Research paper

Woody cover does not promote activity of nest predators in residential yards

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HIGHLIGHTS

- Trees and shrubs attract songbirds; it is not known if they also attract nest predators.
- We model effects of percent woody cover on diurnal activity of predators in yards.
- Five common nest predators are not more active where more woody cover is available.
- Wildlife-friendly gardening should not promote use of yards by nest predators.

ARTICLE INFO

ABSTRACT

Urban development often affects resource availability in ways that can influence not only community structure, but key species interactions that shape population dynamics. Although some resources are unintentionally altered, others are deliberately changed to improve habitat for urban wildlife, particularly songbirds. We hypothesized that management strategies that encourage planting trees and shrubs (i.e. increasing woody cover) would inadvertently attract predators of bird nests, which are generally abundant within cities. To test this, we examined the relationship between percent woody cover, pooled across trees and shrubs, and diurnal activity patterns of nest predators in residential yards. We surveyed predator activity and characterized habitat using aerial imagery of seven suburban neighborhoods in Franklin County, Ohio during April–August 2011 and 2012. Predator activity varied widely among individual yards, but contrary to our hypothesis, the availability of woody cover at either yard or neighborhood scales was not a strong predictor of diurnal activity in yards for five common species of nest predators (Eastern gray squirrel, *Sciurus carolinensis*; common grackle, *Quiscalus quiscala*; brown-headed cowbird, *Molothrus ater*; blue jay, *Cyanocitta cristata*; and domestic cat, *Felis catus*). Thus, our study suggests that wildlife habitat management or gardening programs that recommend increasing woody cover do not necessarily attract some common predators of songbird nests in Midwestern landscapes. Additional research that identifies which habitat features beyond woody cover best predict nest predator activity will facilitate the creation of management recommendations that increase the conservation value of urban environments for songbirds.

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1. Introduction

Urban green spaces can support a diverse assemblage of native biodiversity, including sensitive taxa (Bland, Tully, & Greenwood, 2004; Fuller, Warren, Armsworth, Barbosa, & Gaston, 2008). Within metropolitan landscapes, residential neighborhoods in particular may be hotspots for urban biodiversity, as species richness and diversity generally peak at intermediate levels of urbanization (Blair, 2004; Clergeau, Jokimaki, & Savard, 2001; McKinney, 2002). To increase the suitability of yards for wildlife, wildlife-friendly gardening directs urban citizens to provide food, water, cover/shelter, and places to breed. While feeding birds has been a popular for decades (Davies et al., 2009; Lepczyk, Mertig, & Liu, 2004), more holistic approaches to conservation include supplying resources to meet a variety of needs (Gaston et al., 2007). Vegetation is often the resource of emphasis in most wildlife-friendly gardening, and programs commonly focus on strategies to reduce the amount of

Table 1
Age and landscape composition within 1-km of seven focal neighborhoods in Franklin County, Ohio. Urban index is a principal component factor that loads positively for number of buildings, percent cover by road, pavement and lawn, but negatively for percent cover by agriculture. Adapted from Rodewald and Shustack (2008).

Proportion							
Neighborhood	Year built	No. of buildings	Urban index	Mowed	Paved	Road	Agriculture
Elk Run	1980	812	−0.16	0.27	0.06	0.05	0.31
Cherry	1930–1960	997	0.76	0.36	0.16	0.07	0.02
Woodside	1980	1227	0.32	0.4	0.07	0.05	0.11
Rush Run	1940–1950	1611	0.75	0.41	0.09	0.06	0.06
Kenny	1910–1950	1733	0.89	0.34	0.17	0.06	0
Casto	2000	1776	1.25	0.42	0.2	0.08	0
Tuttle	1910–1960	2285	1.61	0.34	0.3	0.09	0

lawn and to increase woody cover, i.e. by planting trees and shrubs, in order to provide suitable habitat for a variety of species (Gaston, Smith, Thompson, & Warren, 2005; Goddard, Dougill, & Benton, 2010; Grimm et al., 2008).

Of all of the wildlife that potentially could benefit from wildlife-friendly gardening, songbirds are often the intended recipients of habitat enhancement efforts. Providing resources to birds through feeding or other gardening practices has been popular in the US and UK for over 100 years and continues to engage millions of people (Cooper & Smith, 2010; Cordell, Betz, & Green, 2008). Wildlife-friendly gardening recommendations have the potential to affect songbirds directly and indirectly. Several studies show that residents can expect positive direct effects for songbirds when implementing wildlife-friendly gardening, such as increases in abundance and species richness as food and vegetation resources increase (Daniels & Kirkpatrick, 2006; Fuller et al., 2008). However, indirect effects of wildlife-friendly gardening are less well-understood, and some of these may be negative for urban songbirds. For example, bird feeding is posited as one driver of biotic homogenization of avian assemblages in urban environments (Blair & Johnson, 2008; Chace & Walsh, 2006; Kark, Iwaniuk, Schalimtzek, & Banker, 2007), and has the potential to facilitate disease transfer among songbirds (Bradley & Altizer, 2007; Robb, McDonald, Chamberlain, & Bearhop, 2008). In particular, there is a poor understanding of how changing resource availability as a result of wildlife-friendly gardening practices may influence species interactions, including those between songbirds and their nest predators (Robb et al., 2008).

