

Habitat Use and Nesting of Breeding Brown Thrashers

Joshua Castle, Eastern Kentucky University

Mentors: Drs. David Brown and Kelly Watson. Coauthor: Kasie Bradley

Introduction

Across North America, the populations of bird species are in decline. Results from long-term surveys revealed a net loss of approximately 3 billion birds across all biomes, a decline of 29% since 1970 (Rosenberg & et al. 2019). This substantial population decline is not restricted to threatened and endangered species but includes many common birds that may impact environmental function, which could lead to devastating consequences. If we continue to ignore the decline of common bird species, North America will soon suffer an immense financial cost as more birds are added to the endangered species list (Rosenberg & et al. 2019). This added cost will make it more challenging to protect already endangered species, and many could potentially go extinct.

Recent research into the decline of avian species has focused on the effects of exotic plants. bush honeysuckle (*Lonicera spp.*) has become a focus on many studies as it is now widespread throughout much of the United States. The branch structure and early leaf flush of these invasive woody shrubs make them an inviting substrate for nest construction for many songbirds (Schmidt & Whelan 1999; Rodewald & et al. 2009). Studies have shown that shrub-nesting birds tend to prefer bush honeysuckle over native shrubs but at the expense of higher predation rates and lower daily survivorship, suggesting that bush honeysuckle is an ecological trap (Schmidt & Whelan 1999). However, not all research has shown adverse effects associated with bush honeysuckle. Researchers observing gray catbirds witnessed adults delivering food to nestlings more frequently as bush honeysuckle invasion increased in the study site, leading to a better nestling body

condition (Gleditsch & Carlo 2014). Further research is needed into the mechanisms leading to higher predation rates and the impacts these invasive shrubs have on avian communities, leaving the classification as an ecological trap a controversial subject.

One Kentucky species that utilizes shrubs in its breeding season is the Brown Thrasher (*Toxostoma rufum*). The North American Breeding Bird Survey reported a 41% decline in the population of Brown Thrashers from 1966 to 2015 (Cavitt & Haas 2014). Along with habitat invasion by exotic plants, this and other species also face a decline in breeding habitat. This decrease in suitable breeding ground is only exacerbating the already steady fall of bird populations across the continent.

We chose this species for study because of their early arrival in Kentucky and their tendency to produce 2 broods during the breeding season, maximizing the opportunity to locate and monitor active nests. The large nests constructed by this species are easily distinguished from other species as well as located near or on the ground allowing for visual monitoring. The size of Brown Thrashers makes them an excellent candidate for attaching radio transmitters to juvenile birds that have not reached full adult weight. While they are not themselves threatened, Brown Thrashers could provide valuable insights to land management for less common shrubland bird species.

The objective of this study was to test the effects of land cover dominated by invasive shrubs on the home ranges and nesting locations of breeding Brown Thrashers. By locating nests and tracking individuals throughout the breeding season, we sought to identify a preference between native and exotic plants and whether this impacted nesting success and home range use.

Methods

Study Area: The site chosen for this study was Taylor Fork Ecological Area (TFEA), a 24-hectare area located in Madison County, KY, that is owned and managed by Eastern Kentucky University's Division of Natural Areas. This restoration site is composed of old pastureland that is in the early stages of succession. It is primarily composed of blackberry scrub vegetation and woody shrub habitat, with patches of trees throughout. TFEA is dominated by invasive plants that typically occur in highly disturbed sites such as multiflora rose (*Rosa multiflora*) and bush honeysuckle. The landscape is also host to many native plants, including dogwood (*Cornus spp.*), boxelder (*Acer negundo*), eastern red cedar (*Juniperus virginiana*), and eastern redbud (*Cercis canadensis*). TFEA has abrupt edges along its borders that adjoin with neighboring pastureland and softer internal edges created by a trail system.



Figure 1. Taylor Fork Ecological Area (Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community)³

Home Range and Land Use: Our research utilized mist nets to capture birds as they moved across their habitat. Nets were opened at sunrise and checked every 30 to 40 minutes, depending on bird activity. We

used 10 nets across 30 sites, rotating them every 2 to 3 days as birds became aware of their presence. Near the end of our study, a limited number of nets were deployed for more focused capture efforts that involved attaching a taxidermied decoy to a tree branch and playing Brown Thrasher vocalizations over a wireless speaker.

