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The author list should be one single paragraph (no breaks). Authors should be listed by first name or initial followed by last name and separated by commas. Use superscript numbers to link affiliations, and symbols (e.g., \*†‡) for author notes (see below). For example, X. Jones1\*, P. Smith1,2.

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**Abstract:** Predicting how wildlife respond to urbanization is challenging, due in part to the single-city focus of most urban ecological research. Here, we delineate continent-scale patterns in urban species assemblages by leveraging data from a multi-city biodiversity survey and quantify how differences in greenspace availability and average housing density among ten North American cities relate to the distribution of eight widespread North American mammals. The magnitude and direction of most species' responses to urbanization were associated with landscape-scale differences among cities. Further, species richness consistently declined with urbanization in more densely developed cities. Given our results, it may therefore be possible to design cities to better support biodiversity and reduce the negative influence of urbanization on wildlife.

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More people live in cities than in rural areas worldwide (Seto et al. 2012). To meet the demands of their human inhabitants, cities are expanding in area commensurate to roughly twice their population growth rate (Angel et al. 2011). This urban expansion drives global environmental change and threatens biodiversity (Grimm et al. 2008, Seto et al. 2012). And although some species can inhabit and possibly thrive in cities (Goddard et al. 2010), explorations into their urban ecology were historically rare and have only increased in recent decades (Magle et al. 2012, McPhearson et al. 2016, Fidino and Magle 2017). Despite these increased levels of urban ecological research there is still much to understand about how urbanization influences Earth’s ecology.

Most urban ecological studies focus on a single city, which limits our understanding of urban areas as ecosystems (Magle et al. 2019). Single-city research can identify ecological responses to local patterns of urban development, but these responses cannot be extrapolated to other cities that differ in age, size, climate, or human population density, among other variables (Ramalho and Hobbs 2012, Aronson et al. 2016, Magle et al. 2019). Current multi-city assessments, for example, show that differences in bird and plant richness among cities are correlated with among-city differences in land-cover and age (Aronson et al. 2014). Likewise, the location of water bodies or railways within a city can facilitate or hinder movement between wildlife populations and therefore influence where in a city that species may persist (Beninde et al. 2018). As a result, a single species may respond to urbanization in different ways among cities. Multi-city comparative approaches are therefore necessary to understand whether species’ responses to urbanization are generalizable across cities, or if they vary due to landscape-scale differences among cities (Aronson et al. 2014; Beninde et al. 2018; Magle et al. 2019). Such assessments, however, remain challenging because few coordinated efforts monitor biodiversity in multiple cities.

Here we show how landscape-scale differences among cities influence the within-city distribution of urban-adapted mammals by leveraging data collected by the Urban Wildlife Information Network (UWIN; www.urbanwildlifeinfo.org) – a systematic multi-city biodiversity monitoring survey (Magle et al. 2019). Our goals were to determine if the distribution and richness of mammal species within cities changed as a function of among-city differences in 1) greenspace availability and 2) average housing density. These two landscape-scale metrics are respectively associated with the average habitat potential in a city and its intensity of urbanization, which may collectively indicate the overall quality of a city as habitat for a species (Aronson et al. 2016; Magle et al. 2019). We predicted that the expected proportion of habitat patches a species occupies within a city (i.e., the relative occupancy of a species) would increase in cities with more greenspace but decrease in cities with higher average housing density. Likewise, we predicted that within cities, species would exhibit a stronger negative response to urbanization (i.e., be less likely to occur closer to an urban core) in cities with higher average housing density or less greenspace. We advance previous multi-city biodiversity assessments by quantifying whether the magnitude and direction of a species’ response to urbanization changes due to landscape-scale differences among cities. This unique approach allows us to begin to identify the degree to which results from a single city can generalize to other cities or if species’ responses to urbanization are unique to individual cities.

**Results**

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All Figures and Tables should be cited in order, including those in the Supplementary Material (which should be cited as, for example, “Fig. S1”, and “Table S1”). You may include line or page breaks if you would like to place the figures within the text near where they are referenced. Please do not place figures in text boxes.

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Supplementary Materials:

Materials and Methods

Figures S1-S#

Tables S1-S#

Movies S1-S#

Audio Files S1-S#

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