A Qualitative Comparison of Avian Species Habitat Usage and Competition Among Varying Levels of Disturbance in a Temperate Forest, Grassland Mosaic

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Abstract

Having a gradient of different habitats almost always effects what diversity and competition will occur between species. Nest selection for cavity nesting passerines is especially important for their survival. *Tachycineta bicolor, Troglodytes aedon,* and *Sialia currucoides* were monitored in the Beaverhill Natural Area, near Tofield, Alberta, to observe their habitat usage and competition between them in each of the three grids that are made for *T. bicolor*; road grid, spiral grid, and new grid. A qualitative study was done to determine which grid would be the most effective for *T. bicolor* success. Each grid was composed of its own unique habitat that affected which, and how many species inhabited the man-made nest boxes provided in each grid. The number of *T. bicolor, T. aedon, S. currucoides,* and inactive boxes were counted, as well as the presence of mice in each of the three grids over a three to five-year range dependent on when the grids were established. This data was qualitatively analyzed, and it was found that the new grid provided the best habitat for *T. bicolor* because it is an open and semi-wetland habitat area. However, because the study was qualitatively done it does not prove definitively which habitat would be best or the usage of habitat by each of the species, specifically *T. bicolor*. More data would need to be collected, as well as tests to further the understanding of the best habitat for *T. bicolor.*

Introduction

The Beaverhill Natural Area is in the Central Parkland Natural Subregion. Though most of this subregion is characterized by its heavily cultivated farmland, Beaverhill Lake, located to the north of the natural area, used to be among one of its largest waterbodies in the area (Alberta Parks, 2015). The Beaverhill Lake is recognized as a wetland area and the Beaverhill Natural Area located on its south shores has provided habitats to more than 270 species of birds, despite the dramatic receding of the lake in 2005 (BBO, Beaverhill Lake, 2019). The Beaverhill Bird Observatory (BBO), which is located along the south shoreline, was first established in 1984 (BBO, About BBO, 2019) with the mission to promote the conservation of avian species focusing primarily on migratory birds as well as, bring that awareness to the public (BBO, Mission, 2019). Among the species being studied, there are *Tachycineta bicolor* (Tree Swallows), *Troglodytes aedon* (House Wrens), and *Sialia currucoides* (Mountain Bluebirds). All three of these species compete for nesting in the man-made nest boxes provided by the BBO as they are all cavity

nesters. Three grids are intended to observe *T. bicolor*; the road grid, the spiral grid, and the new grid. Each grid is representative of a different habitat type within a temperate aspen parkland ecotone. Due to this difference of habitat, the habitat use, and competition in each grid proved to be different, which is consistent with *T. aedon* and *S. currucoides* habitat preferences. Each grid has different characteristics of which make them more or less desirable to each of the species.

This paper will discuss the difference in habitat and characteristics within each of the three grids that affect the number of *T. bicolor, T. aedon,* and *S. currucoides*, and ultimately which grid is best suited for *T. bicolor* success. The grids were monitored by interns at the BBO from May to August over the course of three to five years. The total number of each species for the years and the inactive boxes were documented for each grid. Due to inconsistencies in data management methods, a quantitative comparison of the three grids was not possible. However, qualitative conclusions can still be drawn from the data to make generalizations of habitat use and competition between grids.

Methods

During a four-month period of each year, May to August, three *T. bicolor* grids were monitored in the Beaverhill Natural Area near Tofield, Alberta by interns. The nest boxes were checked weekly by the interns for nest construction progress, egg numbers and temperatures, nestling numbers and age, as well as adult presence. When necessary maintenance was also done on the boxes. The road grid had 66 nest boxes set up along a fence line on an east/west oriented road accessing the BBO. The spiral grid had 92 nest boxes set up throughout semi-open grassland by the volunteer parking lot. The new grid had 50 nest boxes set up in five parallel rows of 10 in an open semi-wetland/grassland area where there are little anthropogenic disturbances. Nest boxes were placed roughly 10-15 meters apart, posted on a single metal or wood pole. The box size was 12 x 15 x 23 cm. Though the grid nest boxes were intended for *T. bicolor*, *T. aedon,* and *S. currucoides* are a constant competitor with the *T. bicolor* for the nest boxes occupancy.

