

**Effects of urbanization on the population density of bird species in cities compared to state
parks**

Samuel DiLandro

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Dr. Binaya Adhikari

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Introduction

As we progress through the 21st-century, our impact on the planet becomes more and more obvious. One method of impacting the planet is urbanization, which, defined by Tisdale, is a process of population concentration (Tisdale, 1942). In the United States, we see this often because of growing populations. More people demands more space for them to live. A common method used in urbanization is deforestation, which primarily has an effect on the birds living in the trees in that area, specifically the population density. In a study conducted in Beijing on afforestation efforts from 1987-2014 as a result of deforestation, it was found that 80% of the bird species were migratory and left, while 15% of the species observed had remained (Pei et al., 2018).

This experiment observed the effects of urbanization on bird species diversity by comparing the number of bird species found/bird species richness in urban habitats/cities with state parks. Those numbers were found on the eBird.org internet database. The question asked was “Where could more bird species exist, in urban or non-urban habitats?” It was hypothesized that there will be a higher bird species richness in state parks than in cities. It was predicted that if cities are considered urban areas, then there will be a higher bird species richness in rural areas when compared. The independent variable was the type of area where the bird species were being observed, and the dependent variable is the bird species richness.

Methods

A Microsoft Word document was opened, containing lab instructions. This document was transferred to a Google Document, and then shared between the lab partners. A state was chosen from a list provided on that same document, followed by a decision of who would focus on research for cities in that state, and who would focus on research for state parks in that state. Research was then conducted using the ebird.org website, and the information desired was

collected and organized in a table in the collaborative Google Document. When all of the data was gathered, data on the bird species density was taken from the table in the Google Document, and transferred to a Google Sheets document. Specifically, a bar graph was made in Google Sheets using specific data from the experiment, such as city/state park mean bird species populations and city/park standard errors, or SEM.

Results

There was a significant difference between the number of bird species found in state parks compared to the number found in cities. The average number of bird species found in state parks was 133.00, while the average number of bird species found in cities was 242.27. The standard deviation of the cities viewed was 30.40, and the standard error SEM was 5.55. The standard deviation of the state parks viewed was 51.88, and the standard error SEM was 9.57, and the t-value was 9.9534 (Figure 1). The p-value was 0.0001 which was found to not be statistically significant. The difference noted between the average amount of bird species found in the areas observed was a negative difference, with the average number of species differing by 109.27 bird species (Figure 1). The number of bird species observed in each of the areas was also more consistent among the cities viewed, than among the state parks. The amount of bird species viewed in the state parks observed had a wider range than those species viewed in the cities, ranging from 1 species to 213. The range of species observed in cities ranged from 202 to 314 (Figure 1).

Discussion

The hypothesis tested in this experiment was whether more species of birds could be observed in either urban or non-urban habitats. It was hypothesized that a higher bird species richness would be observed in state parks rather than in cities. The results found that the bird

species richness was actually higher in cities than in parks, rejecting the hypothesis. A potential reason for why the results differed from the hypothesis was not able to be developed. A contributing factor to the rejection of the hypothesis might have been misplacing the meanings of “urban” and “rural” early on in the experiment, which caused some confusion. The hypothesis was developed as such because, as stated by MacArthur and MacArthur (1961), it’s common knowledge that more species of birds will be found in a forest or mixed wood than in a field of comparable size, being because the wood will have trees and places for the birds to nest. It was believed that the reasons for such a hypothesis were justified by the previous claim from MacArthur and MacArthur (1961). This was experimented upon when Pei et al (2017) discovered that Beijing gained 81 bird species as a result from a progressive increase of forest coverage.

If given the opportunity to perform this experiment again, I would attempt to make clearer distinctions between urban, non-urban, city, and state park areas. I found the distinction difficult to keep up with as I progressed through the experiment. Extra time for data collection and discussion with the group would also contribute to a better outcome of an experiment like this in the future, as well. This experiment offers a wider view on the effects of urbanization on wildlife, which will hopefully be kept in mind for those who will continue to use urbanization as a method of expansion.

References

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Figures

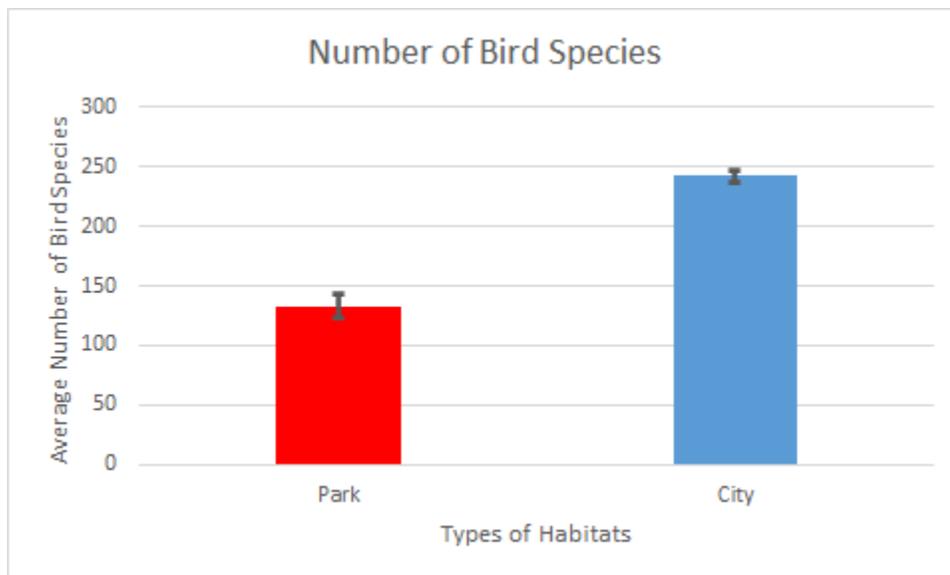


Figure 1: A visual display of the number of bird species in cities compared to the number of species in parks. The small black lines at the top of each graph column displays the SEM for each location. The X axis shows each location, parks and cities, and the Y axis shows the average number of bird species recorded.