One potential, though often unrecognized, complication of increasing trees and shrubs in residential yards is that woody cover may attract predators of songbirds and their nests (Alterio, Moller, & Ratz, 1998; Yanes & Suarez, 1996). Woody cover provides nest predators with food resources (e.g. fruit, nuts, small mammals, songbirds and nest contents) and protection from predation by other species (Parker & Nilon, 2012). Increased woody cover from exotic honeysuckle (*Lonicera maackii*) in urban forest fragments is associated with decreased nest survival for songbirds due to increased nest predation (Rodewald, Shustack, & Hitchcock, 2010) and brood parasitism (Rodewald, 2009). Vegetation buffers planted to protect hoiho (*Megadyptes antipodes*) chicks in New Zealand had the unintended consequence of attracting nest predators, presumably in response to increased prey activity in planted buffers (Alterio et al., 1998). The possibility of trees and shrubs attracting nest predators is particularly troublesome given that nest predators often reach high densities in cities as compared to exurban areas due to use of anthropogenic foods and relaxation of top-down controls (Fischer, Cleeton, Lyons, & Miller, 2012; Longcore, Rich, & Sullivan, 2009; Parker & Nilon, 2012; Prange, Gehrt, & Wiggers, 2004). Thus any positive effects of woody cover for songbirds could be diminished if activity of nest predators is higher in these areas, and if exposure to predators is a primary driver of nest predation rates. However, increases in wildlife-friendly habitat and food-bearing plants were associated with an increase in the proportion of British gardens frequented by some generalist predators but not others (Baker & Harris, 2007), and more research is warranted to quantify the effects of individual habitat features on nest predator use of yards.

Complicating our understanding of associations between predators and vegetation is that we do not know the spatial scale at which nest predators respond to habitat in urban areas. While breeding songbirds may be sensitive to habitat characteristics at fine scales (Daniels & Kirkpatrick, 2006), nest predators may select habitats at geographic scales much greater than that of residential yards. While design and management at the scale of individual yards has been shown to be useful for predicting patterns of use of certain species of birds (Daniels & Kirkpatrick, 2006) and mammals (Baker & Harris, 2007), there is debate about the appropriateness of the yard scale for informing conservation due to the potential of spatial autocorrelation of habitat features within neighborhoods (Warren, Lerman, & Charney, 2008) and the necessity of maintaining habitat at scales beyond that of individual yards in order to support viable wildlife populations (Goddard et al., 2010; Warren et al., 2008). Gaining a better understanding of how characteristics at the scale of yards and neighborhoods influence generalist species such as nest predators will help advance discussions regarding the use of these two scales in wildlife management and conservation.

We explored how landowner decisions about vegetation management influenced predator activity at yard and neighborhood scales. We hypothesized that the structural and food resources provided by trees and shrubs would attract predators, and thus, predicted that predator activity would be positively associated with woody cover.

2. Methods

2.1. Study area

This study was conducted within 7 suburban neighborhoods in Franklin County, Ohio which is located within the greater metropolitan area of Columbus with >1.9 million residents (Fig. A1; US Census Bureau, 2013). With resident permission, we worked in 150 private yards in 2011 and 173 private yards in 2012 (13 to 32 yards per neighborhood; >50% of area of each neighborhood). We included as many yards as possible within 3.5 ha bordering riparian forest parks used for complementary research (Rodewald & Shustack, 2008). Neighborhoods were similar in area (~3.5 ha), and variations in age, building density, and landscape composition are described in Table 1 (see Rodewald & Shustack, 2008 for methods).

Vegetation characteristics, including availability of woody cover, also varied greatly among neighborhoods (Fig. 1). Vegetation in yards at Casto and Elk Run was planted <30 years ago when these subdivisions were developed, and common species included Bradford pear (*Pyrus calleryana*), purple-leaf sand cherry (*Prunus* × *Cistena*), river birch (*Betula nigra*), boxwood (*Buxus* spp.), red maple (*Acer rubrum*), and sugar maple (*Acer saccharum*). Intact, mature vegetation dominated yards in the remaining