To gather a variety of data, radio transmitters were selectively attached based on the age of birds and capture location. Of 18 birds captured, 8 were fitted with transmitters. The data of only 7 birds was used in our analysis as 1 left the effective range of its transmitter and was only detected a few times. Transmitters were attached using a harness constructed of plastic beading string that looped over the legs, much like backpack straps. Loops were tightened to proper fit and held in place with metal beading crimps. Radio-telemetry began the day of capture using a Yagi 3 element antenna and programmable receiver. Once located, GPS coordinates for each bird were logged in the Collector for ArcGIS app. After tracking concluded, data points were used to determine the home range of tracked individuals. Using ArcGIS, we superimposed home range data on a supervised land cover classification of TFEA produced at 84% accuracy and were able to determine the preferred habitats of Brown Thrashers.

Results

Home Range: The average home range for all Brown Thrashers tracked was 4.84 ± 7.47 ha, with a mean core area of 1.75 ± 2.71 ha. Within home ranges, woody shrub and blackberry scrub were the two predominant land cover types, with home ranges on average comprising $1.70 \text{ ha} \pm 2.53$ (38%) and $1.58 \text{ ha} \pm 2.61$ (36%) respectively. Core areas depicted a similar land cover composition ratio with an average of $0.63 \text{ ha} \pm 0.94$ (37%) woody shrub and $0.63 \text{ ha} \pm$

1.16 (36%) blackberry scrub. Proportions of land cover within home ranges and core areas closely resembled proportions of land cover across TFEA.

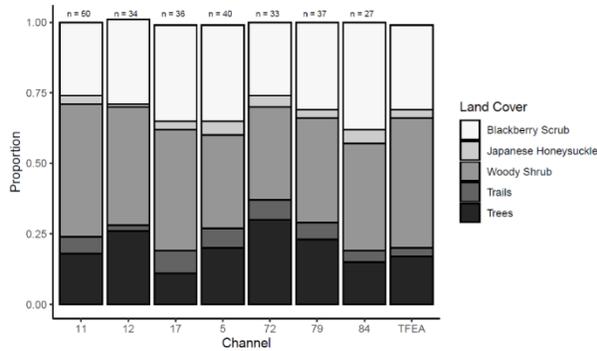


Figure 2. Land cover proportions of brown thrasher home ranges at Taylor Fork Ecological Area Summer 2020

Land Use: Of the 257 recorded locations, Brown Thrashers were found 115 times in woody shrub land cover, followed by 68 locations in trees, 59 locations in blackberry scrub, 5 locations in Japanese honeysuckle, and 10 times were located on trails within TFEA. Land use of Brown Thrashers was disproportionate to the total land cover within TFEA ($X^2(4, N = 257) = 19.5, p = 0.05$). Using only location data found within the 80% home range contour, Brown Thrashers were observed to be located in a higher frequency than expected in the trees land cover type and less often than expected in the blackberry scrub land cover.

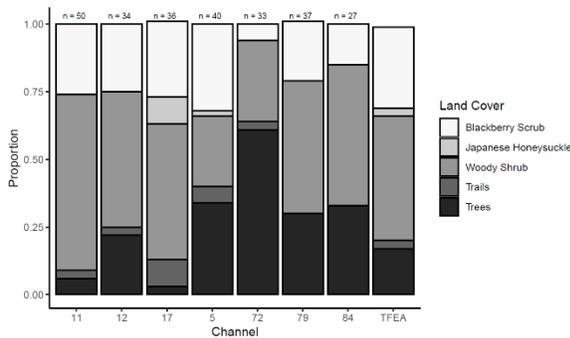


Figure 3. Proportion of locations found in each land cover at Taylor Fork Ecological Area Summer 2020

Discussion

We found a disproportionate use of bush honeysuckle as nesting sites. Given this preference, we expected to observe Brown Thrashers using woody shrub land cover at a higher rate than available. However, home ranges and core areas showed a similar ratio to available habitat throughout the study area. bush honeysuckle grows in dense patches throughout our study site, creating a closed midstory canopy where it occurs. This, along with bush honeysuckle's allelopathic properties, has created barren understories within these patches. While Brown Thrashers show a predilection toward nesting in bush honeysuckle, it is likely that they must forage in other land cover types where more dense understory vegetation and thicker leaf litter are found. This would align with previous studies that show that non-native plants reduce insect diversity where they grow (Narango et al. 2017).

