

# Suppression of Tree Recruitment in Deciduous Forests by an Invasive Shrub, *Berberis thunbergii*

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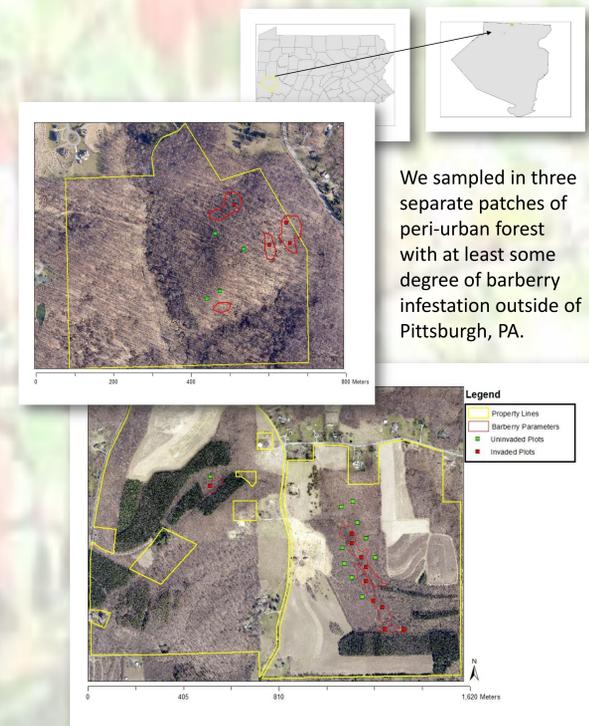
\*Authors contributed equally

## Introduction

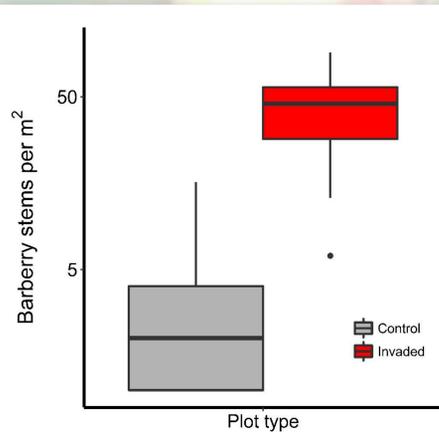
Invasive plant species dramatically affect native species and ecosystems. *Berberis thunbergii* (Japanese Barberry), an invasive shrub in the United States, is rapidly spreading through deciduous forests. Initially brought to the United States as a landscaping ornamental, *B. thunbergii* escaped cultivation and has overtaken many forest understories in the northeast, particularly in forest patches near urban areas. Relatively little attention has been paid to the ecological effects of this invasion. *B. thunbergii* may compete for resources with native plants and may also induce an allelopathic effect. The aim was to test the effect *B. thunbergii* has on tree sapling recruitment in forest environments, and if it is in turn detrimental to future forest ecosystems. We hypothesized that *B. thunbergii* would suppress saplings from germination/maturation and potentially affecting the health of future forests.

## Methods

We sampled tree recruitment in randomly selected, 4 m<sup>2</sup> quadrants in patches of forest that were heavily infested by *B. thunbergii* and in control plots of periurban forest near Pittsburgh, Pennsylvania. *Acer*, *Quercus*, and Lauraceae were counted and measured for height in each plot. *B. thunbergii* was also counted and measured for diameter. First and second year *Allaria* stems were also counted.



We sampled in three separate patches of peri-urban forest with at least some degree of barberry infestation outside of Pittsburgh, PA.

