Monitoring use of restored areas by avian and insect pollinator communities in the Balcones Canyonlands Preserve

Wren Conner, Darren Proppe, and Elijah Wostl
Environmental Science and Policy, St Edward's University, Austin, TX
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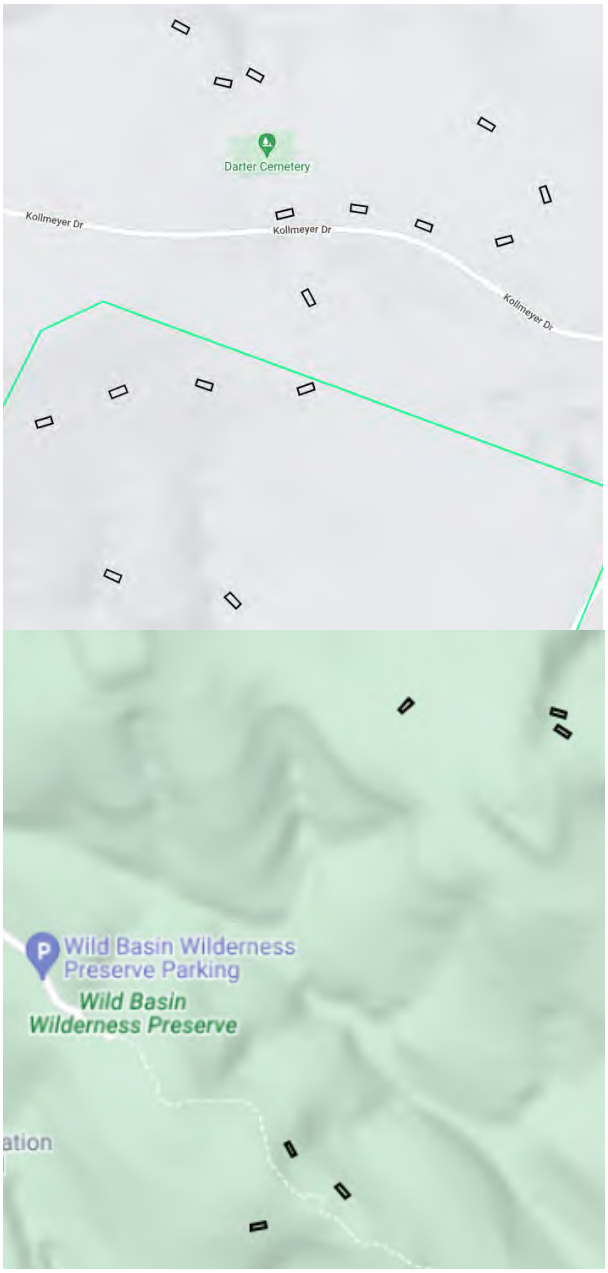
The Balcones Canyonlands Preserve (BCP) system was formed in 1996 to protect important habitat for endangered avian species which rely on mixed juniper-oak woodlands. However, the preserve consists of several tracts of land which vary in habitat quality, with some sites undergoing active restoration. These sites lack critical information on how they are being used by local avian and insect pollinator communities, which could be used to inform future best practices for land management. This project aims to address this gap in knowledge by running surveys of avian abundance and diversity as well as surveys of insect pollinators at several sites across the BCP. Eleven restored and eleven unrestored plots were set up, each 25x10 meters, and categorized by whether or not active restoration had been ongoing at the site. Each plot also contains three smaller 3x3 meter plots for the purpose of insect pollinator surveys. Surveys consist of one 10-minute audiovisual bird survey observing whether a bird came within the plot, and three 5-minute insect pollinator surveys, one for each subplot. Preliminary data indicates significant differences in avian diversity, individual counts, and uses between restored and unrestored sites. As data collection continues, the information collected by this project will provide land managers with new information about how avian and insect pollinator communities are using the land they manage.

Introduction

The Balcones Canyonland Preserve (BCP) is a preserve system that conserves habitat for wildlife in Central Texas. It was established in 1996 in response to dramatic habitat loss as the Austin area urbanized- between the years of 1985 and 2016, the Austin metropolitan area lost over 24% of its forest cover (Dreiss et al. 2022). The BCP consists of several tracts of land with varying levels of habitat quality, as many were degraded by use before becoming part of the preserve (Balcones Canyonlands Preserve 2007). Many of these tracts are actively being restored, which led to our questions: How does restoration affect how much the land is used by avian and insect communities, and how does it change the composition of those communities? We predicted that restored areas would have higher avian species richness, and more use overall by both avian and insect pollinator communities.

Methods

This study is being conducted on 4 BCP properties owned by the City of Austin and Travis County: JJT, Medway Ranch, Vireo Preserve, and Wild Basin Wilderness Preserve. The maps on the right show our plot locations: 6 plots were located at Medway Ranch, and 10 were located at JJT. The green lines on the first map are the boundary of the Medway property adjacent to JJT. The second map on the right shows our Vireo Preserve and Wild Basin plots, of which there are 3 on each property. Links to our online maps were provided to preserve managers of each property so they would have access to the precise locations where we are surveying.



Each site consists of one 25x10m plot (with 3 3x3 plots within for pollinator surveys), which we marked on our maps. There are 22 in total, with 11 in restored areas and 11 in unrestored areas. We conducted 10-minute audiovisual surveys of avian use as well as species diversity, and surveyed pollinator use via three 5-minute pollinator use surveys. At least three replicate surveys will be conducted at each site. We did not collect anything in the field beyond observational data.

