Fire and *Microstegium* invasions in eastern forests

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Microstegium invasion in a forest understory


Prescribed fire in *Microstegium*-invaded area

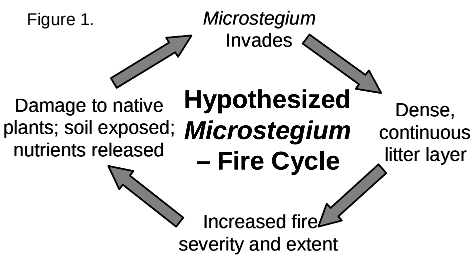
Introduction

➢ 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



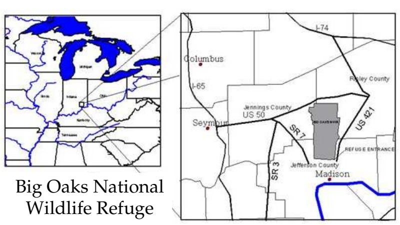
Methods

➢ 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.

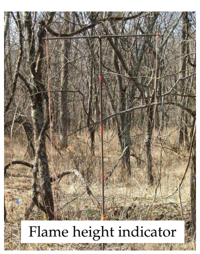
Measurements

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

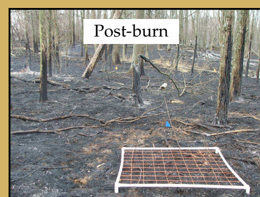


Big Oaks National Wildlife Refuge


Flame height indicator

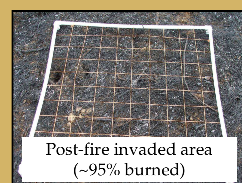
Results


Pre-burn (early spring)


Post-burn


Post-burn (early summer)


Applying early spring prescribed fire


Post-fire invaded area (~95% burned)


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

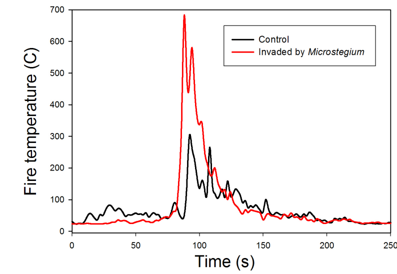


Figure 3. Representative temperature profiles of prescribed fires in a control area and in an area invaded by *Microstegium*.

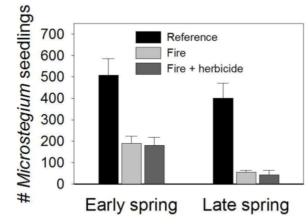


Figure 4. Number of *Microstegium* seedlings emerging in 25 x 25 cm plots that were untreated (reference), treated with prescribed fire, or fire + pre-emergent herbicide (pendimethalin).

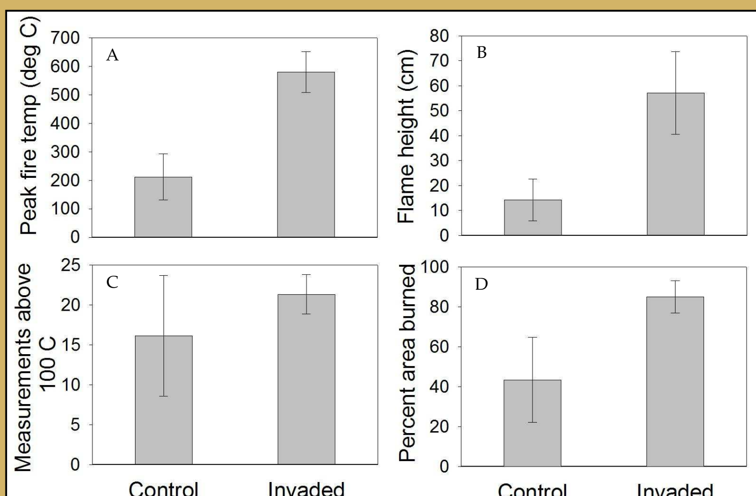


Figure 2. Prescribed fire peak temperatures (A), flame heights (B), number of measurements above 100 °C (C), and percent area burned (D) in control and invaded areas.

Conclusions and future research

➢ Fires in *Microstegium*-invaded areas had higher peak temperatures, higher flame heights, and burned areas more completely. Early and late spring fires each reduced *Microstegium* seedling emergence by more than 60%.

➢ We are currently evaluating the effects of fire on *Microstegium* dynamics, survival of experimental tree seedlings, native herbaceous communities, and soil nutrient availability in invaded and control areas.

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

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