Assessing avian diversity after wetland habitat restoration in the Gunpowder Creek watershed

Kevin Black
Boone County Conservation District, Northern Kentucky University

Introduction

Wetland habitats – where water is present above or near the soil surface for prolonged periods of time – provide food, shelter, and nesting and breeding opportunities for a number of bird species. Approximately 10% of bird species in the United States (~140 species) are considered wetland-dependent, requiring access to a wetland for some or all of their life cycle (Robert E. Stewart, Jr. 1996). However, the presence of wetlands is often at odds with human development and millions of acres of wetlands have been modified or removed in the last century. Today, natural wetlands make up only 5.5% of total land surface area in the United States (Dahl 2011). We have only recently begun to understand the importance of wetland habitat for a variety of services, and conservation efforts to protect these scarce habitats have increased. One new conservation practice is wetland restoration, which takes areas that have been converted from a wetland to other uses and returns them to their original function. But are these restored habitats as useful to the birds that rely on them as natural wetlands? In Eastern Kentucky, restored wetlands have shown to have less avian diversity and fewer wetland-dependent species than intact wetlands (Reeder and Wulker 2017), however no research has investigated the relationship between wetland restoration and avian community composition here in Northern Kentucky. For this study, we examined the species richness, abundance, and diversity of birds at a restored wetland to determine the effectiveness of the restoration project on the avian community, and to establish a benchmark for future diversity studies in the area.

Figure 1. An outline of YMCA Camp Ernst, located on Camp Ernst Road in Burlington, KY. The star indicates the location of the ~ 5 acre wetland on the property.

Methods

- Study site was the restored wetland at YMCA's Camp Ernst in Burlington, KY (Figure 1). The restoration project – completed in spring 2017 – was implemented as part of Boone County Conservation District's 2014 Gunpowder Creek Watershed Plan to provide habitat and reduce stormwater flow in Gunpowder Creek.
- Observations were made biweekly from December 26, 2018 - February 8, 2019 for a total of 14 hours of on-site observation. Each individual observation period lasted one hour from 11:00am to 12:00pm and followed a fixed route within the wetland of approximately 1.5km.
- Bird species were identified by sight and/or sound from within the wetland area or in the surrounding riparian canopy. Richness (number of species) and abundance (number of individuals) were recorded with the eBird application.
- We analyzed our data with the program Microsoft Excel. Calculations were done using the Shannon Diversity Index to determine the species diversity (H') of the avian community.

Results

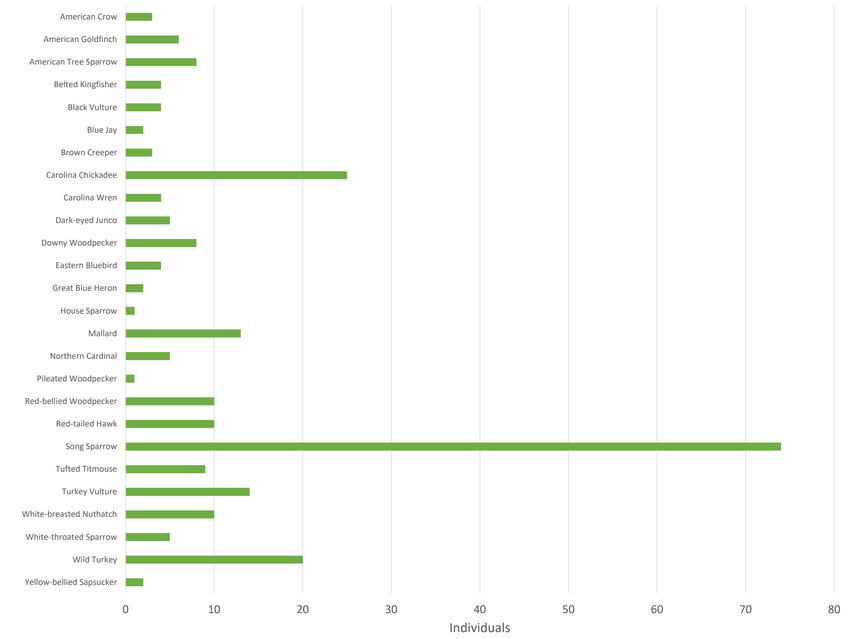

Figure 2. The abundance of each bird species observed from December 2018 to February 2019 at the restored wetland of Camp Ernst in Burlington, KY.

Pileated Woodpecker (left), Great Blue Heron (center) by Leonard Beck Photography. Song Sparrow (right) by Kimmy Birrer Photography.

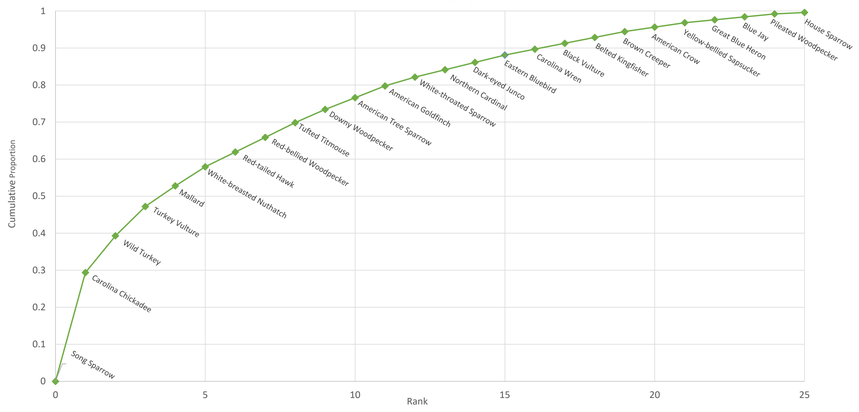

Figure 3. The rank abundance curve of species observed from December 2018 to February 2019 at the restored wetland of Camp Ernst in Burlington, KY. The species were ranked in order of relative abundance at the study site. The slope of the curve indicates the diversity of the bird community, with a flatter curve representing a more diverse community.

Analysis

- In total, we observed 26 different species and 252 individual birds. For each individual period, we observed 8 species and 18 individuals on average.
- Song Sparrows (74 individuals) and Carolina Chickadees (25 individuals) were the most abundant species, while we only saw one Pileated Woodpecker and House Sparrow (Figure 2).
- Song Sparrows and Carolina Chickadees made up approximately 40% of the total bird community, with each other species comprising between 0.5% - 8% (Figure 3).
- The species richness (*S*) was 26, the evenness (*J'*) was 1.49. We used these numbers in the Shannon Diversity Index to find a species diversity (*H'*) of 2.68

Carolina Chickadee by Leonard Beck Photography.

Discussion

Remarkably, we found that the avian community at the Camp Ernst wetland showed a high diversity (H' = 2.68). The results from this study differ from previous research in Kentucky, which showed that avian diversity at restored wetlands remained low (H' ≤ 1.13) up to 25 years after restoration was completed (Reeder and Wulker 2017). A possible explanation for these findings is that diversity is measured as a combination of species richness and abundance, so although we did not observe a large number of species, the diversity is higher than expected because the species that we did observe were relatively evenly distributed. Another consideration to make is that this study occurred through the winter only, meaning that all bird species which had migrated out of the region were not counted. Future research should attempt to account for these missing species by measuring richness, abundance, and diversity in the summer season. After annual species diversity is found, the Camp Ernst wetland should serve as a reference site for avian diversity studies at other natural or restored wetlands in Boone County and the greater region.

References

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