

Urban Landscape Impacts on Avian Populations

Elise Monsson, Maggie Deller, Carson Cambre, Mike Schlott, Kaitlin Garrison, Aidan Brennen, Ziqi Wang, Michael Lyman

Abstract

The role of birds in any ecosystem cannot be understated; they provide services such as pollination, seed dispersal, ecosystem health indications, and population control. Greenspaces are increasingly important in protecting their ecosystems from urban disruption. The differences in bird populations between the greenspace of Burnet Woods and the urban University of Cincinnati campus were studied. A bird identification app was used to identify birds, and data were collected twice a week in each location. The total amount of birds found at the University of Cincinnati Campus was 394 birds and at Burnet Woods was 334. There were 25 species found at the University of Cincinnati campus and 50 at Burnet Woods. Analysis supports the fact that Burnet Woods is a more species-rich environment.

Introduction

As the human population continues to expand more green space is used, resulting in a large contrast between the ratio of urban landscape and natural green space. Recent studies have shown that 419 species of native American birds have experienced a loss of 2.5 billion birds in the last 50 years (Rachael 2019). The ecological degradation caused by the drastic decline in bird numbers has had a severe negative impact on humans and other organisms. Some ecosystems and islands with large numbers of birds, such as Madagascar, New Zealand and the Oceania region are expected to lose 26-48% of their other species (Cagan 2004). In order to protect biodiversity and human health, it is necessary to study what kind of environment can maintain and increase bird diversity. Based on previous research (Kathi 2022), it has been shown that the larger the area of green space available the greater the number and diversity of birds. Studies have shown that a 50% increase in green space can increase annual species diversity by 11.5% and seasonal species diversity by 8.2% (Cornell University 2022). This survey seeks to contribute to the study of the relationship between bird population health and urban green space conservation and loss of these spaces to urban development.

Method

Data were collected at 4 markers during 30-minute periods on campus and at Burnet Woods in the morning and evening over a 4-week period. Birds were counted and identified using the Merlin ID app, then entered into excel in order to utilize various data analysis tools. A T-Test assuming unequal variance was conducted using the number of birds found on campus and in Burnet Woods, as well as the number of species found at each location. A Shannon-Weiner Species Diversity Index was also conducted to calculate respective biodiversity present in Burnet Woods and on UC's campus.

Results

The total amount of birds found on UC's campus was 394 and 334 at Burnet Woods 334. There were 25 distinct species found on UC's campus and 50 distinct species found in Burnet Woods. The P-Value found from the T-Test assuming unequal variance between the number of distinct species found on UC's campus and Burnet Woods was 0.045. In figure 1, the species diversity is significantly greater in Burnet Woods than at the Campus locations. The circle sizes below are representative of quantity, where each circle is a representation of a separate species. Figure 2, is a diversity metrics table. The Shannon diversity index (H), often used to compare diversity of locations, was calculated. It was found to be 2.94 in Burnet Woods and 1.32 at Campus. The weight of each species is represented by J and was found to be 0.09 for Burnet and 0.45 for campus. The Simpson Diversity index was found to be 0.91 for Burnet Woods and 0.55 for campus.

