MAPPING BREEDING BIRD TERRITORIES IN THE BEAVERHILL NATURAL AREA FOREST

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Introduction

Population monitoring of bird species is essential for conservation and ecological studies. Population density changes in response to environmental changes, such as habitat loss or climate change. By tracking the number of birds in an area, these shifts can be recognized and measured. Population monitoring is especially relevant as bird populations around the world are in decline, making this an important conservation contribution as well. By following shifts in population density, the scale of decline can be determined, and conservation measures implemented where necessary. Furthermore, as there are usually numerous bird species of varying prolificacy and environmental sensitivity in any given habitat, the health of bird populations is also a good indicator of the general health of the environment that the birds occupy.

Beaverhill Lake, Alberta, was designated a Wetland of International Importance by the Ramsar Convention in 1987 and an Important Bird Area of Global Significance in 1997 because of its significance to nesting waterfowl and the large number of migratory shorebirds and waterfowl that use the lake as a stopover (Beaverhill Bird Observatory 2018). However, the lake has been receding since the 1980's, changing the environment of the area. Areas where marshland previously existed have become grassland, and areas where grassland previously existed have become forest. This has also impacted the bird populations, as the birds follow the shifts in their habitat, losing old areas of land and colonizing new ones.

Bird territory mapping is done by recording all bird sightings and vocalizations, and then interpreting the records to delimit individuals' territories for all species observed and known to be breeding within the study area. This is a widely used method that effectively provides density estimates of breeding bird territories. The Beaverhill Bird Observatory, south of Beaverhill Lake, has been using this method to annually monitor breeding bird populations in both the grasslands and the forest, as the environment changes around vital breeding bird habitat. The grasslands survey has been ongoing since 1992, while the forest survey, was recently started in 2016. The goal of this study was to continue the forest surveys contributing in the compilation of long-term data on breeding bird territory densities in the aspen forest of the Beaverhill Lake Natural Area.

Methods

Study Site

The survey was done in a 25 ha forested area in the Beaverhill Lake Natural Area. The habitat was mature deciduous forest, dominated by trembling aspen and balsam poplar, with willow and grass along the northwest and southeast parts of the survey area.

The survey was done along a grid, with eleven rows running north to south, dividing the grid into ten north-south sections, and twelve rows running east to west, dividing the grid into

eleven east-west sections. Grid points were marked out along each row with trail tape and metal markers attached to trees at 50 m intervals.

Data Collection

We surveyed a total of eight full grids, where surveys done themselves ranged from partial to full surveys. There were two surveyors - one surveying the northern six sections and one surveying the southern six sections, with one overlapping section between the two surveyors. The northern half was surveyed between 5:00 and 8:00 in the morning in early June. In the southern half of the grid, surveys were done both between 6:30 and 10:30 in the morning and 18:00 and 22:00 in the evening, from June to early July. During the surveys, we walked along the rows running east-west in the grid, stopping at each point for 2-4 minutes to make observations. As, the surveys often spanned multiple hours, we varied between starting at the northern and southern rows of our survey areas, to minimize bias resulting from differing levels of bird activity at different times of the day. Every species observed within the forest was recorded, along with estimates of their locations. Birds flying overhead were excluded, as they were assumed to not be breeding in the forest. We used a simplified version of the mapping method outlined by Bibby et al. (1992), where a distinction was made between sightings and vocalizations, and simultaneous observations of multiple birds were indicated. The surveys were done only when there was not enough rain or wind to keep the birds from vocalizing.

Data Analysis

Species maps were made for each species thought to be breeding in the forest, with different letters denoting observations from different surveys, and territory sizes for certain species were acquired from previous literature and used as guidelines for plotting territories (Armstrong 1956, Brewer 1963, Brown et al. 2000, Johnson and Dinsmore 1985, Sherry 1979, Wasserman 1980), particularly when boundaries were unclear. A territory was only established if there were at least two observations, with the exception being nests, in which case, only one observation was needed. Normally, mapping out a territory requires that there be at least two observations at least ten days apart (Bibby et al. 1992), but we excluded this guideline, as many of our surveys were done within a fairly short time frame, making it unreasonable to expect many of our observations to be more than ten days from each other. Birds that were heard singing simultaneously were placed in separate territories, as singing was assumed to be a territorial display. Birds were excluded from a territory entirely if they were too far from a cluster to make a territory of a reasonable size.