It is beyond the scope of this study to ascertain the reason that Brown Thrashers seem to prefer nesting in honeysuckle, but previous studies have suggested that the early leaf flush and branch structure of bush honeysuckle make them an appealing substrate for building nests for many species of birds (Schmidt & Whelan 1999; Rodewald & et al. 2009). Even though the study site has a high abundance of invasive plants, it is not without native shrubs that could have been utilized. Other studies have shown that as the breeding season progressed, the proportion of nests built in native vegetation grew higher (Rodewald & et al. 2009). However, this was not the case for our study as all but one nests were found in invasive plants, including several nests initiated after native plants had fully leafed out. Unlike previous studies that support the theory of bush honeysuckle being an

ecological trap, we did not observe a higher rate of predation or a low daily survival of early-season nestlings. However, one mechanism linked to increased predation rates was the high density of nests built in bush honeysuckle (Schmidt & Whelan 1999). It is possible that the widespread distribution of dense thickets of bush honeysuckle within our study area facilitated conditions that either 1. created a low density of nests that did not alter predator foraging behavior, or 2. provided adequate cover that concealed nests from predators. Both instances would indicate that a widespread, clumped distribution of bush honeysuckle was beneficial to Brown Thrashers as long as alternate foraging opportunities were available. That is not to say that bush honeysuckle does not act as an ecological trap, nor is it our intention to suggest this invasive plant could benefit avian communities. Both suggestions would be irresponsible and unfounded as more extensive research is needed on sites with varying degrees of invasion to determine the impacts bush honeysuckle has. However, given the disproportionate use of bush honeysuckle as a nesting substrate and low nest predation occurrence, we cannot suggest an outright elimination of this invasive species. Although there are well documented negative effects of bush honeysuckle, such as lower arthropod abundance and barren ground, land managers treating these invasive shrubs should consider mitigating the loss of this substrate by establishing native shrubs before removing all bush honeysuckle from an area. In areas where there is a high abundance, such as our study site, it may be wise to maintain at least some patches of invasive plants until native alternatives such as hawthorn or dogwood become established. These species would provide the structural substrate for nest construction and produce fruit that could be beneficial to

other bird species. Failing to establish native alternatives prior to removing invasive shrubs could result in further loss of suitable nesting habitat, which, while otherwise undesirable, bush honeysuckle seems to offer.

Acknowledgements We thank M. McKinney and M. Roberts for help in the field. Access to field sites was obtained from Eastern Kentucky University Department of Natural Areas. Funding was provided By the National Science Foundation.

References

- Cavitt J.F., Haas C.A. (2014) Brown thrasher. *Birds of the world database*. retrieved from <https://birdsoftheworld-org.libproxy.eku.edu/bow/species/brnthr/cur/introduction>
- Gleditsch JM, Carlo TA. (2014). Living with aliens: Effects of invasive shrub honeysuckles on avian nesting. *PLoS ONE*. 9 (9): e107120. DOI:10.1371/journal.pone.0107120
- Narango DL, Tallamy DW, Marra PP. (2017). Native plants improve breeding and foraging habitat for insectivorous bird. *Biological Conservation*. 213: 42-50. <http://dx.doi.org/10.1016/j.biocon.2017.06.029>
- Rodewald AD, Shustack DP, Hitchcock LE. (2009). Exotic shrubs as ephemeral ecological traps for nesting birds. *Biol Invasions*. Published online DOI 10.1007/s10530-009-9426-3
- Rosenberg KV, Dokter AM, Blancher PJ, Sauer JR, Smith AC, Smith PA...Marra PP. (2019) Decline of the North American avifauna. *Science*, 366: 120-124.
- Schmidt KA, Whelan CJ. (1999). Effects of exotic *Lonicera* and *Rhamnus* on songbird nest predation. *Conservation Biology*. 13 (6): 1502-1506

Funded by the National
Science Foundation, DIB:
1950355