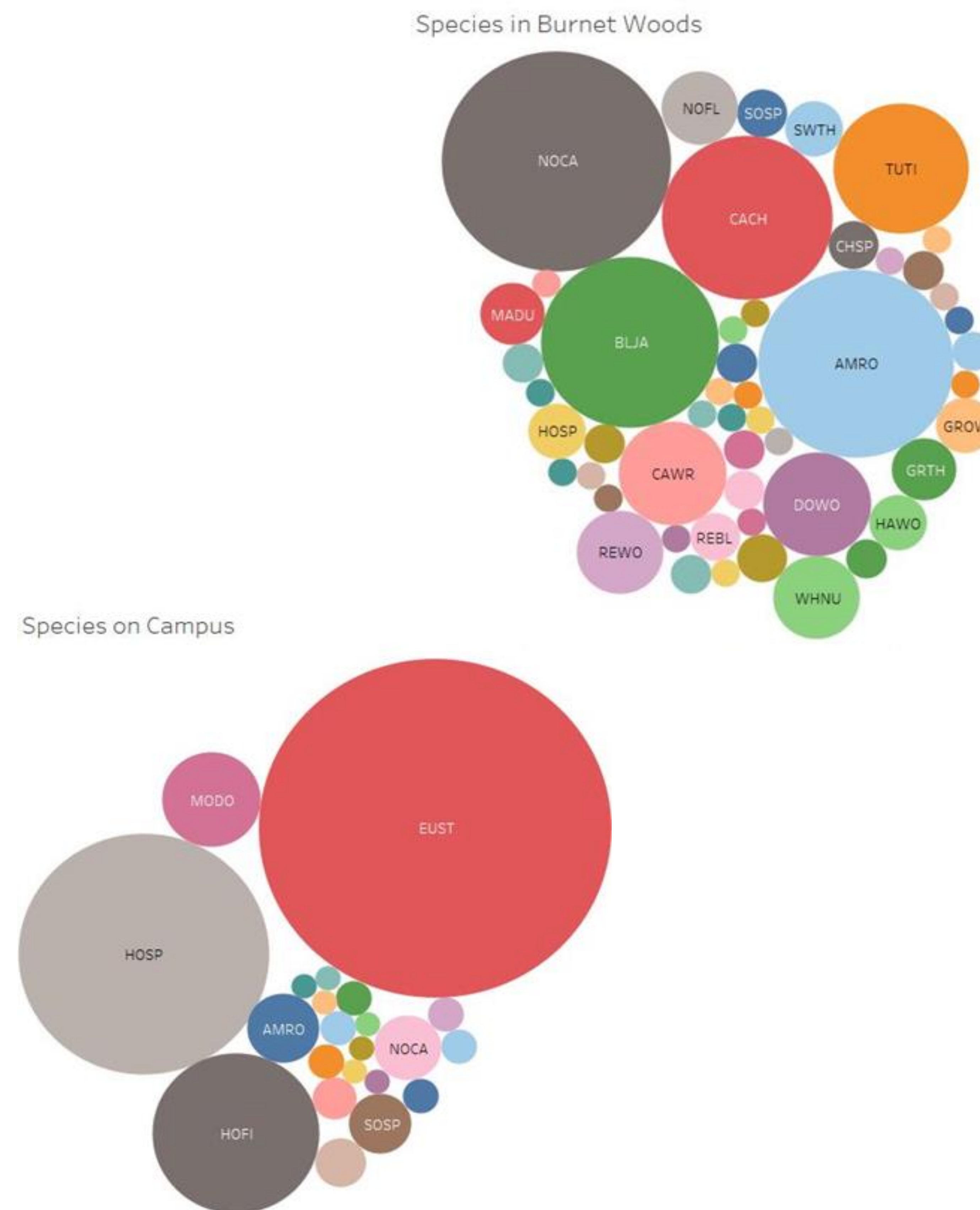


Figure 1: Visualization of the species composition of Burnet Woods (top) and campus (bottom). Different circles and colors represent different species. Size of circles represent the number of individuals.

	Burnet	Campus
Number of species	50	23
Number of individuals	334	574
H'	2.940472	1.316675
J	0.75165	0.419926
Simpson Dominance	0.087339	0.453381
Simpson Diversity	0.912661	0.546619

Figure 2. Diversity Metrics for Bird Species of Burnet Woods and Campus. H' represents diversity. J represents evenness.

Discussion

There were fewer birds observed in Burnet Woods over the course of this study, which may be attributed to forest cover that conceals bird numbers. Species number makes it clear, however, that bird populations in Burnet Woods are more diverse. Results from analysis of the difference in species, along with diversity metrics (i.e., Simpson's index, richness), support that there are statistically significant findings that indicate greater species diversity in Burnet Woods. The area on UC's campus with the highest species variation was around the DAAP building, which is located across MLK from Burnet Woods. The majority of birds found at the University of Cincinnati campus were also invasive species, including the European Starling and the House Sparrow. The results presented here agree with previous studies which suggest that policymakers should consider how to implement more green space in cities and effectively combine green space with man-made infrastructure. Additionally, more plant biodiversity will contribute to higher biodiversity of bird species. Future studies might assess how the United States could follow successful development in Singapore where urban planning has considered protection of native bird populations. Research such as this study could be used to help planners both in the City of Cincinnati and at the university take more proactive measures to protect vital populations by, for example, planting appropriate native vegetation on or around buildings to create more green space for native birds.

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