

Public Abstract

First Name:Carter

Middle Name:

Last Name:Kinkead

Adviser's First Name:John

Adviser's Last Name:Kabruck

Co-Adviser's First Name:Michael

Co-Adviser's Last Name:Stambaugh

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The legacy of fire suppression in savanna, woodland, and forest ecosystems since the early 20th century has allowed heavy encroachment of fire-intolerant species throughout open-oak communities of Midwestern North America. Shifts in resource gradients and the development of novel environmental-species relationships in many of today's second-growth stands has challenged conventional management techniques for objectives such as regenerating oak and pine, reducing fuel loads, and controlling invasive species. This study evaluates controlled burning and mechanical thinning treatments as methods for achieving these objectives while reversing the departure from natural or historic conditions in fire-suppressed woodland communities. We investigated each of these silvicultural practices, including the combination, for over a decade to address changes in stand structure, species composition, tree growth, and bole damage. We found that overstory stocking was significantly reduced after two prescribed burns and lowest in harvest-burn plots, which also contained the greatest percent coverage of forbs, graminoids, shrubs, and vines. Woodland indicator species responded almost equally to harvest-only and burn-only treatments, while the combination led to significantly greater coverage's than in control. Species diversity, richness, and evenness were also greatest on sites where two prescribed fires were conducted following harvests, although there was no significant difference between other treatments. Fire-induced mortality was significant after two prescribed burns, especially where harvested, but had minimal impact on trees >25 cm. Basal re-sprout in harvested stands was marginally reduced by two prescribed fires, but the density of small diameter stems (<12 cm) was still greater than pre-treatment levels ten years after treatments were initiated. Results suggest that severe canopy disturbances such as mechanical thinning do improve structure and composition that is characteristic of open oak-pine woodlands; however, repeated prescribed fires are essential for sustaining open conditions. Overall, treatments show great potential for restoring stands from fully-stocked conditions and maintaining resemblance of historic woodland communities.