Figure 1. T. bicolor on a nest box in the new grid.

The data analyzed were the years of 2014 – 2019, when the road, spiral, and new grids started to be in use. The data analyzed from those years were then compiled to include the number of *T. bicolor, T. aedon,* and *S. currucoides* present within each of the grids, as

well as the number of inactive boxes. Through personal observation of the different habitats of each grid in 2019 and review of previous data collected from interns, a qualitative comparison was done by comparing the numbers of species, inactive boxes, and presence of mice between the three grids of the years 2014 – 2019 to determine habitat usage and competition between the three species.

Results

The collection of the 2019 data for each of the three grids were complete at the end of July and beginning of August 2019, as well as the compilation of the data 2014 – 2019. In a general comparison of years 2014 – 2019, *T. bicolor, T. aedon,* and *S. currucoides* were all present in the road grid. However, *S. currucoides* were more predominant than *T. aedon* were and as the boxes are made for *T. bicolor*, they inhabited the greatest number of nest boxes. As well, mice were only present in the road grid and not in the others. In the spiral grid all three bird species were present but *T. aedon* were more predominant than *S. currucoides* and the number of inactive nest boxes were much lower than those of the road grid. In year 2014 there was only data for the first 48 nest boxes the spiral grid and in 2019 there was only data for nest boxes 20-75, as a total of 56 nest boxes. In addition, *T. bicolor* inhabited the greatest amount of nest boxes in the spiral grid just as in the road grid. In the new grid out of the two years there is data, no *S. currucoides* inhabited any of the nest boxes, only two *T. aedon*, and two inactive boxes were present. The rest were inhabited by *T. bicolor*.

Table 1. (as shown in the appendix) demonstrates the years each of the three grids had been in use and the number of *T. bicolor, T. aedon,* and *S. currucoides* that inhabited the nest boxes, which does not account for whether the nest was successful or not. The numbers represent the nest boxes that had one of the three species in them at some point during the duration of data collection. In addition, the number of inactive boxes is accounted for in the table where the birds did not make a nest in them at all throughout the four months. The number of mice were not accounted for in the table, as the total number of mice was indeterminate.

Discussion

Each grid has unique factors separating it from one another; its competition between species for nest boxes, habitat usage and anthropogenic disturbances. The road grid has a significant decrease in habitat usage for *T. bicolor* than the other two grids. This could be due to it being situated along the road which opens *T. bicolor* to competition for nest boxes, unwanted species entering the nest boxes, and anthropogenic disturbances. Species such as *S. currucoides* use the nest boxes. *S. currucoides* readily nests in man-made nest boxes but primarily uses pre-existing tree cavities made by woodpeckers, just like *T. bicolor* (The Cornell lab of Ornithology, Mountain Bluebird, 2019). Citta & Lindberg (2007) completed a study on *S. currucoides* where they monitored them using nest boxes in different habitat types of which

include the grids along roads, trails in irrigated agriculture, and more. It was found that the *S. currucoides* preferred the nest boxes provided in those habitats where the study occurred, of which coincides with the road grid habitat. In addition, it is stated by Ghilain & Belisle (2008) that *T. bicolor* will choose against nesting in an area where intensive cultures are occurring on farmland, of which also parallels the road grid habitat. Furthermore, the nest boxes are attached to wooden fence poles, of which give mice access to the nest boxes. The spiral and new grid have metal poles that prevent unwanted species, such as rodents or other predatory species, to enter the nest boxes, as shown in figure 2. The Tree Swallow Projects

Figure 2. A nest box pole in the spiral grid has a metal sheath around the metal pole for further protection.

(2019) states that the nest boxes should never be posted on a tree or a wooden fence post as they are easier to climb, ultimately giving easy access to predators or other species that would push *T. bicolor* out of the nest box.

