Short- and Long-term Effects of Fire on Vegetation and Biogeochemical Processes in Southeastern Evergreen Shrub Bogs (Pocosins) (Abstract only)

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ABSTRACT

We report the results of studies of changes in vegetation composition, biomass allocation, and biogeochemical processes before and for ten years (1980–1991) following experimental burning and clearing in an evergreen shrub bog (pocosin) ecosystem. Aboveground biomass measured in permanently marked plots was 1249 $g \cdot m^{-2}$ and leaf area index (LAI) was 3.85 $m^2 \cdot m^{-2}$ prior to burning. Local variations in fire intensity (measured by temperature at the peat surface) were correlated with prefire local biomass (r^2=0.31). By the end of the second postfire year, biomass had recovered to 728 $g \cdot m^{-2}$ and LAI was 3.11 $m^2 \cdot m^{-2}$. Clipped but unburned areas had lower biomass (574 $g \cdot m^{-2}$) and LAI (2.38 $m^2 \cdot m^{-2}$) after two years. However, in subsequent years biomass and LAI declined in burned area, whereas these parameters returned to their pretreatment values after four years in the clipped plot. Variation in postfire production among sample plots was not correlated with prefire standing crop in the burned area, however, posttreatment production in clipped plots was highly correlated with their pretreatment standing crop. Fire produced dramatic shifts in species dominance which persisted after ten years, whereas the rank importance of shrub species was affected very little by clipping. The availability of N and P increased significantly in the first postfire year, but was actually diminished in subsequent years compared to unburned areas. Although ash addition contributed to these increases, increased insolational warming of the burned peat was a significant cause of higher mineralization rates in the burned area. Despite initial increases in availability, fire clearly diminishes total nutrient capital in these phosphorus-limited ecosystems. This diminution may have contributed to the decline in production witnessed in the burned area in the third through the tenth postfire year. Patterns of vegetation and ecosystem response documented here are unique compared to other shrublands. These results are discussed in terms of the long-term role of fire in the evolution of these bogs and in their conservation and management.

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