An Analysis of the Variety and Activity of Bird Species at Nahant Marsh

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Summary

This study analyzed the presence, frequency, and activity of bird species throughout Nahant Marsh, with special focus placed on analyzing trends in bird populations across time and location, especially regarding species rare to the Quad Cities area. This information on bird species and activities across the summer months may influence future avian vitalization efforts within the marsh. The data revealed possible trends regarding bird populations and distributions, showing the amount of influence that time, location, and other factors have upon bird species within the marsh. Further analysis may be needed to investigate more closely the specific patterns and trends seen in these bird populations.

Introduction

There is a wide range of bird species that reside either permanently or temporarily within Nahant Marsh's boundaries. Of particular interest are rare marsh birds which, if found, point to the vibrant health of the marsh ecosystem they reside in. Numerous factors within and around Nahant Marsh may impact the amount, variety, and activity of birds within its boundaries. The marsh is home to forests, prairies, lakes, streams, and marshlands, all of which provide habitats for different bird species. Furthermore, the marsh is surrounded by a highway and interstate, a cement recycling facility, and a trainyard, and is very close to the Mississippi River (**Figure 1**), all of which have their own impacts upon the species present. Conducting analyses of the variety and activity of marsh birds within Nahant Marsh can provide a better picture of the marsh's ecosystem, as well as a greater understanding of the various factors that may influence bird variety and activity by location within the preserve.

Materials & Methods

Determining populations of birds in an area without direct observation can be difficult; however, utilizing song meters is the next most reliable way to monitor populations. Thus, I deployed SM4 Bioacoustic Recorders ("monitors") throughout the preserve in various strategic locations (**Figure 1**) to record for four hours (an hour before and after dawn and dusk) every day. Four monitors started recording at the beginning of May, another four began recording in mid-June, and all recordings ceased by mid-July, which provided me with a large collection of recorded bird calls. These recordings were then uploaded into Kaleidoscope Pro, a bioacoustics sound analysis program that can sort bird call recordings into clusters for further analysis. These clusters were then run through BirdNET, an online research platform which filters out unlikely bird candidates (i.e. bird calls with a confidence score < 0.5) and identifies these audio clusters of bird calls by time, date, and location, giving a comprehensive view of the various bird species found throughout the marsh. This data was then finally combined and analyzed via RStudio to determine the final patterns and trends seen below.

Information about bird species rare to the Quad Cities is taken from the pamphlet "Quad City Avian Checklist", compiled by Kelly J. McKay, Brian L. Blevins, and Jason L. Monson, revised May 2025. The background photo was taken by Julie Malake.