The spiral grid had an increase in habitat usage for the *T. bicolor* and *T. aedon*, but a decrease in *S. currucoides*. This could be due to habitat preference. *T. aedon* prefer open, shrubby woodland habitat areas (The Cornell lab of Ornithology, House wrens, 2019), of which the spiral grid exhibits these habitat preferences, while the road grid does not, and only partially in the new grid. In some cases, *T. aedon* will push *T. bicolor* out of a nest box in the early nesting period, as documented infrequently in some of the years in the data collection. In addition, Quilodran, Estades, & Vasquez (2014) states that *T. aedon* becomes aggressive and protective over a nesting site when nesting areas are in little supply, and "tree swallows were a poor competitor with other cavity-nesting passerines for tree cavities" (Norris, et al., 2018).

T. bicolor prefer to live in open fields, meadows, & marshes, preferably in cavities,

Figure 3. Road grid where the farmer's field is behind the fence to the left and the road is to the right.

which is why they readily use the man-made nest boxes (The Cornell lab of Ornithology, Tree Swallows, 2019). This artificial habitat of the grids is beneficial to *T. bicolor* because open habitat with suitable nesting trees is rare in all but extremely late successional conditions. Although the road and spiral grid demonstrate

some of these characteristics, the new grid exhibits all of them. *T. bicolor* receives no anthropogenic disturbances in the new grid other than the intern's weekly observations. While comparatively, the road has the most disturbance due to traffic, and the spiral grid has some due to being established by the volunteer parking lot. The habitat that the new grid provides could be more favourable to the *T. bicolor* than *T. aedon* and *S. currucoides* because it is in an open semi-wet grassland area and has a reduction in human disturbances. There are very few to no shrubby bushes in the new grid that *T. aedon* prefer for their nesting. However, box 18 was in a shrubby bush area that *T. bicolor* did not inhabit, whereas a *T. aedon* did create a nest after the box had been inactive for a few weeks.
This demonstrates the habitat preference between the two species of cavity nesting birds.

Figure 4. A T. aedon nest in box 18 in the new grid.

Conclusion

Nest selection is vital to an avian species survival, (Citta & Linden, 2007) *T. bicolor* chose not to inhabit a large quantity of the road grid and the spiral grid because it was not their favourable conditions, most likely due to heavier anthropogenic disturbances. The new grid however meets most of all preferences in habitat for the establishment of their nests in the nest boxes. In conclusion, the qualitative analysis done directs toward the new grid, located on the semi-wet grassland, being the best habitat for *T. bicolor*. It provides the correct preference of habitat, there is a lower probability of disturbances occurring, of which include different avian species and rodents, as well as, there is little anthropogenic disturbances. Although these conclusions have been drawn qualitatively, it does not give a definite and significant conclusion to how *T. bicolor* interacts with each of the grids. To obtain a better conclusive answer, more research and further testing needs to be completed as well as, better data management to properly analyze the results. With these adjustments, it will ultimately determine the best way to study and conserve *Tachycineta bicolor*.

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Appendix

Table 1. A summary table of *T. bicolor* (TRES), *T. aedon* (HOWR), *S. currucoides* (MOBL), and the number of inactive boxes throughout the years that each grid had been in use, including the presence of mice.

	Number of Boxes Inhabited by Each Species				
Road Grid	MOBL	HOWR	TRES	**Inactive boxes**	**Mice presence**
2013	-	-	-	-	-
2014	3	0	53	10	Present
2016	3	1	35	27	Present
2017	4	0	43	19	Present
2018	2	1	44	19	Not present
2019	1	0	49	16	Present
Spiral Grid					
2013	-	-	-	-	-
2014	1	9	37	1	Not present
2016	1	11	71	9	Not present
2017	1	10	78	3	Not present
2018	-	-	-	-	-
2019	1	4	49	2	Not present
New Grid					
2013	-	-	-	-	-
2014	-	-	-	-	-
2016	-	-	-	-	-
2017	0	1	48	1	Not present
2018	-	-	-	-	-
2019	0	1	48	1	Not present