Effects of white-tailed deer site use on vegetation structure, composition, and biodiversity in Upper Cumberland region of Tennessee

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Introduction

- Herbivores can exert powerful forces on vegetation structure.
- Selective herbivores have been known to negatively affect vegetation structure and diversity due to browsing.
- *Odocoileus virginianus* (white-tailed deer) have been documented to have tremendous cascading effects regrowth of vegetation in the northeast United States.
- Over browsing of white-tailed deer on vegetation can impede growth and shift vegetation communities.

Objective

- Asses the effects of white-tailed deer site use on vegetation structure and diversity in the Upper Cumberland region.

Methods

- Placed 6 trail cameras across study area (The Bridgestone Nature Reserve at Chestnut Mountain, Sparta, TN).
- Calculated total number of white-tailed deer present in photographs between April 2020 and August 2020 to quantify site use.
- Measured minimum, maximum, and average visual obstruction of vegetation at 4 sample points within 50-meter plots at each camera site.
- Measured vegetation density at 4 sample points within 50-meter plots at each camera site.
- Identified plants within the quadrats to genus to calculate vegetation diversity.
- Calculated Shannon's Diversity Index, Simpson's Diversity Index, species richness, and species evenness at each site.

Figure 1: Browsed and common plants within plots A: *Lespedeza sp.* B: *Osmunda sp.* C: Unknown bramble D: *Maianthemum* E: *Dioscorea sp.*

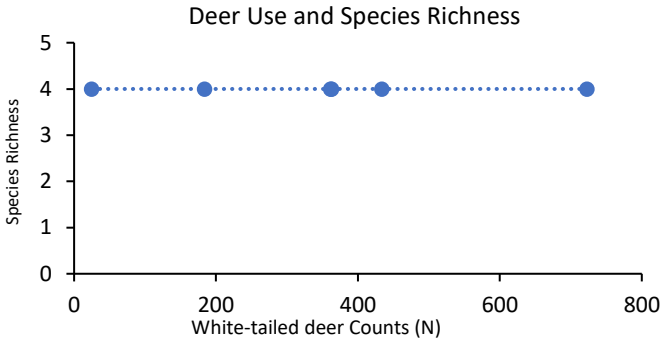

Figure 2: Relationship between deer use and vegetation species richness at 6 sites at The Bridgestone Nature Reserve at Chestnut Mountain, Sparta, TN. Deer occurrence was captured by remote trail cameras and use was quantified as total number of deer occurrences.

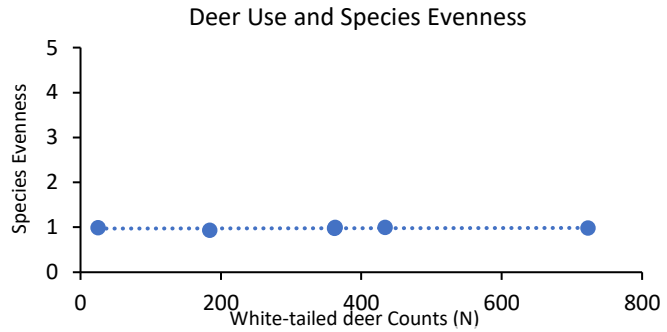

Figure 3: Relationship between deer use and vegetation species evenness at 6 sites at The Bridgestone Nature Reserve at Chestnut Mountain, Sparta, TN. Deer occurrence was captured by remote trail cameras and use was quantified as total number of deer occurrences.

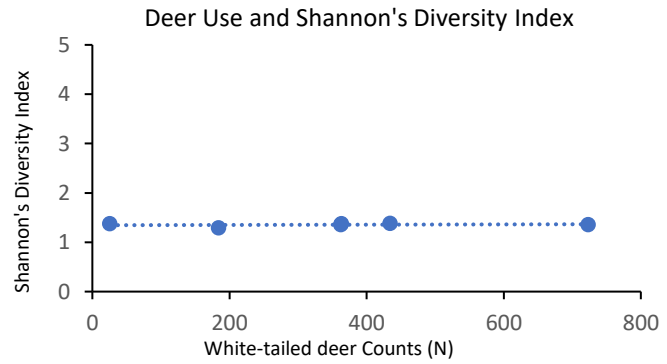

Figure 4: Relationship between deer use and Shannon's diversity index at 6 sites at The Bridgestone Nature Reserve at Chestnut Mountain, Sparta, TN. Deer occurrence was captured by remote trail cameras and use was quantified as total number of deer occurrences.

Results

- Overall species richness was 4 for each plot (Figure 2).
- Percent forbs, percent debris, percent grass, percent fern and percent woody all had increasing correlation slopes with the increasing number of white-tailed deer while percent bare and percent brambles/vines had decreasing correlation slopes (not pictured).
- All the visual obstruction measurements resulted in slightly greater correlation slopes with the increasing number of white-tailed deer.
- Species evenness and Shannon's diversity index were unaffected by deer use (Figures 3 and 4).
- Simpson's diversity index indicated there is a negative correlation between plant diversity and white-tailed deer.

Figure 5: Doe captured on trial camera from one of the plot sites.

Discussion

- Woody component increased with the presence of white-tailed deer; possibly because deer removed herbaceous vegetation competition, facilitating woody species growth.
- Understory regrowth may also have been affected by canopy composition limiting sunlight, although most of our sites had full canopy closure.
- Although woody species were more common, species composition and site diversity were not affected by deer use.
- Although preliminary, our results suggest that deer use may be correlated with shifts in species composition and may shift communities towards a more woody community.
- However, understanding the extent and biological importance of these shifts warrant more research.

Acknowledgements

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