Results

A total of 26 different species were detected primarily through listening to and identifying distinctive calls. The most common species identified was Least Flycatcher with a total of 80 territories in 25 ha giving a density of 3.2 territories per ha. The second most common was Yellow Warbler with a density of 1.25 territories per ha. The rest of the bird species displayed less than one territory per hectare. Biodiversity was high but records of only 14 of the 27 species

indicated a territory. The others either were not detected again or the records were spread out enough that there is not enough data to support that it was the same bird returning to a territory.

Table 1. Number of territories and densities (territories per ha) of bird species breeding and nesting in the Forested Breeding Grid in the Beaverhill Lake Natural Area in June and July 2019.

Species Spotted	**Number of Territories**	**Density (Territories per ha)**
Least Flycatcher	80	3.2
Yellow Warbler	38	1.25
Warbling Vireo	15	0.6
House Wren	13	0.52
Clay-colored Sparrow	11	0.44
American Robin	9	0.36
Baltimore Oriole	9	0.36
Black-capped Chickadee	8	0.32
American Crow	2	0.08
Hairy Woodpecker	2	0.08
Redwinged Blackbird	2	0.08
Sora	2	0.08
White-throated sparrow	1	0.04
Hermit thrush	1	0.04
Roughed Grouse	0	0
Red-eyed Vireo	0	0
Brown-headed Ovenbird	0	0
Varied Thrush	0	0
White-breasted Nuthatch	0	0
Olive-sided Flycatcher	0	0
Sprague's Pipit	0	0
Red-breasted Nuthatch	0	0
Yellow-headed Blackbird	0	0
Ruby-throated Hummingbird	0	0
Swainson's Thrush	0	0
Blue-winged Teal	0	0

Discussion

Since observations were primarily made through audible detection, it is quite likely that birds which have less of a tendency to make territorial calls were underestimated in their territorial numbers; this could include species such as Red-winged Blackbirds which are polygynous and can have up to 15 females for every territorial, vocal male (Axelson G. et al. 2017). 13 of the species observed were not counted as having territories since there were not enough clustered sightings. Some of these were because the birds were not nesting, they were

just passing through, but it must be considered that underestimations are likely. On the other hand, aggressively vocal territorial birds such as the Least Flycatcher who nest in clustered areas may have been over counted if they flew and moved perch and were counted multiple times (Axelson G. et al. 2017).

A problem with our methodology was that the grid was surveyed by two different people, who, for the most part, gathered their data independently and without consulting the other. This resulted in inconsistencies in study methodology. For example, the surveys may have been done at different times or at different paces. Territory sizes may tend to be larger some years and smaller others. Furthermore, having different observers introduces biases in the survey results, as different observers have differing skill levels in identifying and locating birds.

We counted a fewer number of total territories than the studies from the past two years, although the number of species we recorded was greater. The number of territories per species relative to the past studies varied, where some species this year have more territories than the past two years, some have fewer, and some have a number of territories between those from the previous two years. We cannot conclusively determine trends in territory number, as there is not enough temporal data to do so. Perhaps after a couple more annual studies have been done, a trend can be tentatively established. Another major issue in making comparisons between data across multiple years is that each year, the study was undertaken by different people, who did not consult those who had previously surveyed the grid to ensure consistency in survey and territory mapping methodology. This would significantly impair the validity of direct comparisons between annual territory records.

Conclusion

It is very difficult to use this method to accurately analyze the population densities and nesting habitats of every species present in the area, but it is quite effective for giving a general idea and is especially useful for vocal, clustered, territorial birds such as the Least Flycatcher, who was one of the main focuses of this study. It shows their nesting and breeding habits and when continued for multiple years this could provide incredibly valuable data on population fluctuations and alterations of behavioral traits. Considering the trend of declination of population numbers of most North American migratory land birds for the past 53 years or more, including the Least Flycatcher, it is imperative to closely monitor (Hill, N. and Hagan, J., 1991).

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