Near and Deer: How Does White-tailed Deer Overabundance Affect the Floristic Quality of Urban Habitats?

Lillian Braun*, Jack Fogle*, Grace Edmonston, Jordan Gerda, Sara Langworthy, Max Lackey, Nathan Pack, Sean Petit, Hayden Pittock & Dr. Stephen F. Matter
Department of Biological Sciences, University of Cincinnati

Introduction

White-Tailed Deer (*Odocoileus virginianus*) browsing is a financial and ecological burden on many urban communities. An estimated $870,000 in revenue is lost annually across commercial agricultural and timber sectors in addition to $376,000 in household damages and prevention caused by deer browsing alone[1,2]. Furthermore, high urban deer densities have been shown to lead to lower native biodiversity due to increased browsing activity and preference for native plants. The University of Cincinnati and Cincinnati Parks have collaborated to assess the relationship between white-tailed deer intensity and spring ephemeral abundance throughout urban parks of greater Cincinnati. To evaluate the extent of this impact, floristic biodiversity can be quantified through the Floristic Quality Abundance Index (FQAI), which has been shown to illustrate the effects of deer intensity on floristic quality[3]. **Do higher concentrations of urban deer in Cincinnati's Parks lead to lower floristic quality?** We hypothesize that the overabundance of White-Tailed Deer throughout the Cincinnati Park System is negatively affecting its floristic quality.

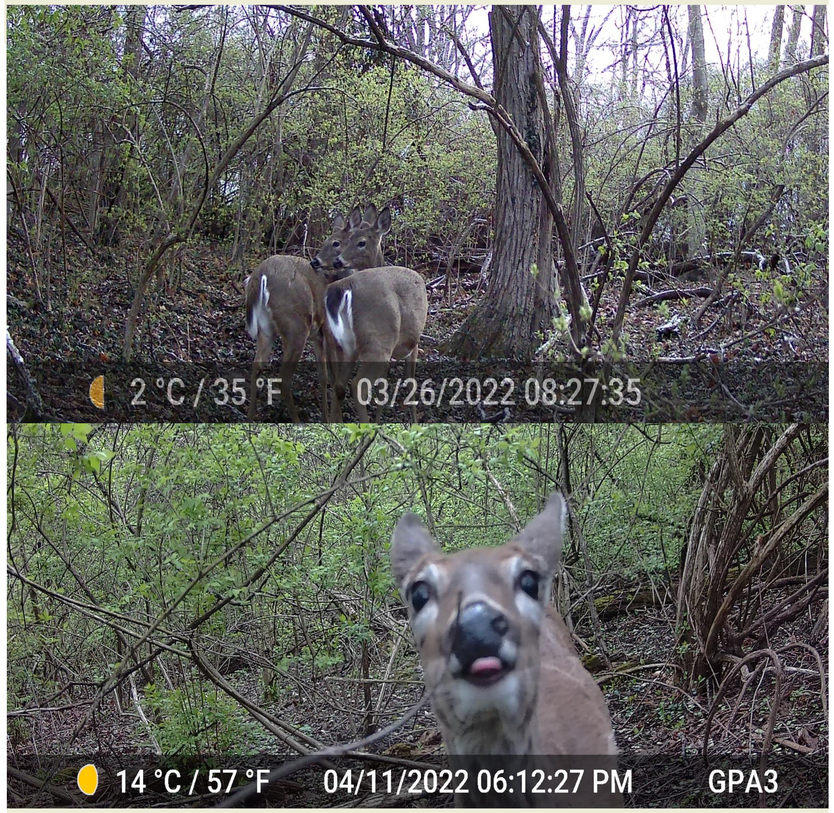

Figure 1. White-tailed deer *(Odocoileus virginianus)* pictured via camera trap in Alms park (top) and Drake park (bottom)

Methods

We measured deer intensity by placing camera traps in nine Cincinnati parks and observing the frequency with which deer trigger the cameras (Fig 1). We established a fifty-meter transect at each park and assessed the percent cover of spring species in six 1m^2 quadrats spaced every 10m (Fig 5). The FQAI score for each park considers the number of native species (Fig 4, A-C), their abundance, and their susceptibility to disturbance, which is measured on a scale 0-10 with a 0 indicating a non-native species (Fig 4, D). FQAI scores were then compared to deer density and park area via linear regression analysis.

