

# Does body condition explain patterns of songbird density in response to urbanization?



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## Introduction

Urbanization is radically altering the structure of wildlife communities and the processes that create them (Shochat et al. 2006). The number and evenness of native species generally decline while exotics increase in abundance as landscapes become increasingly developed (McKinney 2006). The resulting urban communities are similar to each other, suggesting that the mechanisms shaping community structure are not only different from those acting on wildlife in undeveloped landscapes,

but are also consistent across cities (McKinney 2006).

Shochat (2004) proposed such a mechanism to explain the increases in community abundance often observed in cities compared to adjacent wildlands. He suggested that food resources are more abundant and predictable with increasing urbanization while predation pressure declines. As a result, poor-quality individuals that would otherwise be depredated or starve to death are able to survive, inflating population densities. He called his proposal the credit card hypothesis,

because individuals in poor condition were able to survive only because they lived on the credit of future food availability (Shochat 2004).

Shochat's hypothesis predicts that average body condition will decline with increasing urban development while survival rates improve (Shochat 2004). We are conducting a four-year study of avian populations along a gradient of urbanization in east-central Illinois to test this prediction. This paper focuses on body condition, as we currently have insufficient data to estimate survival rates.

## Methods

In 2010 and 2011 we captured birds at 13 sites along a gradient of urbanization in Champaign County (Figure 1). The county is dominated by row-crop agriculture (Champaign County Regional Planning Commission 2005), but also contains many small villages and the adjacent cities of Champaign and Urbana, which have an estimated combined population of 122,461 as of 2010 (US Census Bureau 2012). Study sites were predominantly private residences, but also included the Anita Purves Nature Center, the Homer Lake Interpretive Center, and the Champaign County Forest Preserve District Headquarters. These sites represented rural farm houses, prop-

erties in small villages and on the perimeter of Champaign/Urbana, and residences within the center of the cities. Urbanization was measured by calculating housing density within a 0.5-km radius of each study site using 2008 aerial photographs obtained through Google Earth.

We used mist nets to catch birds at each study site. In 2010, we attempted to maximize the number of birds captured per day. We visited two or three sites each day and set up two to four mist nets, depending on the size of the property. Each site was visited once every week or two from May to September. In 2011, we focused our netting efforts in the morning, when birds were captured most frequently in 2010. Two nets were set up at each

site for one morning per month from March to August. Netting was carried out for 3–4 hours per site in both years on calm days with no precipitation. For each bird captured, we identified its age, sex, and species (Pyle 1997), and marked it with a unique band provided by the US Geological Survey Bird Banding Laboratory. We measured body mass and the length of the lower leg bone (i.e., tarsus) to calculate an index of body condition (see below; Rodewald and Shustack 2008). All measurements were taken by one person (JDF).

Four species were present across the gradient of urbanization and were retained for statistical analysis (Table 1): House Sparrow (*Passer domesticus*), House Finch (*Carpodacus mexi-*

Meadowlark