

PRESCRIBED FIRE AND HERBICIDE MODIFY SOIL PROCESSES DURING BARRENS ECOSYSTEM RESTORATION

By

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Abstract. Prescribed fire has become a common tool of natural area managers for removal of invasive species and maintenance of barrens grassland communities. Certain target species however, resist fire and may require additional removal treatments. We studied changes in soil N and C dynamics following prescribed fire and herbicide application in a remnant barrens in west-central Kentucky. The effects of a single spring burn, post-emergence herbicide, the treatments in combination, and an unburned, no-herbicide control were compared in a 2 way factorial design with 5 replicates. Fescue cover decreased and bare soil increased from near 88 and 2% in control plots to 12 and 28% in + Fire + Herbicide plots. The month after burning, soil N movement measured with *in situ* exchange resins was 1.4-fold higher in burned soils. Fire caused a decline in soil CO₂ flux correspondent with decreased soil moisture. Herbicide alone converted the community from a cool-season grass to a warm-season grass dominated system. The treatment generated a small increase in plant available N, but had no effect on soil respiration, moisture or temperature. In combination fire and herbicide significantly increased plant available soil N and certain net N transformation rates; soil respiration declined by 33%. Removal of non-native plants modify the chemical, physical and biologic soil conditions that control availability of plant nutrients and influence plant species performance and community composition.

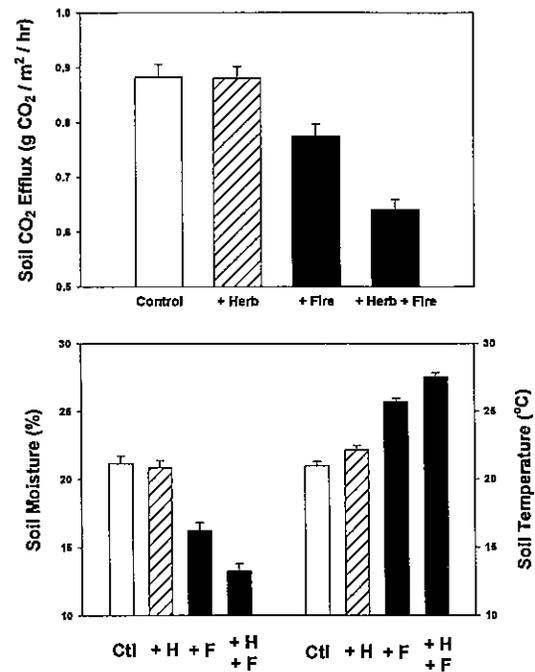
Additional Key Words: Nitrogen mineralization, soil respiration, exotic plant control, *Festuca arundinacea*

Figures 1 & 2

Herbicide alone was as effective in accomplishing the management objectives as Herbicide plus Fire. Herbicide caused no changes in soil N or C dynamics.

Fire alone reduced fescue cover, but had no positive effect on warm season grass cover. Fire produced a short-term change in soil N levels change in soil N, but returned to control levels within one month.

Fire plus herbicide produced additive effects on soil abiotic conditions (soil temperature and moisture), soil N parameters (plant available N and net nitrification) and soil respiration (Figs. 1 & 2).



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