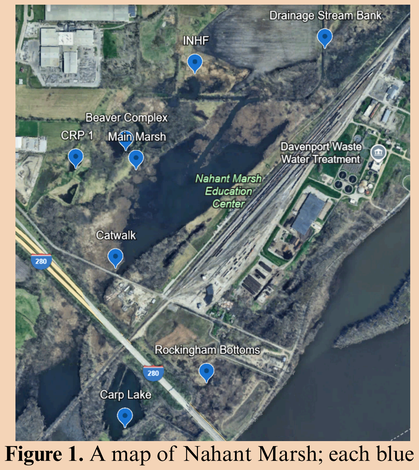

Figure 1. A map of Nahant Marsh; each blue dot is a monitor location

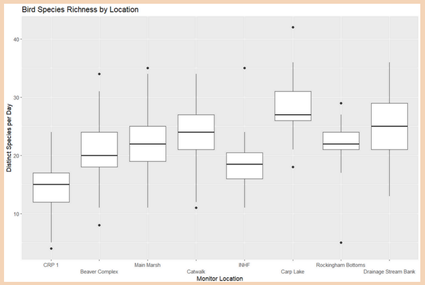

Figure 5. Bird Species Richness by Location

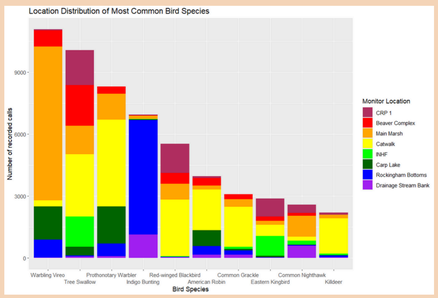

Figure 6. Location Distribution of the Most Common Bird Species

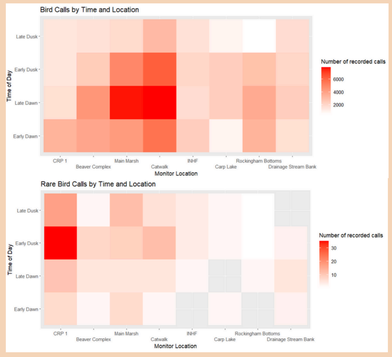

Figure 7. Bird Calls and Rare Bird Calls by Time and Location

Figure 2. Count of Bird Calls over Time; the arrow indicates the addition of four more monitors

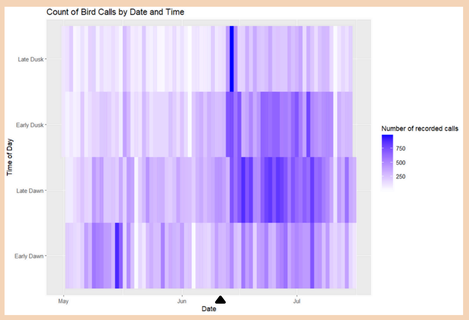

Figure 4. Count of Bird Calls by Date and Time; the arrow indicates the addition of four more monitors

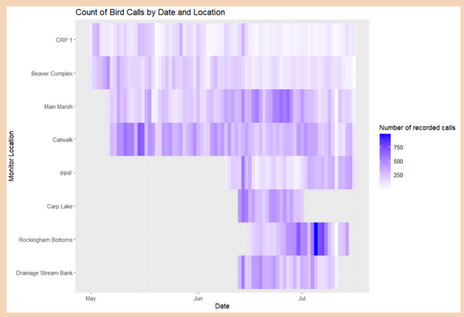

Figure 3. Count of Bird Calls by Date and Location

Taking into account the increase in deployed monitors, the number of recordings per day remained stable throughout the summer before declining in late July (**Figure 2**). The number of recorded calls per day tended to be relatively constant, although some monitors saw bumps in activity at certain points in the summer, such as the Catwalk in the middle of May, the Main Marsh in late June, and Rockingham Bottoms in early July (**Figure 3**). Broken down by both date and time, there is a clear increase in bird activity in the late dawn and early dusk time periods, especially as more monitors were activated in the field (**Figure 4**).

Boxplots of each monitor's average number of distinct bird species per day demonstrates a wider variety of bird species per day at locations such as Carp Lake and the Drainage Stream Bank than those located around the main marsh (**Figure 5**). However, the distribution of species by recordings in the data is massively skewed to the right: out of the total 207 distinct recorded species, 80 are recorded less than 10 times, and the 24 species with over 1,000 recorded calls account for most of the data. The top 10 most recorded species (**Figure 6**) shows that the high level of activity of Warbling Vireos at the Main Marsh and Indigo Buntings at Rockingham Bottoms is likely to have weighted the data heavily at both locations.

A majority of all detected bird recordings appear to occur at late dawn at the Main Marsh and Catwalk locations. On the other hand, most of the recordings of birds rare to the Quad Cities area (mainly Loggerhead Shrikes and Fish Crows) were at the CRP 1 location at early dusk, suggesting that this area may be in some way more attractive to these rare birds compared to other locations in the marsh (**Figure 7**). Unfortunately, there were few detections of rare birds at Nahant Marsh - only 176 out of nearly 95,000 recordings. Furthermore, analyzing the confidence scores of the recordings shows that detections of rare birds are on average less confident than those of non-rare birds. This raises the question on the accuracy of these detections and whether these detected rare birds were actually at Nahant Marsh.

Conclusion

My research found interesting trends on the variety, distribution, and activity of birds found in the marsh, providing Nahant Marsh with valuable information for determining patterns of bird activity in the area across seasons, locations, and even time of day. While analyses of rare bird species in the marsh are unwise considering the lack of data (**Figure 7**), this study still provides a strong basis of information on Nahant Marsh bird populations for current conservation programs and future research.

Acknowledgements

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