

Fuel Bed Characteristics in Invaded and Uninvaded Forest Stands

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Even in the shade of a mature hardwood forest at Antietam National Battlefield, invasive exotic plants such as garlic mustard and Japanese honeysuckle can be a problem.

We measured how the fuels differ between invaded and nearby uninvaded forest stands.

To managers in the Northeast, the term “invasive” can apply to native as well as exotic species. Native species that are sometimes considered invasive include shrubby cinquefoil (Jacobson et al. 1991), goldenrod, gray dogwood, and even red maple. Our focus is on invasive exotic species such as Japanese barberry, Glossy buckthorn, Oriental bittersweet, Japanese stiltgrass, and Asian honeysuckle, which can form dense populations in forested habitats and are especially troublesome to managers in our area. Included are species native to North America but not endemic to the Northeast. For example, pitch pine is vulnerable to conversion to black locust, a tree native as far north as PA but introduced widely in the Northeast since colonial times.

We are comparing infestations to nearby uninvaded stands because fuel loads, fire return intervals (see Lorimer 2001), understory plant diversity, wildlife habitat, and tree regeneration may be altered when invasive species are especially abundant. We know relatively little about the interactions between fire and some of the most problematic invasive species in the Northeast, but have summarized what is known in Richburg et al. (2001).

At 11 sites in 2001-02 (Table 1) we compared forests with invasive species to nearby or contiguous stands that lack the species in question. We included sites with pitch pine (3), spruce-fir (1), and mixed hardwoods or hardwoods (7). At all

sites, we established five plots in the invaded and five in the uninvaded conditions and sampled downed fuels following a modification of Brown’s (1974) planar intersect method. Variables included fuel depth, fuel load by size class, duff depth, basal area for the stand as a whole, percent cover by vegetation stratum, abundance of all vascular plants by species, woody seedling abundance, soil pH, and litter load.

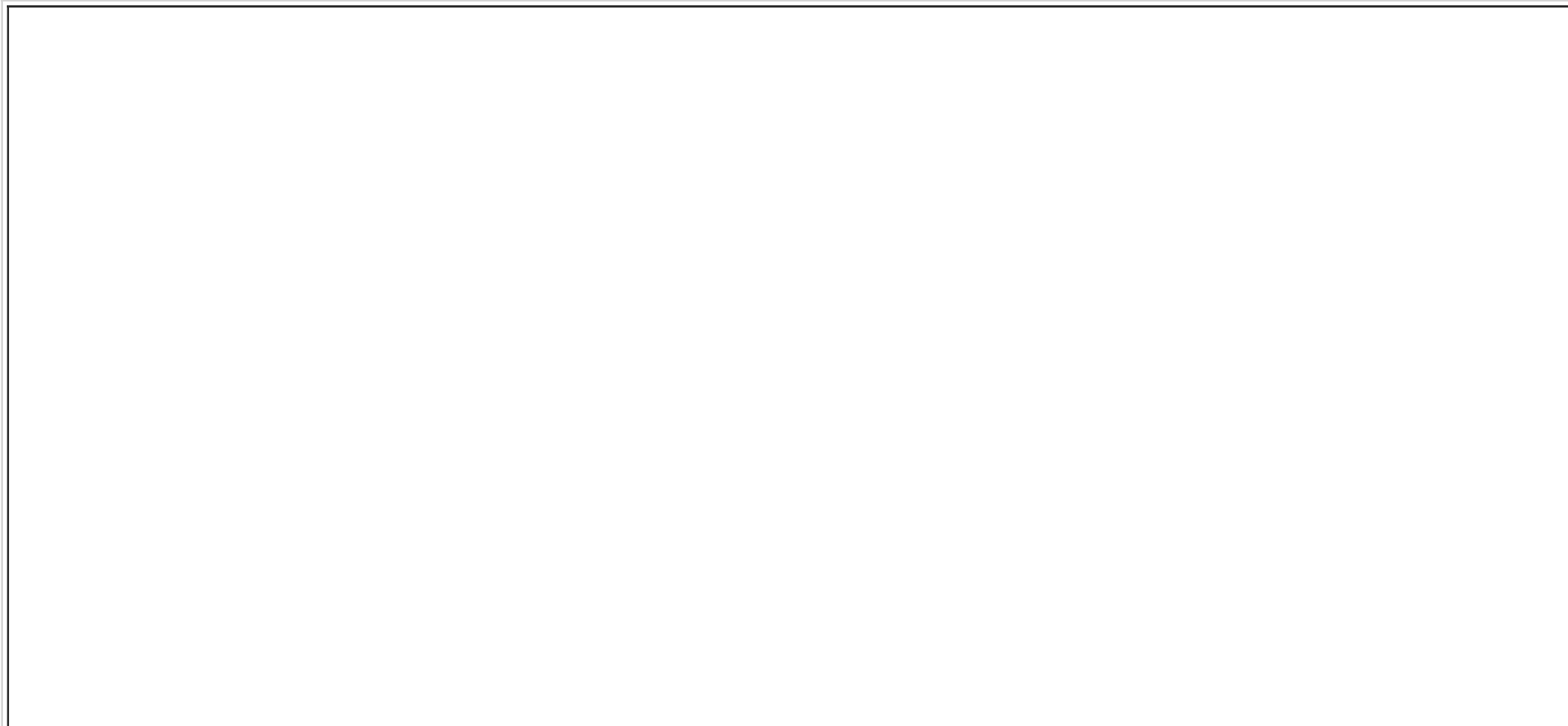
List of study sites studied in 2001-02. * = fire-adapted pitch pine ecosystem

