The Relationship Between White-tail Deer Intensity and Invasive Flora in Cincinnati Parks

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Introduction

White-tail deer populations were nearly extirpated in Ohio around the turn of the previous century; however, restriction of hunting in urban areas has enabled deer populations to surge and flourish. This drastic growth in population size has been correlated with an increase in economic, ecological, and human welfare issues. The continuing advancement of urbanization and increasing deer populations have been correlated with an increase in human wildlife conflict which has been recorded as early as the 1950s (Conover, 1993). However, it is not just overabundant deer populations that have been causing issues - invasive plant species have also been known to cause many ecological problems. Invasive flora have the potential to impact native plant communities, impact ecosystem processes, and can alter other organisms within the ecosystem (Reid et al., 2009).

Ecosystems are complex and overabundant urban deer populations may have various ecological consequences, especially regarding vegetation matrices. Deer have been found to influence the presence of native and non-native plant communities by their browsing behavior, where browsing activity of native plants by a large deer population encourages invasive plant growth, and therefore, changes the vegetation matrix to be covered with more invasive plants species (Knight et al., 2009). Deer overabundance has been found to be more impactful ecologically than invasive plant species (Gorchov et al., 2021). Our study seeks to identify a potential relationship between a large urban deer population and the invasive plant species abundance within the Cincinnati parks. With the Cincinnati parks implementing a deer management program, understanding the potential effects a large deer population has on the vegetation matrix within the parks could provide insight for future urban deer and invasive plant species management.

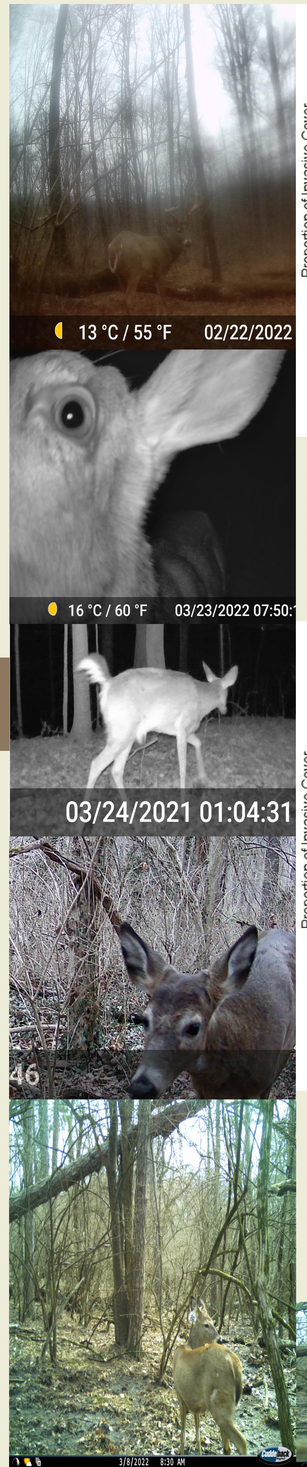
Methods

Trail cameras were used to capture deer intensity and vegetation transects were conducted to obtain vegetation samples within the Cincinnati parks. Historical deer abundance data obtained from the Cincinnati parks was also utilized, where the deer abundance was found by using flyover infrared imaging of the parks that were managed by bow hunting. The historical data is measured in deer/sq. mile. The trail cameras were randomly placed within the different parks and remained within that location for a week. Using the captured images, the deer intensity measured in the number of bursts per hour was calculated by taking positive identifications of deer per hour over the full deployment period and averaging them for an overall burst per hour unit.

The transects were 50m in length and a $1m^2$ quadrat was placed on the forest floor every 10m for a total of 6 total quadrats per transect. The transects were randomly selected within the parks and the percent cover of plant species was recorded. The proportion of the percent cover that was invasive, was found by summing the total invasive plant cover per quadrat and then dividing that value by the total vegetation cover within the same quadrat. The 6 estimates were then averaged for each park and arcsine square root transformed. Two linear regressions were run to find any potential significant relationships between deer intensity (bursts/hr.), density (deer/sq. mile) and invasive plant species measured as transformed proportion of invasive plant cover.