Results

We have not collected all of our data, but we performed some preliminary analyses with the data we have so far. We have not collected pollinator data yet, so our preliminary data focuses on the avian data we have collected. We found restored sites had an average species richness of 3.600 species, while unrestored sites had an average of only 0.714, due to some surveys not recording any birds at all. We found similar numbers in our individual and use counts, with an average of 8.2 uses for restored sites, and 1.0 for unrestored sites.

To test for significance, we performed two-tailed T-tests for our three variables (species richness, individual counts, and use counts), and found a significant difference between restored and unrestored plots for all three (P-values <0.000).

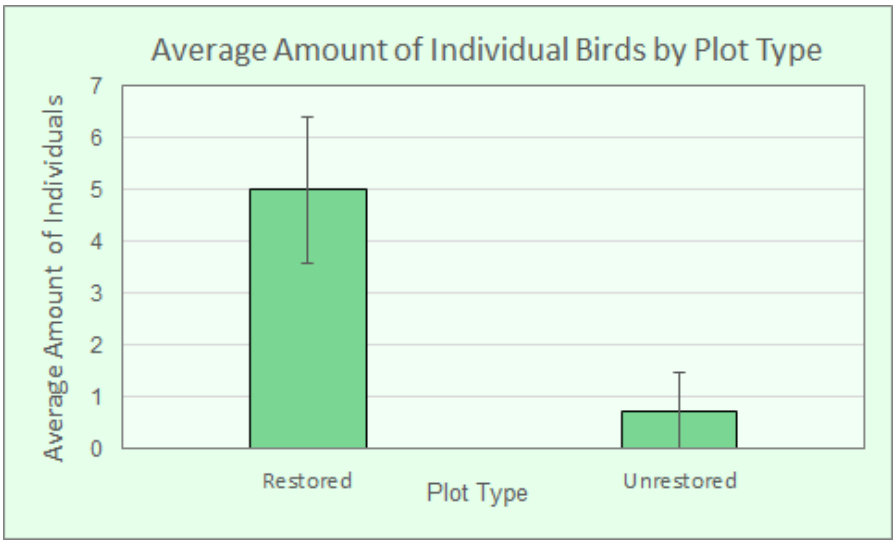


Figure 1. Average amount of individual birds surveyed in a plot, sorted based on whether the plot was restored or unrestored. Error bars represent standard deviation. T-tests revealed a significant difference between the two groups, with a P-value of 0.000003.

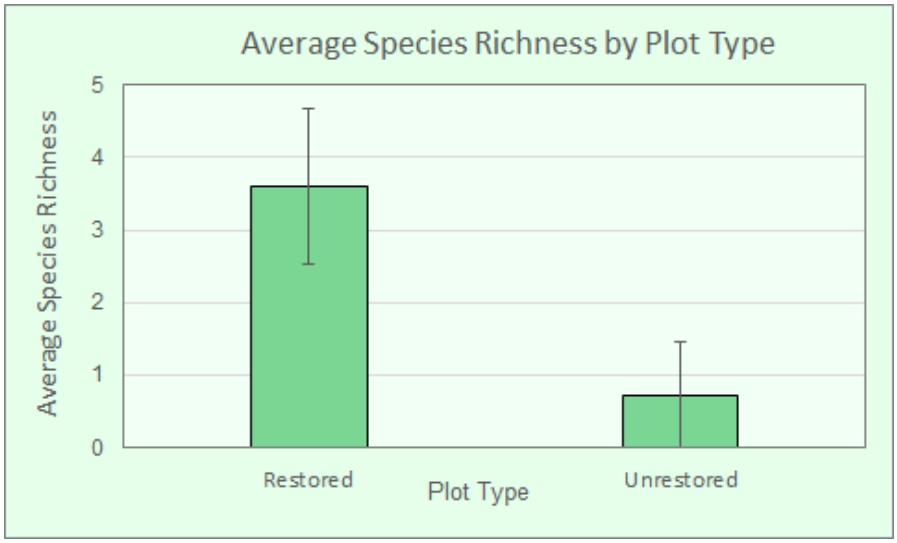


Figure 2. Average species richness surveyed in a plot, sorted based on whether the plot was restored or unrestored. Error bars represent standard deviation. T-tests revealed a significant difference between the two groups, with a P-value of 0.00002.

Conclusion

We predicted that restored areas would have higher avian species richness and use by avian communities, and our preliminary results and analysis support this prediction. T-tests showed significant differences between both the average species richness ($p < 0.000$) and the average number of individual birds ($p < 0.000$) per plot based on whether or not the plot had been restored.

These results are also supported by previous research by Hanle et al. (2020), which found regenerating vegetation (such as increased ground cover and shrub cover) is correlated with increasing bird diversity. One possible contributing factor to the lower individual numbers in the unrestored plots is that habitat quality is diminished due to fewer sources of food, so those plots can only support smaller quantities of birds.

Though these analyses are preliminary, the data we have so far strongly supports our hypothesis and suggests that the restoration efforts in the BCP have a strong positive impact on bird diversity. For this reason, restoration efforts for protected BCP land should continue, as the investment to restore these lands seems well worth the effort.

Literature Cited

Balcones Canyonlands Preserve (2007) Balcones Canyonlands Preserve Land Management Plan, Tier III. Austin, TX: Balcones Canyonlands Preserve.

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Hanle J, Duguid MC, Ashton MS. 2020. Legacy forest structure increases bird diversity and 84 abundance in aging young forests. Ecology and Evolution 10(3):1193-208.