- Acadia National Park, ME (AC)
- Antietam National Battlefield, MD (AN)
- Albany Pine Bush Preserve, NY (AF=Friendly area, AL= Locust and Chubb areas) *
- Cape Cod National Sea Shore, MA (CC) *
- Holbrook Island Sanctuary, ME (HI)
- Manassas National Battlefield, VA (MA)
- Massabesic Experimental Forest, ME (ME)
- Merck Forest and Farmland Center, VT (MK)
- Penobscot Experimental Forest, ME (PE)
- Kittery Division, Rachel Carson National Wildlife Refuge, ME (RC)

We found significantly greater mass of nonwoody litter in three uninvaded pitch pine stands than in the nearby invaded pine sites and in all other forest types combined.

In 8 of the 11 sites, duff depth from 227 Brown planar intercepts on 109 plots was greater in uninvaded forests. This suggests that bare soil in invaded stands might provide a niche for seeds of invasive plants and be less conducive to germination of seeds of native species which often require humus in which to stratify over winter. It will be more difficult to burn invaded habitats where surface fuels are sparse, but response to fire differs by species and it seems likely that application of fire could be effective as a control of invasive plants in some cases.

At 8 of 11 sites, 1-hr fuels were at least slightly more abundant in invaded stands than in uninvaded. This could be due to the increased shrub density in invaded stands as many of these invasives are shrubs. In 10 of the 11 sites, graminoid cover was more abundant in invaded stands, and some of these differences are prominent. The graminoids in the invaded stands tend to be invasive exotic grasses, especially *Poa nemoralis*, *Anthoxanthum odoratum*, and at Acadia National Park, *Festuca filiformis* with these others. At Manassas National Battlefield, an invasion of Japanese stiltgrass was especially troublesome as the thick patches of fine fuels are in interior portions of forest that receive little traffic except deer.





All that lush green grass is an invasive exotic -- Japanese stiltgrass (*Microstegium vimineum*). It is an annual grass that spreads quickly throughout the understory of hardwood forests in Maryland and elsewhere in the northeastern U.S. The native understory that is replaced by this grass does not have the same fuel characteristics.

To summarize, we find distinct differences in the fuels of invaded versus uninvaded forest conditions, but it is difficult to generalize across sites. Pitch pine stands invaded by black locust are vulnerable to loss of the fire-adapted plant community, and litter and duff layers are greatly reduced under locust. Stands invaded by grasses have continuity of fine fuels that suggest these stands might burn more frequently, as fine fuel recovery is quicker following a fire. Where invasive exotic shrubs dominate, there are generally more 1-hr fuels, less litter and duff, more bare ground, and abundant seedlings of some invasive species (e.g., one square meter can have up to 137 smooth buckthorn seedlings, or 343 Norway maple seedlings). These results suggest that the invasive species are likely to persist and that fire regimes may be permanent without intervention. Whether treatments should include fire, herbicide, or cutting depends on, among other things, vegetation type, invasive plant of interest, management goals, proximity to a water body, recreational use by the public, and presence of rare plants and animals. If burning is considered, fuels may require pretreatment to increase the flammability of some invaded stands.

References

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