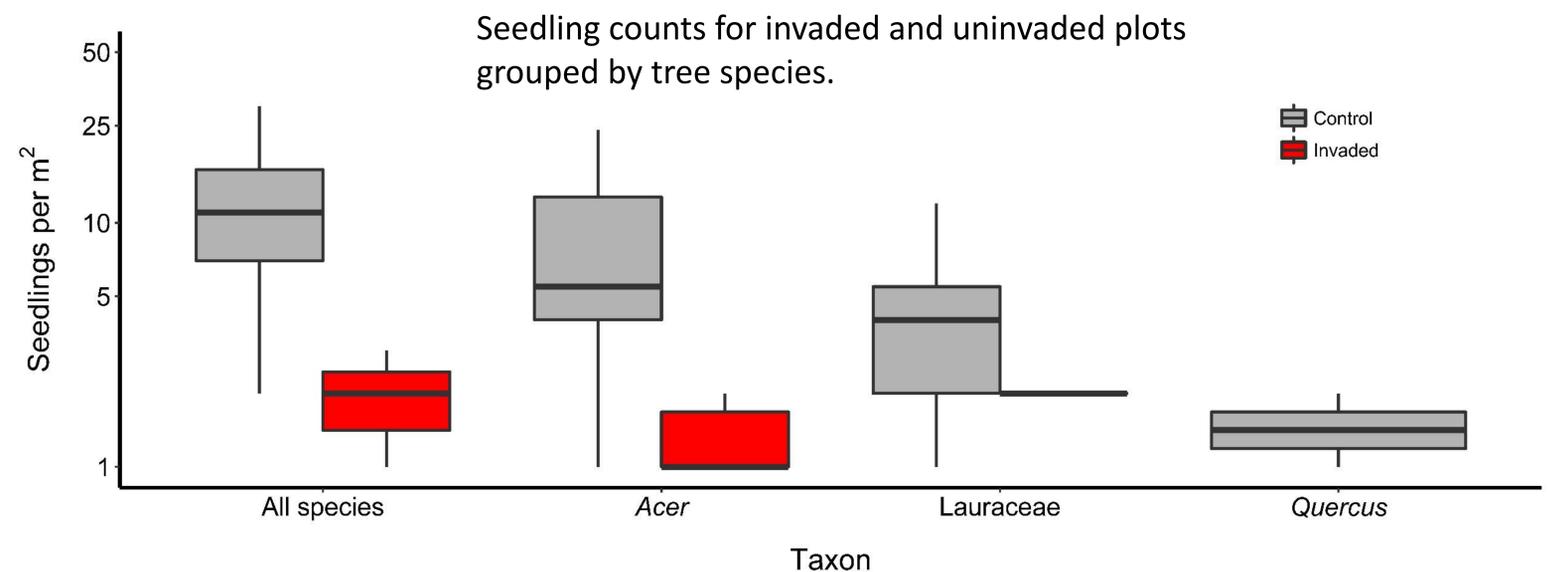
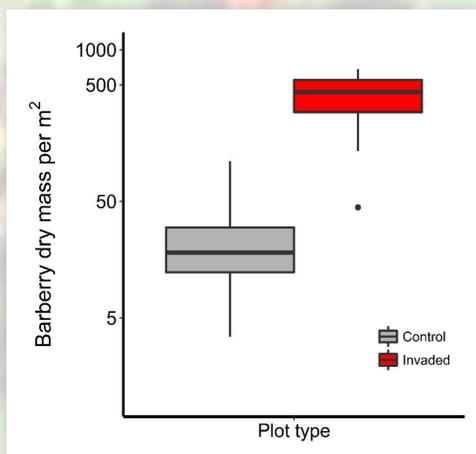


The number of barberry stems in invaded and uninvaded plots is shown here. Control sites did feature some barberry stems, though nearly an order of magnitude fewer.

The photo above shows a plot of forest invaded by barberry, while the lower photo represents a nearby control plot within the same forest.



Barberry dry mass per square meter in invaded plots reaches as high as half a kilogram. Over 2,000 barberry stems were measured to document infestation intensity.



## Discussion

*B. thunbergii* appears to be suppressing tree recruitment, with substantially lower densities of seedlings in invaded areas. Almost zero tree sapling recruitment was observed in invaded plots for all species sampled, including *Acer rubrum*, *Acer platinoides*, *Quercus spp.*, *Sassafras albidum*, and *Lindera benzoin*. *Alliaria* (garlic mustard), another common invasive species with allelopathic effects, was also surveyed to determine if co-occurrence of the two invaders was inducing effect, but we detected no such interacting relationships. Future ecological inquiries on *B. thunbergii* effects should determine what the causal mechanisms of failed recruitment are, including detrimental impacts on other populations of other organisms in the forest.

## Implications

Due to the obvious and detrimental effects of *B. thunbergii*, treatment methods should be considered in infested forests. Ward et. al., 2009 suggest a two-tiered treatment that includes a heat treatment followed by a fire later in the season or the addition of herbicides. Two treatments was the most effective of routes studied.

Ward, J. S., Worthley, T. E., & Williams, S. C. (2009). Controlling Japanese barberry (*Berberis thunbergii* DC) in southern New England, USA. *Forest ecology and management*, 257(2), 561-566.

## Funding sources

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