RESPONSE OF *MICROSTEGIUM VIMEINEUM* AND *LONICERA JAPONICA* TO CONTINUOUS FOREST COVER FORESTRY PRACTICES. Nancy J. Loewenstein, Edward F. Loewenstein, John M. Lhotka and Bradford J. Ostrom. Center for Forest Sustainability, School of Forestry and Wildlife Sciences, Auburn University, AL, 36849. (loewenj@auburn.edu)

**ABSTRACT**

*Microstegium vimineum* (Nepalese browntop) and *Lonicera japonica* (Japanese honeysuckle) are present in the understory of many mesic forests across the Southeast. The impact of these two species on forest regeneration and native plant biodiversity has not been well documented. Even less well known is the response of *Microstegium* and *Lonicera* to moderate increases in light levels, changes in microclimate, and increases in soil disturbance resulting from continuous cover forest management (i.e., uneven-aged management) regimes or minor canopy gaps resulting from natural disturbance and the subsequent impacts on forest regeneration. Our objectives were to examine the changes in biomass, photosynthesis and fecundity of *Microstegium* and *Lonicera* induced by moderate changes in the overstory structure of a riparian hardwood forest and determine the competitive impact of these species on planted *Quercus nigra* (water oak), *Q. pagoda* (cherrybark oak) and *Liriodendron tulipifera* (yellow-poplar) seedlings.

**Methods** - The study was conducted in a forested riparian corridor infested with *Microstegium* and *Lonicera* along Blanton Creek, at the Blanton Creek Wildlife Management Area in Harris County, Georgia. Fifty 0.05 ha (12.62 m radius) plots were established along a mile of the riparian corridor during the winter of 2004 and four cutting regimes were applied randomly across the plots. The treatments were: 1) control - no cutting, 2) light cut - 1/3 of mid-story trees removed, 3) moderate cut - 1/2 of all mid-story trees removed, and 4) heavy cut - all mid-story trees removed. In addition, one half of each plot received an herbicide treatment (3% Roundup Pro).

Mean canopy cover across the treatments, as measured with a vertical densitometer, was 0.91 ± 0.01, 0.88 ± 0.01, 0.86 ± 0.01 and 0.75 ± 0.03 for plots in treatments 1 through 4, respectively. Midday light levels across the 50 plots ranged from 3.1 to 21.1% of full sunlight. Microclimate data (e.g., air temperature, relative humidity, photosynthetically active radiation (PAR), sunfleck duration, and soil moisture and temperature at two depths) was gathered in 12 representative plots across the gradient using HOBO weather stations.

Two 1m² quadrats were established within each of the 50 plots, on the side which did not receive the herbicide treatment, and the percent cover of all species in each quadrat was recorded in April and in September using a short logarithmic cover scale. Also in September, all aboveground vegetation in one randomly placed plot (31.5 cm²) within each of the 1 m² quadrats was clipped and oven-dried for biomass measurements. In October, when the *Microstegium* had just set seed, a second set of plots (31.5 cm²) were clipped from a sample of quadrats across the gradient to obtain information regarding *Microstegium* fecundity. Samples were dried and separated into leaves, stems, and cleistogamous and chasmogamous flowers and/or fruits.

In July and August, measurements to construct photosynthetic light curves were conducted on four plants of each species at each of six plots from across the gradient using a LI-COR LI-6400. Data for light curves were also collected for the *Quercus* and *Liriodendron* seedlings.

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**Results** - Both *Microstegium* and *Lonicera* responded to the relatively minor increases in understory light resulting from the forest structure manipulations in this study. However, *Microstegium* was generally more responsive than *Lonicera*. Total *Microstegium* above-ground biomass was negatively correlated with canopy cover ($r= -0.46, p=0.0001$) and positively correlated with percent light transmittance to the understory ($r=0.39, p=0.0011$). With a decrease in canopy cover from $>90\%$ to between $85-90\%$, the mean above-ground biomass of *Microstegium* plants more than doubled. Additional increases in mean biomass of *Microstegium* plants were not observed until canopy cover fell to less than $76\%$, at which point mean biomass was more than six times higher than in the most shaded plots.

In contrast, total *Lonicera* biomass was not significantly correlated with canopy cover ($r=-0.19, p=0.08$). No increase was observed in mean biomass of *Lonicera* plants until canopy cover fell to $75-85\%$. And with the exception of two or three plots at this level of canopy cover, the range of observed values for *Lonicera* biomass did not differ substantially across the gradient. Given that *Lonicera* is a perennial plant, a larger response to the treatments may be forthcoming this year.

As observed for biomass, *Microstegium* fecundity (total flower number) was negatively correlated with canopy cover ($r=-0.53, p=0.0002$) and positively correlated with percent light transmittance ($r=0.49, p=0.008$). In addition, the proportion of chasmogamous (potentially open-pollinated) flowers tended to increase with a decrease in canopy cover ($r=0.42, p=0.0045$), which could have implications for population genetics. Flowers and fruit were not observed on any of the *Lonicera* plants.

Changes in photosynthetic responses were observed in both species when light transmittance was increased by as little as 2.5 percentage points (i.e., from 4\% to 6.5\% full sun). With an increase in light to just 21\% of full sun, potential maximum photosynthetic rates at least doubled in both species. *Q. pagoda* seedlings had a similar response pattern to the non-native species, but *Q. nigra* and *Liriodendron* seedlings were not as responsive. Changes in light compensation point, instantaneous respiration rate, and amount of light required to attain 90\% leaf saturation in these five species were not as clear cut. These data, in association with the weather station sunfleck data, are currently being analyzed.