



Effects of deer herbivory on floristic heterogeneity in Central Illinois

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Introduction

- White-tailed deer (*Odocoileus virginiana* Zimmerman) population densities in the eastern U.S. are at historically high levels.
- Intense winter browsing by deer can slow growth and replacement of canopy trees.
- Heavy grazing threatens rare herbs, especially early spring ephemerals.
- Intense herbivory can produce alternate state communities and alter succession.

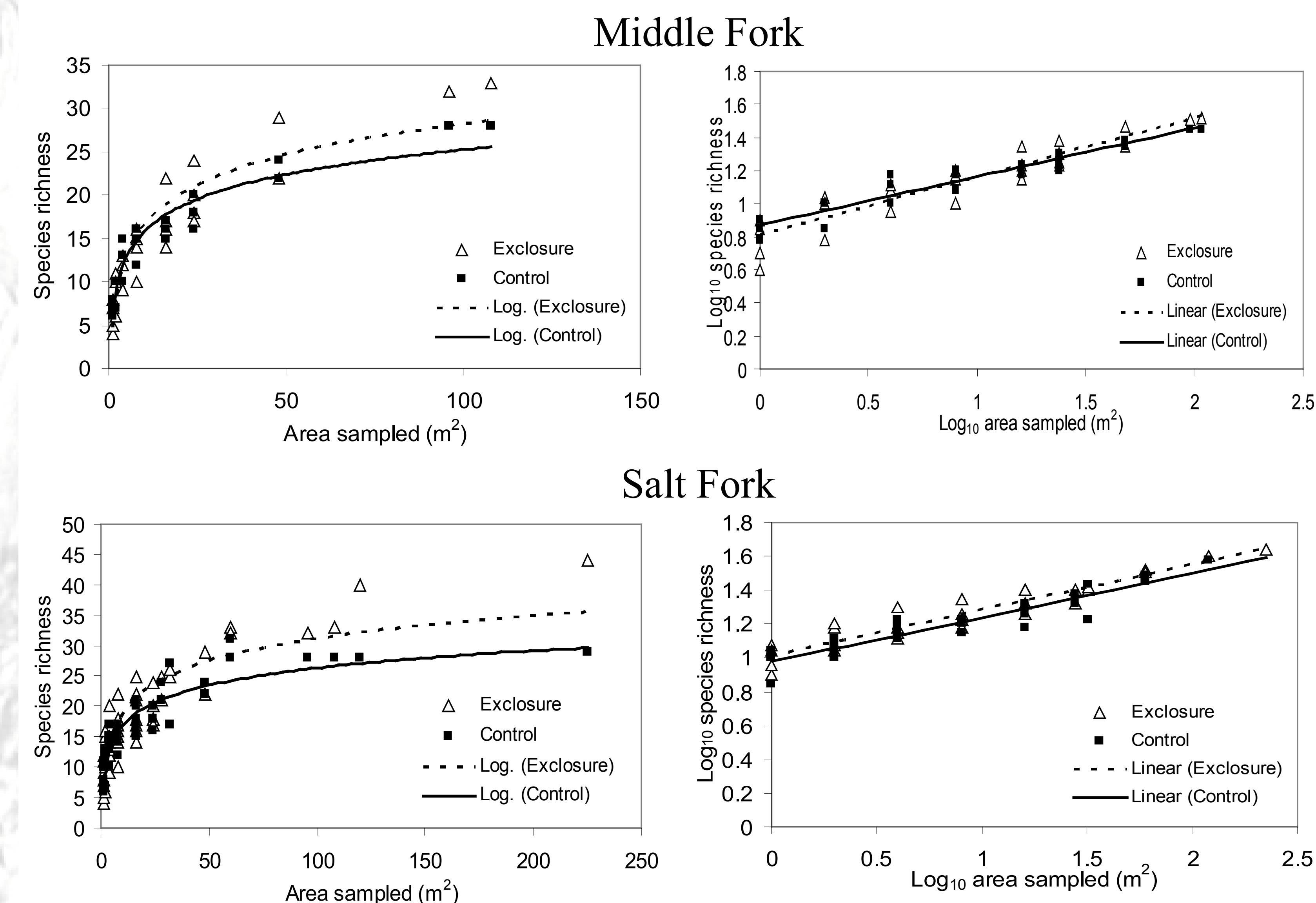
Goals

- Determine if deer herbivory in Illinois is reducing floristic heterogeneity (species turnover) and species richness.
- Identify species threatened by herbivory.
- Predict future changes in Illinois forest communities.

Methods

- Conducted a two part vegetation survey inside established deer exclosures and adjacent control plots of identical size at Middle Fork and Salt Fork County Forest Preserves, Champaign County.
- A four-way nested presence/absence sampling regime was used to generate species-area curves for control and exclosure plots.
- Cover of all species was recorded for five subplots of one square meter within both exclosures and controls.
- Floristic heterogeneity was compared using coefficients of species accumulation (log-log regression slopes), which represent the number of new species added per unit area.