Results

We found a high percentage of invasive cover in Cincinnati Parks. The mean percentage of invasive cover was 75.7% across the sampled parks. The lowest percentage found was in Stanbery Park (37.6%) and the highest (100%) was in Rawson Woods where we found no native species.



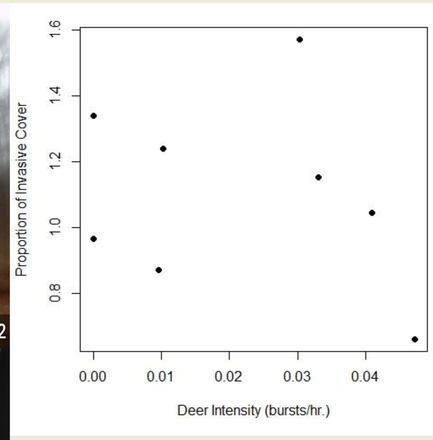


Figure 1. The relationship between deer intensity (bursts/hr.) and the transformed proportion of invasive cover. There was no significant relationship between the transformed proportion of invasive plant cover and deer intensity (t = -0.56, df = 6, P = 0.58).

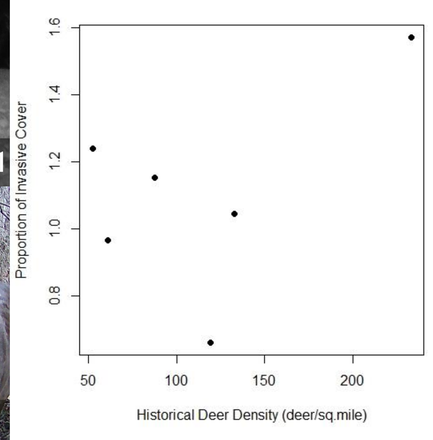
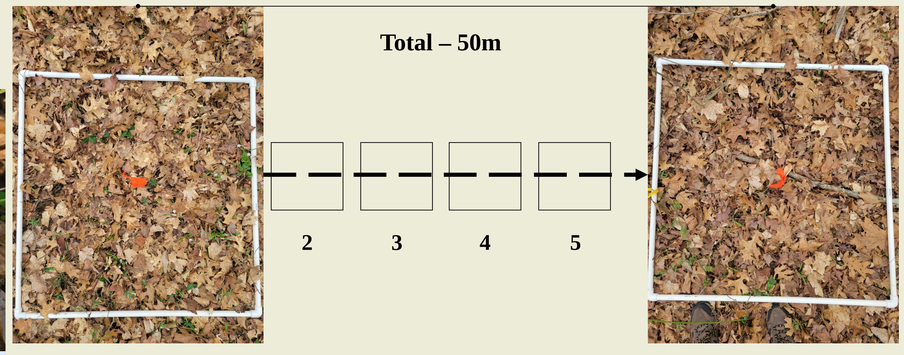


Figure 2. The relationship between historical deer density (deer/sq. mile) and the transformed proportion of invasive cover. There was no significant relationship between the transformed proportion of invasive plant cover and deer density (t = 1.15, df = 4, P = 0.31).



Conclusions

- We did not find the data to be statistically significant and therefore it can be concluded that there is no significant relationship between transformed proportion of invasive plant cover, deer intensity (bursts/hr.), and deer density (deer/sq. mile).
- Although the data did not conclude a significant relationship, previous studies have found potential relationships between deer abundance and invasive flora abundance (Knight et al., 2009).
- There were various limitations with our study that could be improved upon in the future for better estimates of the deer populations and invasive flora abundance within the Cincinnati parks.
- Our data collection period could have caused limitations as abundances of deer and/or invasive flora could be different throughout the year and our methodologies of using trail cameras and vegetation transects could have caused poor estimates of deer populations and flora abundance.
- Future studies should be conducted regarding overabundant deer populations and its potential ecological impacts, especially since the implementation of deer management plans have become more common when trying to manage wildlife and natural areas. Future amendments to our data collection methodologies, as well as further data collection could provide better estimates and potential relationships.

References

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