The effect of *Microstegium vimineum* and deer on non-native woody plants Mitchell J. Vaughn, Ryan L. Goolic, and Janet A. Morrison Department of Biology, The College of New Jersey, Ewing, New Jersey

Abstract:

Suburban forest plant communities are under pressure from intensive deer herbivory as well as invasive species. The differential impact these pressures have on species in the herb and shrub layers can structure forest communities. The passenger model of invasion suggests that deer preferentially eat native species over non-native species, facilitating the success of nonnatives. We are conducting a factorial field experiment with/without deer exclosures and with/without adding *Microstegium vimineum* (Japanese stilt-grass) to many 4 x 4 m plots in three suburban New Jersey forests with different ambient deer pressure. The percent cover of every plant species has been measured semi-annually since before treatments were applied (seed addition in November 2012, fences in March 2013), to follow invasion success and effects on plant assemblages. Here, we focused on the resident non-native plants, which are nearly all woody. Addition of *M. vimineum* had no effect on non-native woody plants, in any forest. In contrast, deer exclosures were strongly protective, but only in the forest with lower ambient deer pressure. That forest (Herronton) started out with appreciable non-native woody cover (about 10%); in fenced plots it remained stable, but it declined in unfenced plots, to 4.5% on average. We surveyed woody plants for deer browse and found that only 8.7% of natives were browsed, while 14.1% of non-natives were, with Rosa multiflora the highest (25.6%). These results question the idea that deer generally prefer native plants. It may be that frequency-dependent diet choices by deer lead to browsing on non-natives when they are relatively abundant.

Introduction:

Suburban forest communities are under constant stress from the invasion of non-native species, high deer pressure, and other anthropogenic factors. The effects of invasive plant species on plant communities and how they invade have been of interest for ecologists and conservationists. Invasive plant species may be able to utilize a wide range of environmental conditions, grow earlier or faster than native plants, and compete strongly against other species.

White-tailed deer are overabundant generalist herbivores that may avoid eating unpalatable invasive plants. The success of non-native plants may be facilitated by escape not only from specialist enemies, but also from generalist herbivores like deer that prefer more familiar, native species. Deer herbivory and the interactions of multiple invasive species are complex, yet may be the major forces shaping the forest understory.

We studied how the exclusion of deer pressure and the addition of the invasive, non-native plant Japanese stiltgrass (*Microstegium vimineum*) influence the success of non-native woody plants in central New Jersey forests. We conducted our study in three deciduous forest stands situated in a human-dominated landscape, but which varied in ambient deer pressure. Percent cover of all plants in the herb layer and percent browse by deer were measured to determine the joint effects of plant invasion and deer.

Methods:

- 40 4 x 4 m plots established in 3 forests with deer densities in a region with ~20 deer / km²
- Plots treated with *Microstegium vimineum* addition, a fenced deer exclosure, or both
- Measured percent cover of all present species in the herb layer in early fall, in each plot :
 - estimated by 10% intervals in 16 0.25 m² subplots
 - converted to interval mid points and averaged across subplots
- Checked for deer browse in 0.5m wide transect along the lower and right side of each plot :
 - counted shredded twig tips typical of deer herbivory as browse
 - a single sign of browse counted, regardless of plant size







addition

Discussion:

Non-native woody plants have yet to experience any significant effects from the 2012 addition of *Microstegium vimineum*. In the forests with higher deer pressure, this could be because woody plant density was so low to begin with that there were too few plants to allow a strong response to be detected. It also is possible that *M. vimineum* simply lacks a competitive advantage against established non-native woody plants, even though it is considered an aggressive invader. It has not been long since treatment addition, so it could take several more years before effects from *M. vimineum* become important.

In contrast to the *M. vimineum* addition treatment, non-native woody plants were more abundant in deer exclosures, while there was no significant difference between the plots prior to treatment. This only occurred in the one forest that started with abundant non-native woody cover (Herronton). This suggests that deer consume non-native woody plants when they are more abundant. There was a lack of recovery for native woody plants in the exclosed plots. This is in opposition to the idea that non-native success is due to preferential consumption of native plants from deer. The non-native species Rosa multiflora was the second most common plant recorded in our deer browse samples, and had the highest percent of plants browsed (except for one other that only had a sample of five plants), even though it is non-native and well-defended with thorns. These findings suggest that abundance may be a more important determinant for deer food choice than provenance or defenses, and that the success of some non-native woody plants in deer-ridden suburban forests is driven by their own competitive ability rather than avoidance by deer.

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