development groups to question programs or approaches to planned development and other attempts to limit sprawl. However, land use is only one concern. The huge increase in resource use that goes along with urbanization trends is also an important issue for the preservation of natural areas and the conservation of

natural communities. The concept of a growing ecological footprint (Sanderson *et al.*, 2002) of metropolitan centers and their surrounding suburbs is a critical element in the suite of challenges facing resource managers.

### Opportunities

With challenges come opportunities. As is often the case with issues of conservation, it is a sense of urgency that creates the motivation for action. Suburban development and loss of open space are occurring at unprecedented rates in the U.S. and much of the world. The issue is well known to most citizens, from first-hand experience as well as from the popular literature and media.

Current technology allows biologists to reach people as never before. A more aware and interested public creates increased educational opportunities. In addition, the recognition of the importance of human dimensions in the conservation of natural resources has reached new heights, and collaborations between ecologists and sociologists are growing. Stakeholder (Carpenter *et al.*, 2000) involvement at local levels, more inventive and innovative approaches to conservation planning, such as the large-scale holistic Sonoran Desert Conservation Plan (<http://www.pima.gov/sdcp/>), and regional collaborative approaches to specific issues, such as animal damage and control (Curtis *et al.*, this volume), are just some of the ways that ecologists, conservationists, and resource managers can, and must, face the challenges presented in the growing human landscape.

The issue of urban and suburban sprawl is widespread and ubiquitous throughout much of the world. It is arguably among the most important resource and conservation issues of the 21st century. We hope that the ideas presented in this special issue of *Urban Ecosystems* contribute in a small way to this very large challenge.

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