Abundance and distribution of avian nest predators and predator activity at Wild Basin

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INTRODUCTION

Urbanization directly affects biodiversity by altering the amount and configuration of habitat and the availability and types of local resources (Marzluff and Rodewald 2008). In addition to changing habitat, urbanization can change ecological processes like species interactions (Shochat et al. 2006). For example, urbanization can shift interactions between breeding birds and their predators (Rodewald et al. 2011, Stracey 2011), which can have important consequences for bird populations in more urban areas. Research has demonstrated that Golden-cheeked Warbler nests in and around Austin, Texas are subject to predation by species such as Western Scrub-jays, Cooper's Hawks, Brown-headed Cowbirds, and American Crows (Stake et al. 2004, Reidy et al. 2008), and understanding nest predation rates in relation to fragmentation and land use practices is an important research objective for recovery of this endangered species (USFWS 1992).

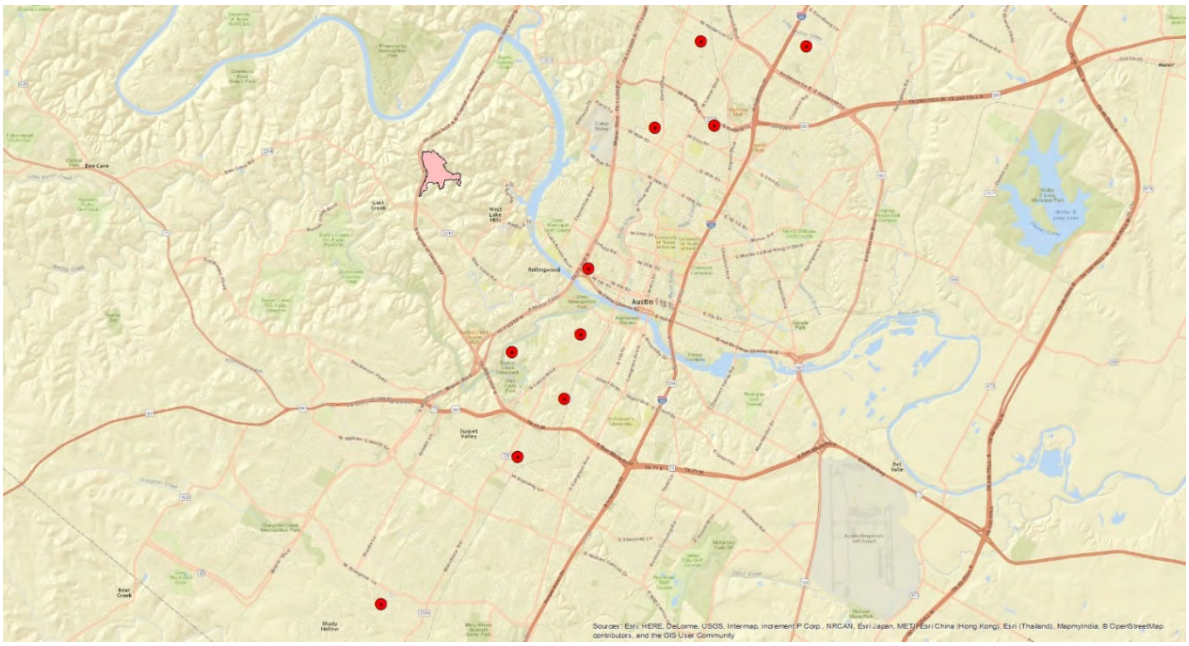
Generally, urbanization is accompanied by an increase in nest predators with a simultaneous decrease in predation rates, a phenomenon termed the "urban predation paradox" (Shochat 2004, Fischer et al. 2012). The mechanisms driving the predation paradox are unclear, but one likely explanation is that human-provided resources (e.g., bird feeders, pet food, or garbage) allow predators to switch from traditional prey sources to anthropogenic foods (Rodewald et al. 2011). Here, we plan to explore the relationship between avian nest predator numbers and their predatory activity in an urban landscape. Our approach will examine avian nest predator distribution and activity at a relatively fine spatial scale across the landscape of Wild Basin and within the urban "matrix" of Austin, Texas.

RESEARCH OBJECTIVE

The goal of this project is to evaluate the abundance and distribution of several common avian nest predators within Wild Basin and the broader urban landscape and examine the relationship between predator numbers and predatory activity.

METHODS

Study sites
We conducted this study at 14 locations, including four sites within Wild Basin and ten residential sites across the gradient of urbanization in Austin, Texas.



Data collection

We conducted point counts at each site following the guidelines of Ralph et al. (1993). We conducted surveys between sunrise and 10am on days with minimal wind and little to no precipitation. Each point count location was surveyed once between May-June 2016. Following the point counts, we examined avian nest predator activity using artificial nests and motion-triggered trail cameras at each of the 14 locations. Each artificial nest was placed at a standardized height (approximately 2m) to mimic the nest placement of the Northern Cardinal (*Cardinalis cardinalis*). In each nest, we placed one quail egg and one plasticine egg, and a trail camera will be placed approximately 1m away. All equipment was retrieved after 7 days in the field. Videos from each site were reviewed in the lab, and all activities at the nest (wildlife inspecting nest, touching egg, taking egg, etc.) were logged in a datasheet.

For each site, ArcGIS was used to characterize the impervious ground cover, tree canopy cover, distance from downtown, proximity to a greenspace, distance to nearest major road, and distance to nearest water source.

RESULTS

Over 250 videos of wildlife activity were recorded at the 14 artificial nest sites. Nests were categorized as predated if any eggs were removed during the one-week study interval. The predation rate of artificial nests at the Wild Basin sites was 50%, whereas 60% of the nests were predated at the residential sites. We also found that nests in more urbanized landscapes in Austin are less likely to be predated – only 20% of the nests within 3.5 miles of downtown were predated whereas 100% of nests farther from downtown were predated. There was a significant positive relationship between nest predation activity (using number of videos as a proxy) and distance from downtown (Spearman's rho = 0.80, p = 0.006).

The predator communities differed between Wild Basin and residential sites within the landscape "matrix." The Western Scrub-jay (*Aphelocoma californica*) and Blue Jay (*Cyanocitta cristata*) were the only two species observed to predate the artificial nests at the Wild Basin. The video captured at

neighborhood sites revealed five species of predators, including the Blue Jay, Great-tailed Grackle (*Quiscalus mexicanus*), Deer Mouse (*Peromyscus maniculatus*), Opossum (*Didelphis virginiana*), and Squirrel (*Sciurus niger*). In the urban residential sites, avian species were responsible for 66% of the nest predation events, and mammals were responsible for the remaining 33% of predation events. In the Wild Basin sites, bird species were responsible for 100% of predation events.

Avian point counts at each site indicated that avian predators were present at all of the 14 study sites. Our results demonstrated that nests within densely populated parts of the urban landscape were not predated, even though avian nest predators such as blue jays and great-tailed grackles were present at those sites. This suggests that the "nest predator paradox" may in fact be occurring within the Austin urban ecosystem, in which predator abundance and predation rates are decoupled in the presence of anthropogenic resources.