Research Article

Introduction to the Special Section—Bat Habitat Use in Eastern North American Temperate Forests: Site, Stand, and Landscape Effects

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Abstract

Forest bats of eastern North America select habitats for roosting, foraging, and winter hibernation/migration over a myriad of scales. An understanding of forest-bat habitat use over scales of time and space is important for their conservation and management. The papers in this Special Section report studies of bat habitat use across multiple scales from locations across the eastern forests of North America. The consensus of the studies in the Special Section is that the larger portion of the variability in bat habitat use occurs at the smaller scales of sites (roost trees) and stands (foraging areas). Nevertheless, it was also recognized that these features occur discontinuously across larger-scale watersheds and landscapes. (JOURNAL OF WILDLIFE MANAGEMENT 70(5):1171–1173; 2006)

Key words

bat, bats, communities, forest, landscape, roost, scale, species, stand.

Gaps in our understanding of bat habitat use are widely acknowledged (Arnett 2003, Keeley et al. 2003, Miller et al. 2003). Bat conservation and management in eastern North American forests requires knowledge of habitat use at variable geographic and temporal ecological scales and knowledge of how limiting factors vary across these scales (Ford et al. 2005).

Bats are highly vagile habitat specialists when compared to other forest mammals. Most species of bats that occur in eastern North America are migratory. Some species migrate short (5–10 km) to long (600+ km) distances in the autumn to winter hibernacula in mines and natural caves. Other species (e.g., genus *Lasiurus*) can migrate to forested wintering grounds in the southern United States or to Central America and the upper Caribbean basin, and then they return in the spring to summer habitats (Koopman et al. 1957, DeGraaf and Yamasaki 2001). Bats select specialized habitats for roosting, foraging, and winter hibernation or migration over myriad scales (Grindal and Brigham 1999, Erickson and West 2003, Gehrt and Chelsvig 2003, Gorresen et al. 2005). Selection of individual roost trees occurs at the smallest scale, and selection of suitable foraging habitat occurs at the larger forest-stand and watershed and whole landscape scales, where the selection of small- and medium-scale habitat needs are optimized (Dejong 1995, Jaberg and Guisan 2001). Additionally, temporal scales of habitat use vary from entire seasons to individual evenings (Milne et al. 2005). Depending on resource abundance at temporal scales, foraging habitat selection and local population sizes may be affected (greater or less than expected) based on body size, wing morphology, and echolocation characteristics. Our understanding of how most bat species utilize habitat space across disparate scales of space and time is poorly synthesized, which has made their conservation as a group problematic.

This Special Section presents studies of bat habitat use at multiple scales from locations across the forested region of eastern North America. Together, the papers offer an initial synthesis of habitat scale and bat ecology. The papers were originally presented at joint 90th Annual Meeting of the Ecological Society of America and IX International Congress of Ecology, held in August 2005 in Montreal, Quebec, Canada.

The papers in the Section address issues of scale for individual species, species comparisons, and bat communities. Miles et al. (2006) used radiotelemetry to study day-roost selection at multiple scales by evening bats (*Nycticeius humeralis*) in natural and intensively managed pine stands in southern Georgia. In natural stands of mature longleaf pine (*Pinus palustris*), the species selected day-roost sites based on features at the tree, plot, and landscape scales, possibly to reduce commuting costs. In managed loblolly pine (*P. taeda*) stands with fewer potential roost sites, sites appeared to be selected by tree and plot features. Carter (2006) reviewed the literature on habitat associations of the Indiana bat (*Myotis sodalis*) maternity colonies. He reports that in the Midwestern United States, large Indiana bat maternity colonies are located in snag-rich bottomland, riparian, or other hydric forest types. He discusses 3 hypotheses for these findings and concludes that these are preferred maternity colony habitats due to their location near foraging sites. In the Champlain Valley of New York and Vermont, Watrous et al. (2006) used radiotelemetry to determine minimum habitat requirements for the Indiana bat at 7 spatial scales, ranging from the roost tree to 3-km buffers surrounding the tree. Trees selected as roost sites were large,

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exposed, dead with exfoliating bark, located at low elevations, and close to water. Home-range locations in this region of diverse, patchy land cover were associated with water and were characterized by east-facing aspects.

In New Brunswick, Canada, Broders et al. (2006) distinguished habitat use and distributions of the northern long-eared (*M. septentrionalis*) and little brown bats (*M. lucifugus*) into 4 ecologically distinct groups based on species and gender. The results of the study suggest that the accurate assessment of bat habitat use requires understanding differences in the spatial and temporal aspects of habitat selection between genders as well as for species and guilds. The application of studies that ignore gender effects may be detrimental to bat conservation and management.

Three similar studies characterized habitat use at a gradient of scales by species for bat communities of the southeastern United States. Yates and Muzika (2006) in the Missouri Ozarks, Loeb and O'Keefe (2006) in the southern Appalachians of northwestern South Carolina, and Ford et al. (2006) in the upper Coastal Plain of South Carolina determined habitat preferences by the analysis of acoustic surveys at large numbers of bat survey plots. Each of the 3 studies concluded that local, stand, and site factors were more important than larger-scale landscape features.

Knowledge of the spatial and temporal scales of bat habitat use is important for bat conservation efforts. For example, the potential effects of the development of wind-energy projects on bats are becoming an issue of increasing concern (Bat Conservation International 2005, Johnson 2005). Federal and state regulatory agencies are developing procedures for reviewing project proposals. Reynolds (2006) reports on the assessment of bat activity at a proposed wind-energy development in New York State. The assessment of a site requires consideration of spatial- and temporal-scale issues. The accurate assessment of migratory bat activity at proposed wind-power sites will require a long-term monitoring effort.

The papers in the Special Section present 8 studies of bat habitat use in temperate forests of eastern North America. The common theme through the majority of the studies indicates that habitat features at small scales (i.e., roost trees, foraging sites) account for a larger part of the observed variability in habitat use across several species of bats and over a wide array of eastern forest types and landscapes. However, the studies also acknowledge that, while highly mobile bats appear to select smaller-scale habitat features, these features can and often do occur discontinuously across much larger watershed and landscape scales.

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