

Relationship Between Select Atmospheric Parameters and Suburban Land Use with Bird Diversity

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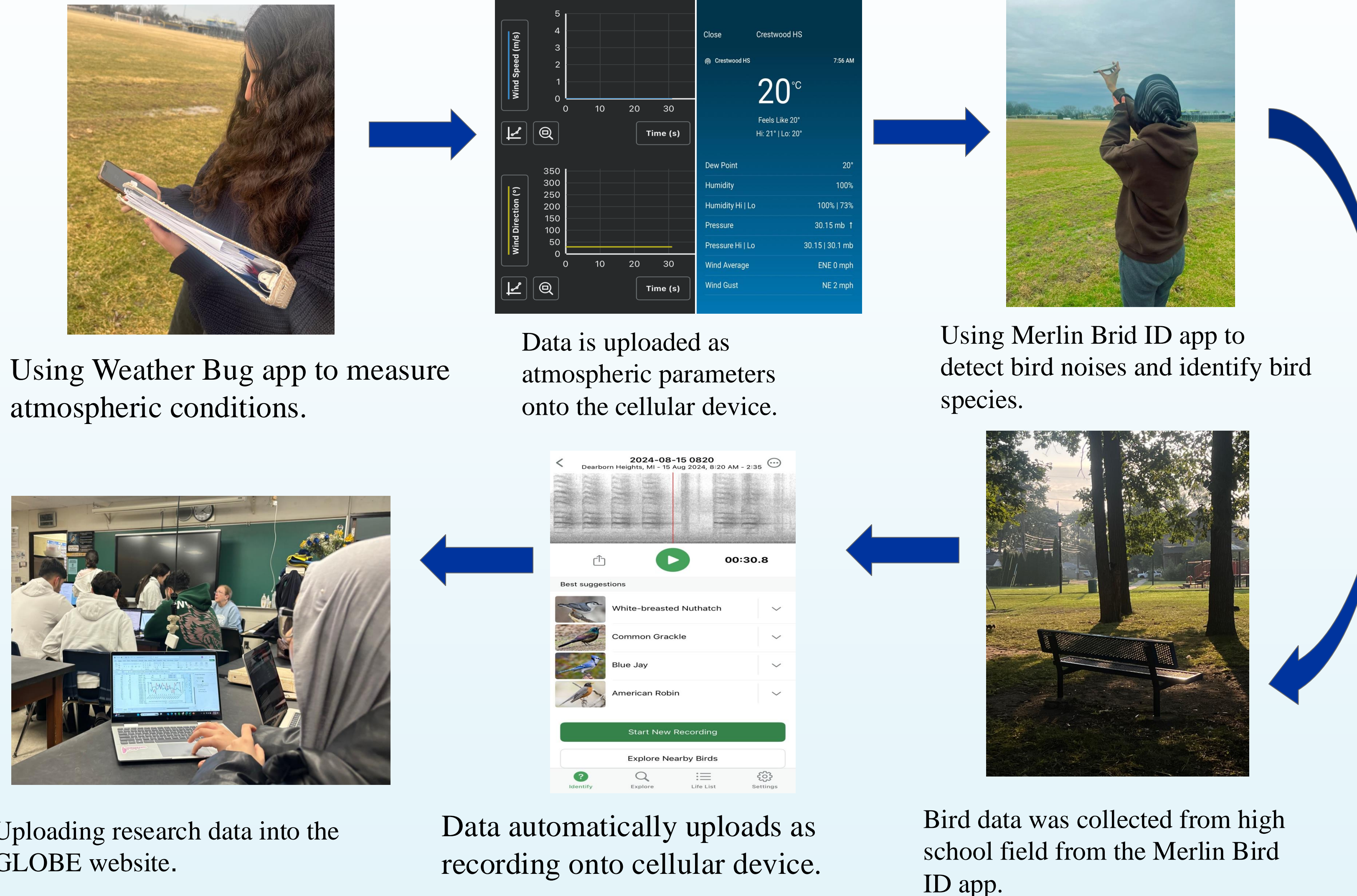
Abstract

In the Summer of 2024 bird activity was monitored in three different locations in **Dearborn Heights, MI (Southeastern Michigan)**. The sites include the soccer practice field at Crestwood high school (Site 1), a small park behind the city post office (Site 2), and an open field in front of a senior citizen center (Site 3). Data collection took place at 8:00 A.M. three (3) times a week throughout much of the summer. The total number of birds encountered during each data collection was tabulated along with bird species composition. In addition, **weather data** was recorded using both the high school's Weather Networks weather station (which sends data directly to GLOBE every 5 minutes) and using a Vernier weather station at the two other sites. Each site varied substantially in habitat quality, as determined from the Shannon wiener index. Although this is an unexpected result, it is interesting to note what types of birds were found in each location. The high school site was a larger area and less diverse than the other sites, but it attracted many **invasive bird species** rather than **native species**. The post office park (Site 2) on the other hand was the smallest area and had the least number of birds, it surprisingly contained the most **diversity** of all the sites. The open field behind the Berwyn senior citizen center (Site 3) had a moderate amount of birds and not as diverse as the post office park.

