

## Introduction

By 2050, it is estimated that 66% of the world’s populations will live in urban areas.<sup>[1]</sup> Cities are designed for a very specific type of organism: us. The pressure of urbanization is changing ecosystems across the globe; the extent of its damage is yet to be determined. Urbanization results in the fragmentation and destruction of habitats, leading to declines in global biodiversity.<sup>[2]</sup>

Diversity is vital to a healthy environment. The greater the diversity of an ecosystem, the more likely it will survive disturbances.<sup>[3]</sup> There are different lenses through which diversity can be examined. Taxonomic diversity classifies organisms based on their species identity, whereas functional diversity classifies organisms based on their specific role in the ecosystem. It is important to understand an ecosystem through both perspectives because taxonomic diversity alone does not account for the significance of different traits in an ecosystem.<sup>[4]</sup>

This study aims to examine the differences in taxonomic and functional diversity of organisms in ecosystems of different levels of urbanization through the context of birds and trees.

## Research Question and Hypotheses

### Question:

How is the taxonomic and functional diversity of an ecosystem affected by urbanization?

### Hypotheses:

- As level of urbanization decreases from site to site, the taxonomic and functional diversity of birds in that ecosystem will increase.
- As level of urbanization decreases from site to site, the taxonomic and functional diversity of trees in that ecosystem will increase.

## Methods

### Bird Identification:

- Point-count method: tallied all birds seen or heard in 10 minutes.
- Recorded weather and ambient noise.

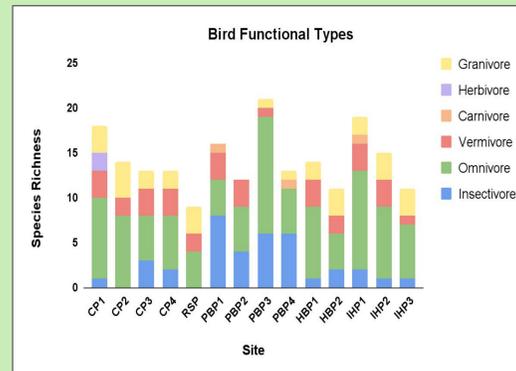
### Tree Identification:

- Point-central sampling method: all living trees above four feet were identified in a 10-meter radius from site center.
- Number of individuals of a species were not recorded.

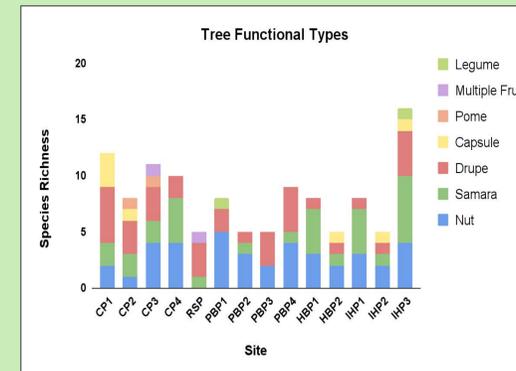


**Figure 1:** Sites sampled in relation to Times Square

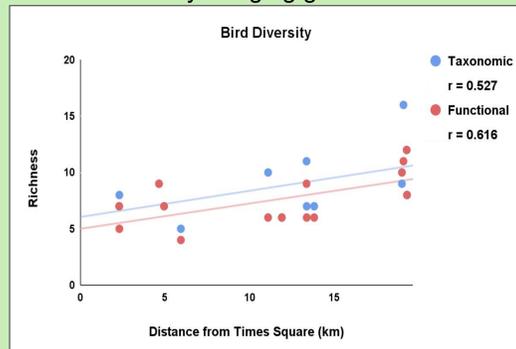
## Results



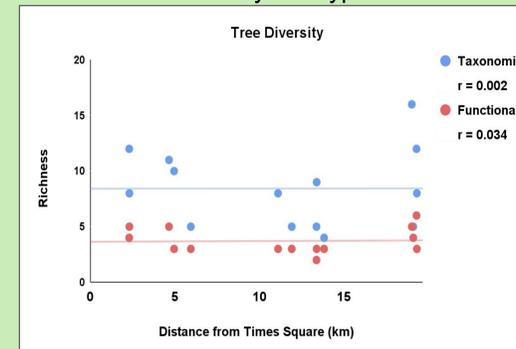
**Figure 2:** Bird species compositions of each site classified by foraging guild.



**Figure 3:** Tree species compositions of each site classified by fruit type.



**Figure 4:** Bird diversity in relation to distance away from Times Square. Pearson’s r value was used to find the correlation coefficient.



**Figure 5:** Tree diversity in relation to distance from Times Square. Pearson’s r value was used to find the correlation coefficient.

## Field Images



**Figure 6:** Field researchers identifying tulip tree



**Figure 7:** Unidentified tree species



**Figure 8:** Field researchers performing a point count

## Data Analysis

### Defining Level of Urbanization:

Times Square was chosen as our urban core. We based the level of urbanization of sites on their distance from Times Square. The further away, the less urban the site.

### Defining Functionality:

- Birds were classified by foraging guilds (i.e. omnivore ground forager, granivore ground gleaner etc.).
- Trees were classified by fruit type (i.e. samara, nut, drupe, etc.).

## Discussion

### Bird Diversity:

The taxonomic and functional diversity of birds increases as urbanization decreases, supporting our hypothesis. Our results suggests that cities have a negative impact on bird diversity.

There were some limitations that may have led to error in our study. Restrictions such as the amount of time we had at each site, location of site, and season of observance may have affected the birds we were seeing and given us an inaccurate representation of each site.



**Figure 9:** *Troglodytes aedon* (House Wren)<sup>[5]</sup>

In order to maintain bird diversity in urban parks, city planners should consider switching to green infrastructure such as green roofs and habitat corridors.

### Tree Diversity:

There was no relationship between taxonomic and functional diversity of trees and urbanization, rejecting our hypothesis.



**Figure 10:** *Platanus x acerifolia* (London plane)<sup>[6]</sup>

Although there was no correlation, urbanization may still be affecting trees. Urbanization can also pose threats to the diversity of ecosystems through the introduction of invasive species, something we did not account for. Future studies may define tree functionality differently.

Our study serves as a reminder that we share this city with diverse groups of plants and animals and that we must actively work to preserve these communities.

## Acknowledgements

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## References

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- [5] <http://www.audubon.org/field-guide/bird/house-wren>
- [6] <https://www.parquesama.com/especies-botanicas-pruebas/>