FIRE ECOLOGY OF WOODY PLANT POPULATIONS IN UNGRAZED TALLGRASS PRAIRIE: EFFECTS OF SEASON OF FIRE ON DEMOGRAPHY, ABUNDANCE, AND REGENERATION

Kristy M. Hajny, David Hartnett, Gail Wilson, Ben Vanderweide, and Krysta Hougen
Kansas State University, Division of Biology, Manhattan, KS 66506, USA

ABSTRACT

Reductions in fire frequency and changing land use and management have enabled woody plant species to increase in grasslands worldwide. Nevertheless, fire is seldom eliminated from grasslands and the survival of woody shrubs depends on their fire-resistance traits and their ability to tolerate fire through regeneration from basal and aerial meristems. We assessed how season of fire affected growth, stem densities, and mortality rates of Jersey tea (*Ceanothus herbaceus*) and smooth sumac (*Rhus glabra)*, two common shrubs of North American grasslands, in ungrazed sites. Additionally, we measured relative frequency and cover at various topographical positions on watersheds seasonally burned for 12 y, long-term unburned sites, and sites burned every 4 y. Although, spring, fall, and winter fires resulted in 100% stem mortality, fire stimulated increased basal resprouting, resulting in positive stem population growth rates. By contrast, populations in unburned and summer-burned sites showed lower mortality rates, both basal and aerial resprouting, but lower resprouting rates and lower population growth rates. Stem densities in spring-, fall-, and winter-burned sites increased significantly during the early growing season, but declined thereafter. Unburned areas did not show any change, while summer-burned populations showed continually decreasing stem densities. Therefore, our preliminary data suggest that summer burning may be a more effective management tool in reducing shrub densities and population growth rates in grasslands than spring burning, the most common management practice in the Flint Hills region. However, summer watersheds are only burned every 2 y because of insufficient fuel loads and these data may not show a full oscillation of stem-density dynamics. Genet (clone) populations were characterized by stable densities and low flux, whereas intraclonal ramet (stem) densities showed high turnover rates with fire, suggesting that frequent fire strongly influences the demography but not the genetic structure of clonal shrub populations.

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