Discussion

To improve the accuracy of this research, data collection should have started earlier (e.g., in May) to reduce chance variation and allow for more in-depth analysis of the relationship between air parameters and bird diversity/abundance. As the research progressed, researchers became more adept at bird identification, and using tools like recorders or surveillance cameras could further increase accuracy. Tracking bird populations is crucial, as birds serve as environmental indicators. As Nicole Lee notes, "indicators are used as early warning signs of environmental change," helping to prioritize areas for conservation. We reject our first null hypothesis that air parameters don't affect bird abundance. The data showed a trend: warmer temperatures were associated with higher bird populations. For example, a temperature drop from 24° C to 18° C in Berwyn field on 8/14-8/16 led to a decline in bird population from 15 to 0. The data also revealed a significant difference between sites. Site 1, located in an urban environment with many street trees, had a high bird population, consistent with research by Wood and Esaian that street trees attract more birds. However, Site 1 also had a high proportion of invasive species, with 77% of birds being invasive, indicating poor environmental health. In contrast, Site 2 (Post Office Park) had the lowest number of invasive species and the highest bird diversity, with a Shannon Wiener Index of 1.82. We accept our null hypothesis that bird species are not affected by air parameters, as there was no clear correlation between temperature changes and species presence. However, we reject the null hypothesis that urban environments don't influence bird diversity, as Site 2's abundance of natural resources led to higher diversity. Finally, despite Site 1's high bird abundance, the large number of invasive species indicates its poor ecological health.

Methodology



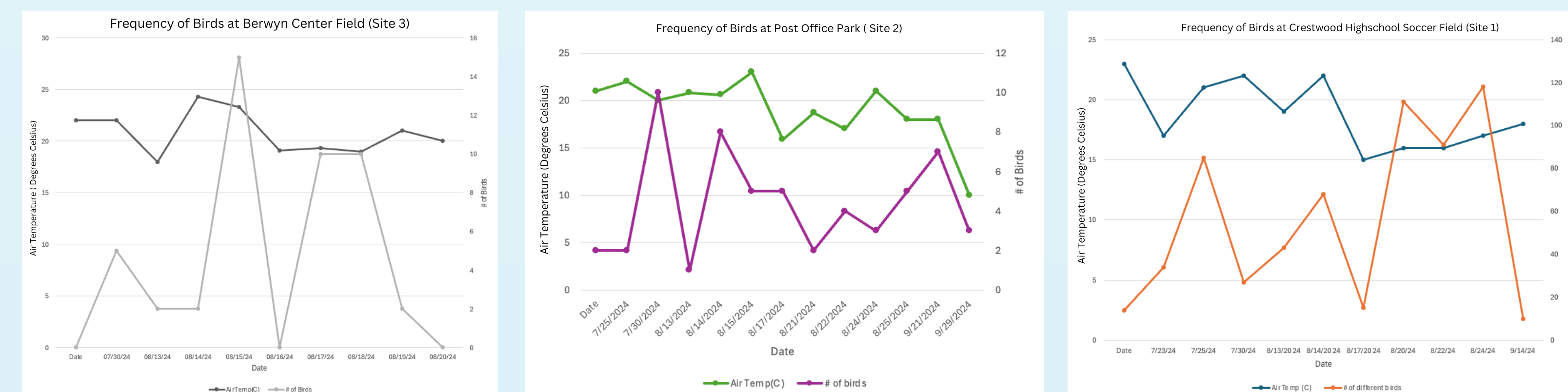
Conclusion

Our research confirms that atmospheric parameters play a significant role in bird presence, with lower temperatures correlating with fewer birds in that area and vice versa. This finding aligns with established ecological principles, as birds tend to reduce activity and seek more sheltered areas in colder conditions to conserve energy. Understanding these patterns is crucial for predicting how climate change and seasonal shifts may impact local bird populations, which in turn affects ecosystem balance and biodiversity.

One of the most unexpected findings was the high bird population at Crestwood High School, despite it not being the most ecologically ideal habitat. This suggests that factors beyond just habitat quality—such as food availability, reduced predation, or lower competition—may be influencing bird distribution. This highlights the complexity of habitat selection and the need for further research into urban ecological niches.

In contrast, the post office and Berwyn Center had significantly lower bird presence. At the post office, we hypothesized that resource completion played a major role. While the area had a high density of trees, indicating a rich and diverse population, the Shannon-Wiener Index suggested that species competition may have limited overall bird numbers. Additionally, the high presence of squirrels, potentially including invasive species not native to Michigan, likely contributed to 10 resource competition, further reducing bird presence. These findings show the importance of studying interspecies interactions in urban environments, as competition from both native and non-native species can influence population dynamics.

Results



Acknowledgements

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