Native tree seedling germination, growth, and survival in forests invaded by *Berberis thunbergii*

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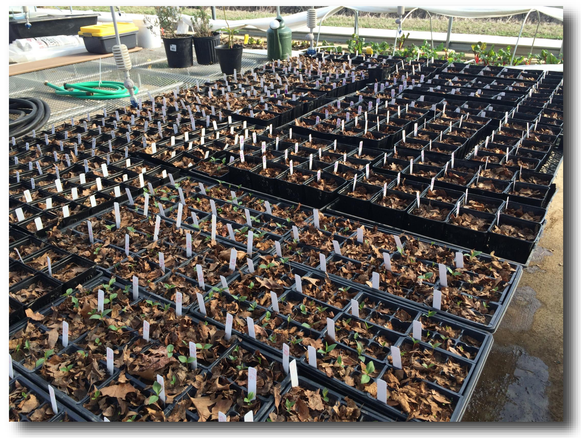
Introduction

Invasive plants negatively impact native species through various mechanisms, including competition for various resources, allelopathy, and ecosystem engineering (DeGasperis and Motzkin 2007). Many invasive plants alter soil conditions, which may decrease growth, survivorship, or germination of native plants (Ehrenfeld et al. 2001). *Berberis thunbergii*, commonly known as Japanese barberry, aggressively invades eastern deciduous forest understories and often alters the structure of native plant communities as a result. Previous research conducted in western Pennsylvania demonstrated that plots containing *B. thunbergii* harbor substantially depressed densities of native species. Additionally, there were noticeably lower soil pH levels (Silander and Klepeis 1999).

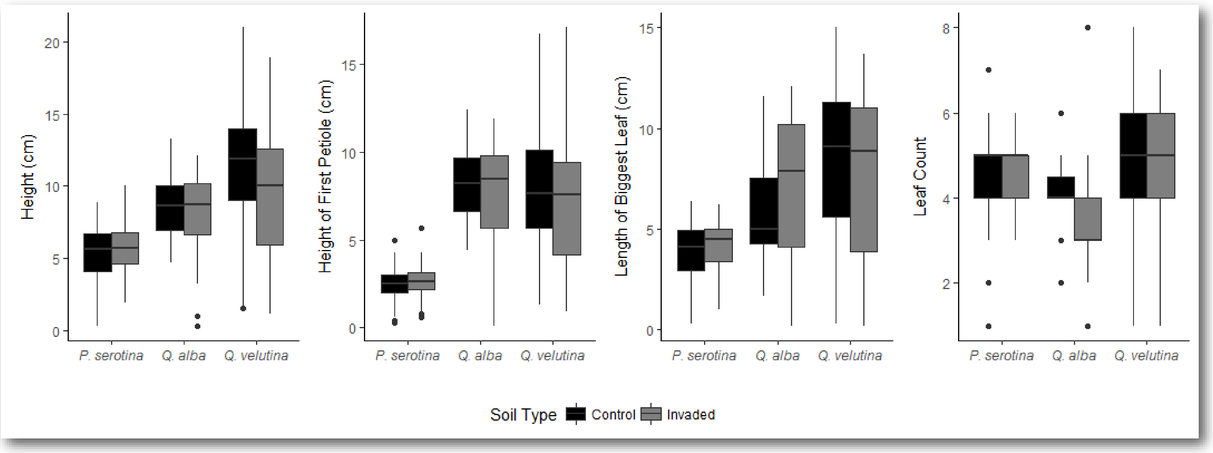
Methods

To test if soil negatively affected native seedlings, soil cores were extracted from invaded and control plots. Native seeds of *Quercus alba* (n=251), *Quercus velutina* (n=202) and *Prunus serotina* (n=603) were grown on the two different soils to test for possible effects on seedling success and growth in a greenhouse setting. Plant survivorship, height, height from the base to the first leaf, total leaf count, and longest leaf length were compared.



Statistical Analysis

Q. alba's success rate was 23%, *Q. velutina*'s success rate was 96%, and *P. serotina*'s success rate was 59%. This was expected because of the time allowed for certain species to germinate between plantings. Factorial ANOVAs were used to compare the different variables measured. Plant height and leaf count were significant when considering both soil and species type as interaction terms. A Post-hoc Tukey (HSD) of both models only identified reduced leaf count of *Q. velutina* that was grown on barberry-invaded soils. All other terms were insignificant.



Implications

Once the weather is suitable, these juvenile plants will be introduced to three different 2.5m^2 plots: control, invaded and invaded-removed. Removal consisted of cutting *B. thunbergii* at the base of its crown and heat-treatment via propane torch (Ward et al. 2013), see Figure 1. This additional field experiment will provide further information on how juvenile native plants respond when introduced to intact plots of *B. thunbergii* or plots removed of this invasive through common management practices.

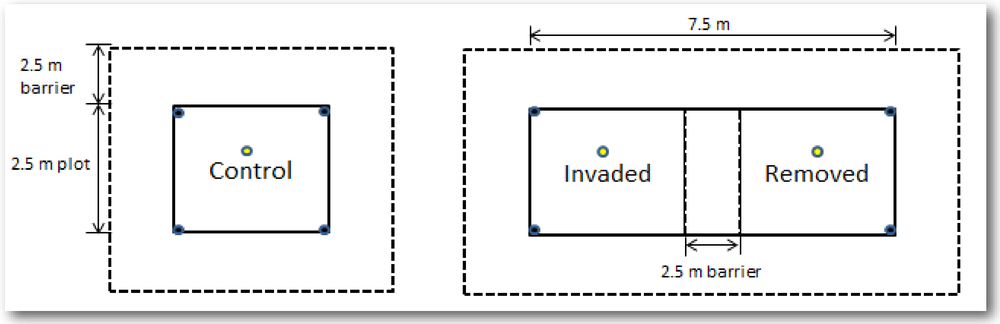


***Figure 1**: Each plot type is 2.5 m^2, with a 2.5 m barrier cleared of barberry to limit barberry effects. A fence was used to limit herbivory.*

Discussion

Based on our findings to date, it appears that barberry infestation does not alter soil chemistry or microbial communities in such a way that reduces seedling recruitment. In the summer, in situ field survivorship and growth of these subjects will be conducted to see if field observations are consistent with those in the greenhouse. Light, temperature, and soil conditions of the different plots will be collected throughout the summer. Since *B. thunbergii* tends to grow dense, we think that light may be the factor that limits seedling success.

References

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