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PURDUE EXTENSION
WEED SCIENCE
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An Introduction to *Microstegium vimineum* (Japanese stiltgrass/Nepalese browntop) an Emerging Invasive Grass in the Eastern United States

Background

Microstegium vimineum (Japanese stiltgrass; Nepalese browntop) is an annual grass that was introduced to the southeastern U.S. from Asia in the early 1900s. It was first documented in Tennessee in 1919, and has since invaded most of the Eastern U.S. as far west as Texas (Figure 1). Currently, *Microstegium* is listed as an invasive species in more than 20 states. It can grow in a wide range of habitats, including open ridgetops and grasslands, forest understories, and riparian areas. *Microstegium* often invades along roads, trails, forest edges, streams and areas that have been naturally (e.g., flooding) or unnaturally (e.g., timber harvests) disturbed. Once it invades, it can require years of management to eradicate.

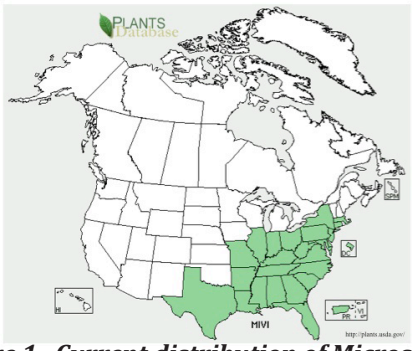

Figure 1. Current distribution of Microstegium vimineum in North America.

Biology and Identification

Unlike other warm season C4 grasses, *Microstegium* is highly shade tolerant and can persist at less than 5% of full sunlight. This is believed to play a role in its success as an invasive in forests, where most native grasses are cool season C3 species. As a warm season grass, *Microstegium* is most productive during the summer months when cool season native species are less active. In Indiana, *Microstegium* germinates in late spring (March-April) and is relatively short (often < 10 in tall) until mid-June. It has a loosely branched habit and produces spreading tillers which intertwine to form dense mats. Culms can grow to more than 6 ft tall, although they often fall flat and develop roots at nodes along the stem. *Microstegium* can be identified by its relatively broad (1/2 in wide x 3-4 in long), bright green leaves that often form a shallow 'v' as they extend from the stem. Leaves have hairs along the mid-rib that form a faint silver line down the mid-section with one side of the leaf often having a larger margin than the other (Figure 2a). Flowers can be self and cross pollinated, and a single tiller can produce between 100 and 1000 seeds (Figure 2b,c). Although *Microstegium* can be confused with native *Leersia* species., *Dicanthelium clandestinum*, *Polygonum* species and other species, it can be distinguished by its growth form: it is most often found in dense patches > 1 m in diameter. In addition, *Microstegium* produces seed in September and October, whereas most native species produce seed much earlier in the year.

Created 3/25/2011
Revised 3/29/2011

An Introduction to *Microstegium* . . .

March 25, 2011

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Effects on the Environment

When *Microstegium* invades it can quickly crowd out native species, resulting in significant reductions in herbaceous species productivity and diversity (Figure 3). Invasions can also alter native plant community composition, change soil nutrient cycling processes, and inhibit tree survival and growth. In addition, *Microstegium* can change soil properties (e.g., nutrients and pH), and reduce light availability. Senesced *Microstegium* decomposes slowly, resulting in a thick layer of thatch that may inhibit native tree and herbaceous species recruitment. In invaded areas native plants are also favorably grazed by white tailed deer and herbivory of native tree seedlings by voles may be substantially greater than in non-invaded areas.

Management

Microstegium is difficult to manage because invaded areas are often very large and the seed can persist in the soil. Although multiple methods may be used to kill *Microstegium*, there are few practical techniques. Recent research has shown that invasions can be successfully removed with hand-weeding, mowing, or selective herbicides but that the recovery of the native community and return of invasions the following season varies greatly among removal methods. Hand-weeding can be effective for small invasions and mowing can help to reduce seed production in flat, easily accessible areas. For large invasions in areas with trees or steep topography, selective herbicides are preferred. Grass-specific herbicides can economically eradicate large invasions, prevent re-invasion the following year, and allow native species to recover (Table 1).

Various online and in-print documents have recommended fire, pre-emergent herbicides, and non-selective herbicides such as glyphosate to remove invasions. However, pre-emergent and non-selective herbicides inhibit native species recovery and too little is known about the interaction between fire and *Microstegium* to determine if fire might be a feasible management tool. Therefore we do not currently recommend these other methods for controlling *Microstegium*.

There are currently no available biocontrol agents for *Microstegium*. However, we have recently documented disease on populations of *Microstegium* in its invasive range, caused by fungi in the genus *Bipolaris* (Figure 4). The disease can significantly reduce *Microstegium* productivity and flowering in the field and greenhouse studies indicate that pathogens can inhibit seed head production by nearly 40%. Because these fungi can infect many native and agricultural grasses, it is highly unlikely that they will ever be successfully

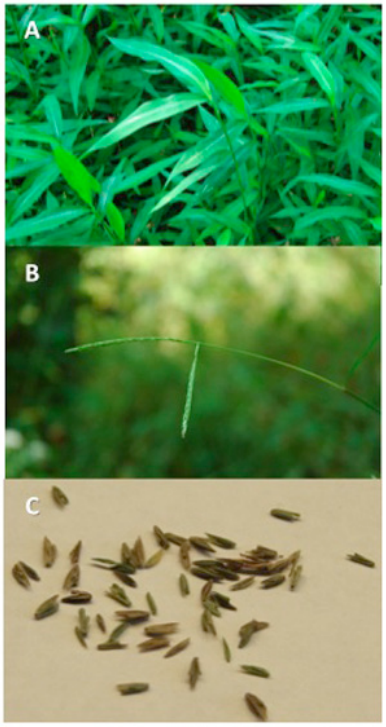

Figure 2A-C. Images of Microstegium vimineum depicting (A) "V" shaped, white colored midvein, (B) seedhead, and (C) mature seeds. Photos by S.L. Flory

Figure 3. When Microstegium invades, it can completely take over the forest floor, forming dense lawns. Photo by S.L. Flory

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marketed for biocontrol of *Microstegium*. The disease is naturally spreading in *Microstegium* populations (including Indiana); thus, allowing the disease to work its natural course may be the best option.

Table 1. Possible control methods to control Microstegium invasions.

Treatment	Tested	Recommended	Notes
Preemergent Herbicide	Yes	No	Prevents growth of *Microstegium* and native plants.
Non-specific Herbicide	Yes	No	Kills *Microstegium* and native plants.
Grass-specific Herbicide	Yes	Yes	Extremely effective. Can prevent recolonization of sites the following year with minimal damage to natives. Grass-specific herbicides are products that contain the active ingredients clethodim, quizalofop P-ethyl, sethoxydim or others. However, grass-specific active ingredients are sometimes packaged with other herbicides. Be sure to read the herbicide label to assure that the product you used is labeled for your specific location and how to use the product properly.
Hand-weeding	Yes	Yes	Practical for small, isolated invasions. Must be repeated multiple times per year.
Mowing	Yes	Yes	Must be timed such that plants are mowed before seed set. Practical for flat areas with few trees.
Controlled Burning	Yes	No	Not yet known how to best time fire to control invasions.
Biocontrol	No	No	Pathogens appear to have large host range and may damage native and agricultural plants.

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