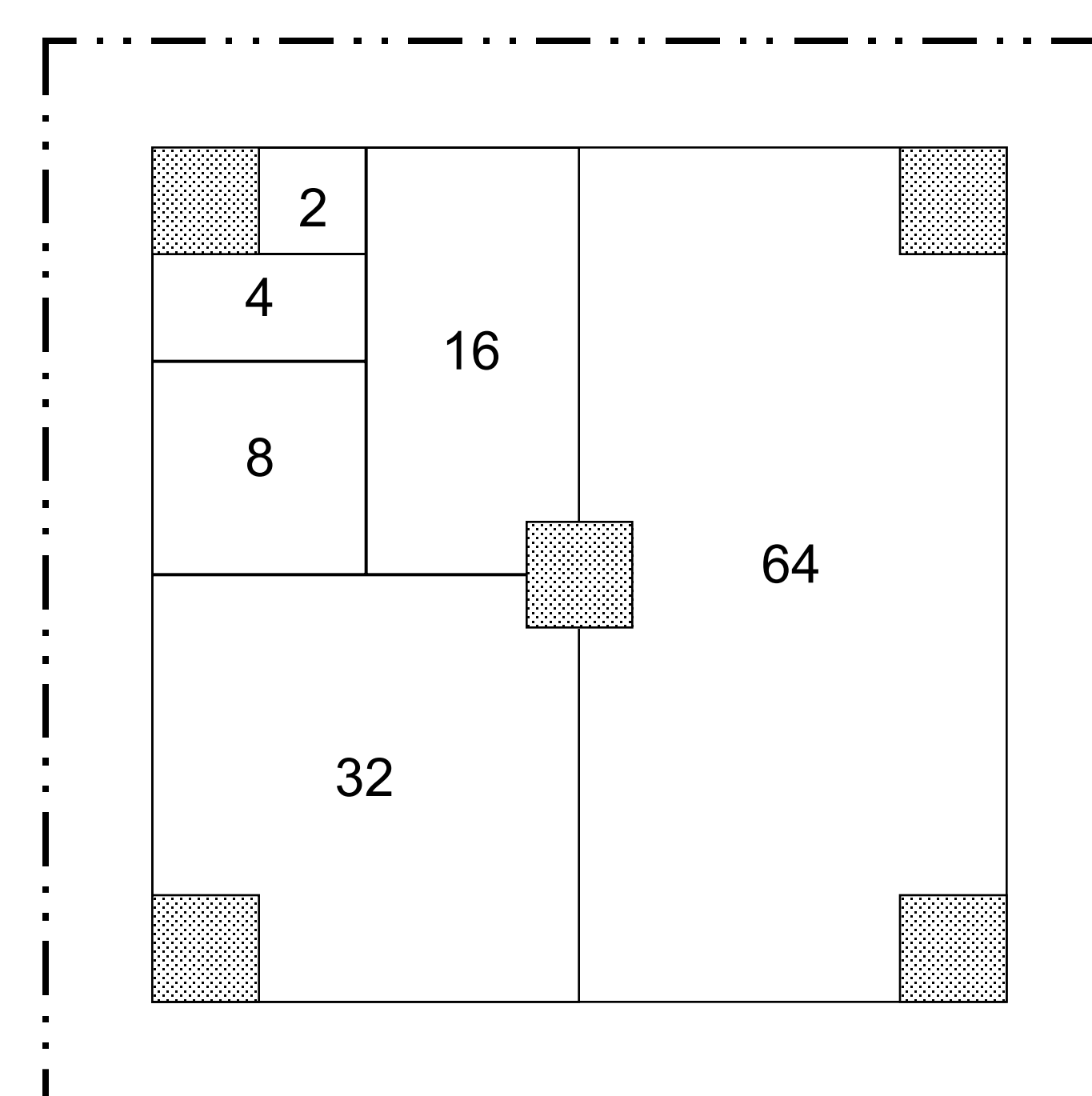
Species-area curves and log-log species-area curves for deer exclosures and control plots at Middle Fork and Salt Fork County Forest Preserves.



Species richness and coefficients of species accumulation for Middle Fork and Salt Fork Preserves.

Site	Plot	Total richness	Coefficient of species accumulation (β)
Middle Fork	exclosure	33	0.354 ^a
	control	28	0.293 ^a
Salt Fork	exclosure	44	0.269
	control	39	0.262

^a. Coefficients of accumulation are significantly different (t-test, $P < 0.05$).



Schematic of nested sampling regime for a 128 m² plot. Shaded areas represent cover sampling subplots. The 32 m² sampling regime is repeated once for each corner, and species lists are added to determine richness of larger plots. Dashed lines represent exclosure fencing.

Results

- Total richness was higher in exclosure plots.
- Coefficients of accumulation for species-area relationships were significantly higher within exclosures than controls at Middle Fork, but not at Salt Fork.
- Woody cover was lower in controls at both sites, but the differences was not significant.
- Enchanter's nightshade (*Circaea lutetiana*) and oak (*Quercus* spp.) seedlings were observed within both exclosures, but were not found in either control plot.

Conclusions

- Lower richness in both control plots and reduced species accumulation in Middle Fork control suggest deer herbivory at its current level can reduce floristic heterogeneity by eliminating rare or vulnerable species.
- No significant change in coefficients of species accumulation was noted at Salt Fork, suggesting effects of herbivory are dependent on site characteristics.
- Lower woody cover in control plots implies herbivory is affecting survival of woody plants.
- Future studies will compare multiple exclosure sites and include an index of deer herbivory to further clarify roles of site characteristics and changes in intensity.

Examples of plant species which may be adversely affected by deer herbivory include Enchanter's nightshade (*Circaea lutetiana*) and Oak (*Quercus* spp.) seedlings. These species were present in both exclosures and absent from both controls. Twayblade orchid (*Liparis lilifolia*), an uncommon species, was observed in Salt Fork exclosure only.