
Microstegium invasion in a forest understory

Invasive grass (*Microstegium vimineum*) increases fire intensity in eastern forests

S. Luke Flory[1], Sarah Emery[2], Keith Clay[1], and Joseph Robb[3]
1. Indiana University; 2. University of Louisville; 3. Big Oaks National Wildlife Refuge


Prescribed fire in *Microstegium*-invaded area

Introduction

➢ Plant invasions can alter fire characteristics such as temperature, flame height, and rate of spread, which may promote invasions and result in a positive feedback between plant invaders and fire.

➢ We are examining the interaction between fire and the invasive annual grass *Microstegium vimineum. Microstegium* invasions produce a widespread and dense fuel layer that may alter fire intensity. Increased fire intensity in invaded areas may cause greater damage to native vegetation, unpredictable fire behavior, and further invasions (Fig 1).

➢ We are conducting prescribed fires and experimental burns to determine how *Microstegium* invasions affect fire behavior, how fire affects invasions, and whether invasions can be managed with fire.

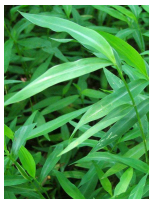
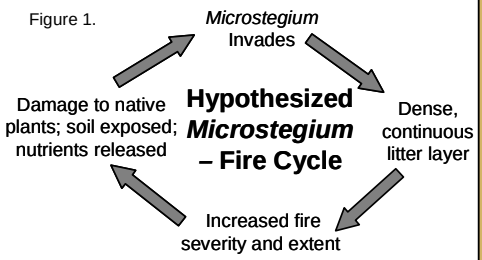

Microstegium vimineum

Figure 1.



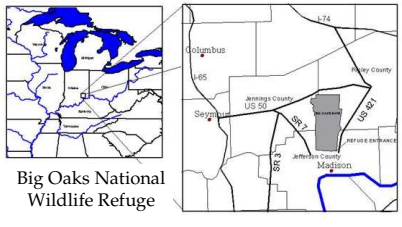
Methods

➢ We are studying differences in fire behavior in invaded and control areas and the dynamics of *Microstegium* and native vegetation in response to fire using prescribed and experimental burns at Big Oaks National Wildlife Refuge (BONWR) in southern Indiana.

Measurements

1. Temperature
2. Flame height
3. Percent area burned
4. Native herbaceous vegetation dynamics
5. *Microstegium* dynamics
6. Experimental tree seedling survival
7. Soil nitrogen cycling


Temperature data logger



Big Oaks National Wildlife Refuge


Flame height indicator

Results


Pre-burn (early spring)


Post-burn


Applying early spring prescribed fire


Post-burn (early summer)


Post-fire invaded area (~95% burned)


Post-fire in control area (~35% burned)

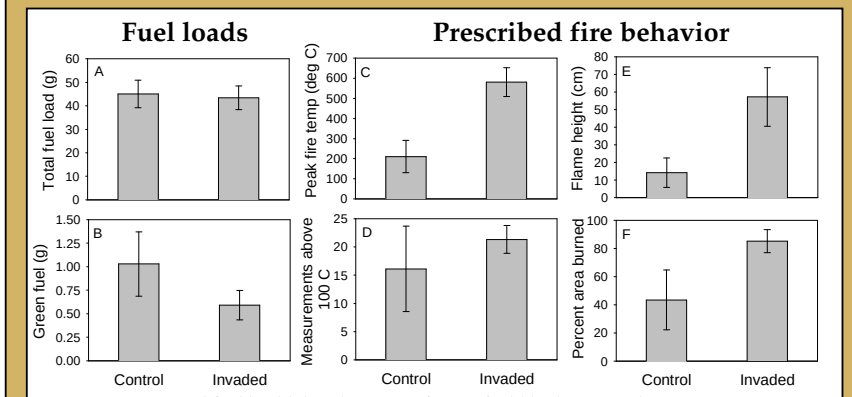


Figure 2. Average total fuel load (A) and amount of green fuel (dry biomass; B) per 25 cm x 25 cm quadrat in control and invaded areas. Prescribed fire peak temperatures (C), number of measurements above 100 °C (D), flame heights (E), and percent area burned (F) in control and invaded areas.

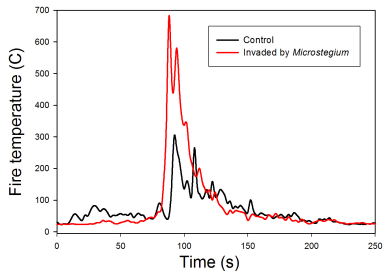


Figure 3. Representative temperature profiles of prescribed fires in a control area and in an area invaded by *Microstegium*.

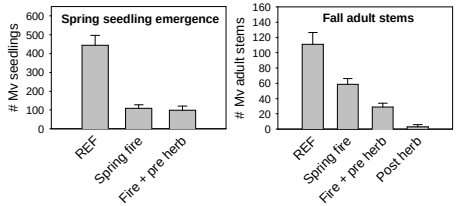


Figure 4. Number of *Microstegium* seedlings emerging in the spring and number of adult stems found in the fall in 25 x 25 cm plots. Plots were untreated (reference), treated with spring prescribed fire, spring fire + pre-emergent herbicide (pendimethalin), or post-emergent herbicide (fluazifop-P-butyl) in the summer.

Summary and future research

➢ Control and invaded areas had similar fuel loads but control areas had more green fuels. Fires in *Microstegium*-invaded areas had higher peak temperatures, higher flame heights, and burned areas more completely. More green fuel in control areas likely reduced fire intensity and spread.

➢ Spring fires reduced seedling emergence by more than 60% compared to referenced plots. Fall adult stem counts were lower with spring fire and even lower with fire plus pre-emergent herbicide. The fewest *Microstegium* stems were found in plots treated with grass-specific, post-emergent herbicide.

➢ These results suggest fire is suppressing *Microstegium*, but removal of litter and release of nutrients may increase colonization and seed production over time. We are currently evaluating the effects of fire on *Microstegium* dynamics, survival of experimental tree seedlings, native herbaceous communities, and soil nutrients in control and invaded areas.

➢ Over the next two years we will conduct spring prescribed fires to determine if invasions alter fire behavior and if fire promotes invasions. Our results will indicate how invasions affect fires and if fire can be used to manage invasions.

Contact:
Luke Flory
sflory@indiana.edu
www.lukeflory.com