Exploring the potential for native shrub assemblage restoration in northeastern forests with high whitetail deer and invasive shrub densities

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Introduction

Two concurrent major environmental stressors on native plant vegetation in forests include overabundant deer populations that contribute to overbrowsing and the rapid spread of invasive plants. Novel restoration techniques to support floral biodiversity in northeastern forests are needed given the severity of degradation these two stressors induce. We experimentally tested the hypothesis of associational resistance and if key native shrubs can withstand deer overbrowsing and invasive species by assessing survivorship of *Asimina triloba, Staphylea trifolia, Amelanchier canadensis, and Lindera benzoin*) along gradients of 1) invasive species cover and 2) deer density.

Methods

- Twenty experimental plots and four fenced deer exclusion plots
- Seven *S. trifolia,* seven *L. benzoin*, five *A. canadensis*, and three *A. triloba* planted at each plot
- Environmental sensors (HOBO Pendant) measured light and temperature
- Three 1 m^2 plant surveys were conducted in each plot
- Deer cameras set up at twenty experimental plots to track fauna presence

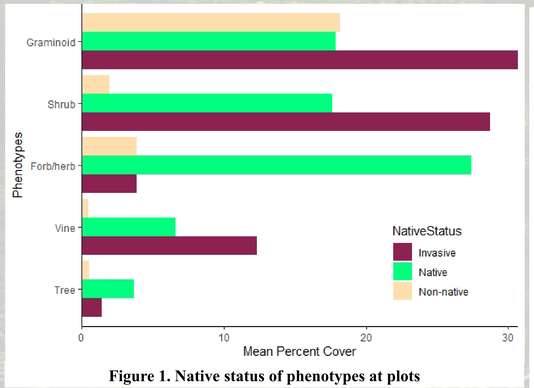

Figure 1. Native status of phenotypes at plots

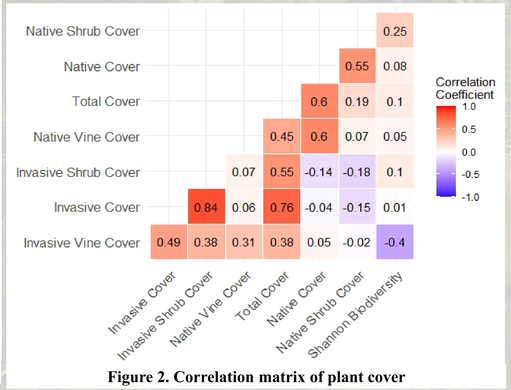

Figure 2. Correlation matrix of plant cover

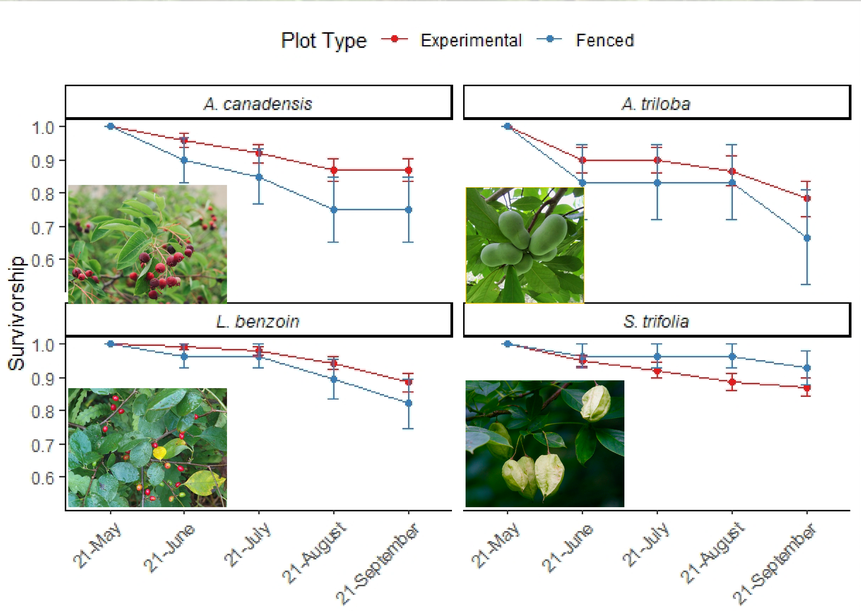

Figure 3. Survivorship of focal plant species

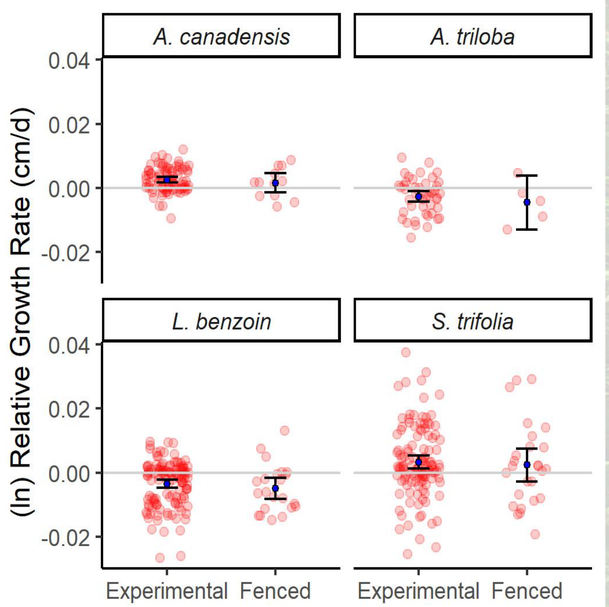

Figure 4. Relative growth rate of focal plant species

Discussion

Survivorship

Binomial generalized linear model and a linear mixed effect models suggested moderate evidence that:

1) light was negatively associated with the survivorship of *S. trifolia*;
2) fence plots were negatively associated the survivorship of *A. canadensis;*
3) native cover was positively associated with survivorship of *A. triloba*;
4) Shannon biodiversity was positively associated with survivorship of *L. benzoin*.

Results indicate that survivorship of all four focal plant species do not exhibit associational resistance. *A. canadensis, A. triloba,* and *L. benzoin* survived better outside of deer exclusions. *S. trifolia* exhibited higher survival rates inside deer exclusion plots, but overall survivorship is very high.

Discussion

Relative Growth Rate - Height

Binomial generalized linear model and a linear mixed effect models suggested:

1) weak evidence that native cover was negatively associated with the survivorship of *S. trifolia*;
2) moderate evidence that light was positively associated the survivorship of *A. canadensis;*
3) moderate evidence that fence plots were positively associated with survivorship of *A. triloba.*

Results indicate that relative growth rate of all four focal plant species do not exhibit associational resistance. *A. triloba, L. benzoin, and S. trifolia* had better growth inside of deer exclusions.

Conclusion

All four focal plant species may be good for ecological restoration techniques in forests heavily populated with deer and invasive plant species. These species could be used to restore understory native plant communities, sustain forest biodiversity, and enhance ecosystem function in northeastern U.S. forests.