Results

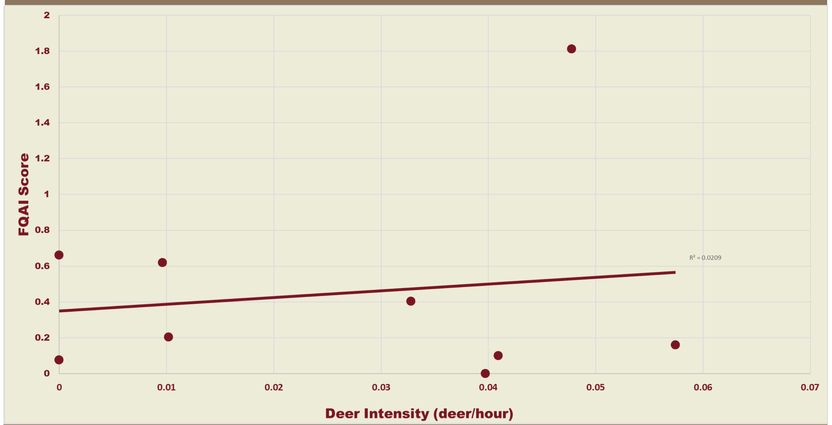

Figure 2: There is no significant correlation between Deer Density and FQAI scores ($F_{(1,7)} = 0.15$, $p = 0.71$)

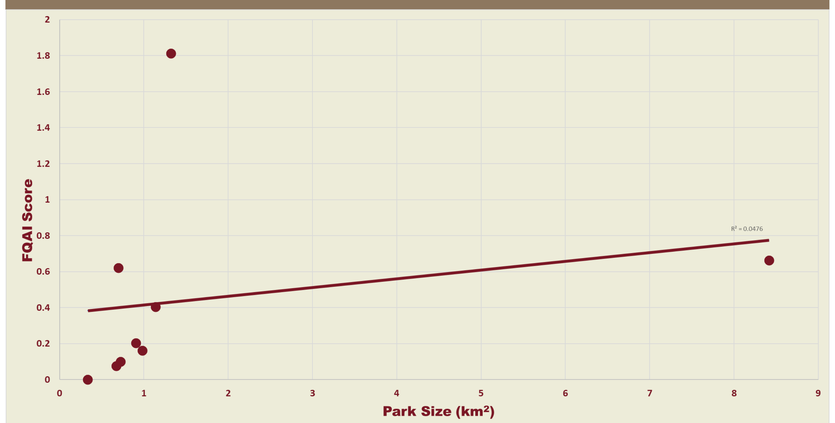

Figure 3: There is no significant correlation between Park Size and FQAI scores ($F_{(1,7)} = 1.24$, $p = 0.30$)

Figure 4. Spring ephemerals: Red Trillium (A), Dutchman's Breeches (B), Virginia Spring Beauty (C), & Lesser Celandine (invasive species; D)

Figure 5. 1m^2 PVC framed transect placed at 0m

Discussion

Our studies showed that there is no significant correlation between deer density and FQAI score (Fig 2). This may be due to effective deer management, small sample size or exhaustive grazing from local deer populations.

Our studies also showed that there is no significant correlation between park size and FQAI score (Fig 3), however a trend was observed which may be due to effects such as a species-area effect, higher disturbance in smaller parks, edge effect in smaller parks, or urban proximity.

Future Applications

Year-round data collection to eliminate discrepancies in deer activity influenced by seasonality

Increased transect placement and camera trap deployment in each park

Additional data collection methods to support deer intensity

- Cincinnati Parks flyover data
- Scat collection analysis

References

1. Conover, Michael R. 1997. Monetary and Intangible Valuation of Deer in the United States. *Wildlife Society Bulletin (1973-2006)*, 25, 2: 298–305
2. Marquis, David A.; Brenneman, Ronnie. 1981. The impact of deer on forest vegetation in Pennsylvania. Gen. Tech. Rep. NE-65. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experimental Station. 7p.
3. Filazzola, Alessandro, et al., 2014. Estimating the Impacts of Browsers on Forest Understories Using a Modified Index of Community Composition, *Forest Ecology and Management*, 313: 10–16.

Support provided by the Cincinnati Parks and the University of Cincinnati