PRELIMINARY EVALUATION OF OPERATIONAL OAK REGENERATION METHODS IN CENTRAL MISSOURI

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ABSTRACT

Oak regeneration on mesic upland sites continues to be a major challenge throughout the hardwood forests of eastern North America. Oak forests across northern and central Missouri have been historically maintained through natural and anthropogenic disturbance regimes. This cycle has been interrupted in many areas through fire suppression, high-grading, and intensive grazing so that more shade-tolerant species are out-competing oak advancement. Resource managers are seeking silvicultural methods that increase or sustain the oak component on these mesic sites. Reducing overstory and midstory densities to increase light, reduce competition, and increase growing space for oaks is one strategy of increasing oak regeneration potential.

Data were collected on permanent plots in three stands each at Daniel Boone, Little Lost Creek, and Reifsnider Conservation Areas (CA) in the St. Louis Region of the Missouri Department of Conservation in 2007. Each stand within a CA was randomly assigned one of three mid- and overstory reduction treatments: leaving 40-percent stocking using herbicide (40H), 60-percent using herbicide (60H), or 60-percent using mechanical methods (60M). One to two acres of each stand were reserved for a control. Removal focused on maple, the most competitive species in the region. Treatments were completed by spring 2008. After allowing a growing season for response, we collected data again in the winter of 2008/2009. Analysis of variance (ANOVA, $\alpha = 0.1$) was used to measure the effects of treatments on canopy cover and density.

Treatment effects were detected for mean canopy cover ($P = 0.010$). Cover was reduced by 12.3 percent in the 40H treatments, 2.3 percent in the 60H treatment, and 7.6 percent in the 60M treatment (Fig. 1). Before treatment, the most abundant overstory species were oaks (64 percent) followed by maples (27 percent). Selective removal of maple increased the oak composition to 86 percent and sharply decreased the composition of maples to 5 percent across all treatments.

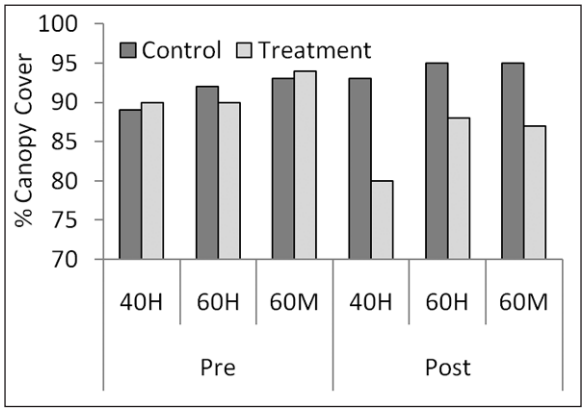

Figure 1.—Estimates of canopy cover before treatment and 1 year after treatment in the St. Louis Region of the Missouri Department of Conservation.

Treatments substantially reduced maple composition and slightly reduced oak species composition in the midstory (Fig. 2), but treatment effects were not significant for oak species composition. Reduction in maple composition was accompanied by an increase in proportion of other species.

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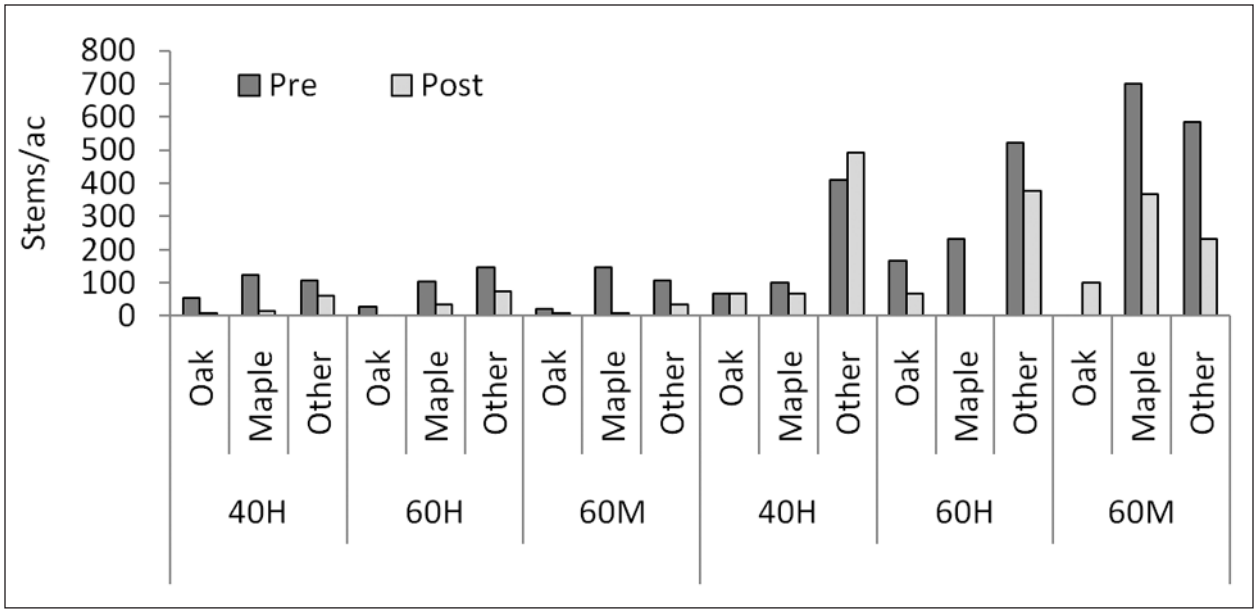

Figure 2.—Density of lower midstory (< 1.5 in. d.b.h. and > 3.3 ft.) and upper midstory (> 1.5 to < 4.5 in. d.b.h.) before treatment and 1 year after treatment in the St. Louis Region of the Missouri Department of Conservation.

Oaks made up a significant proportion (8-31 percent) of the regeneration (< 0.3 feet) prior to treatment (0 to nearly 10,200 trees/acre). Treatments resulted in slight reductions in oak and maple regeneration, but these reductions were not significant. Average seedling height increased after treatment, but the increase in height was greater for maple and other species than for oak.

No significant relationships existed between canopy cover and seedling stem density before treatment. However, a scatter plot shows that canopy cover less than 89 percent was required to consistently achieve a density of > 600 oak stems/ac without falling below that density.

In conclusion, the study demonstrates that although oaks were the dominant overstory species before and after treatments, other species, particularly maples, were the dominant species in the midstory. Because oaks were a minor component in the midstory after treatments, it is likely that removing the overstory trees in the near future will reduce the oaks to a minor component in the new stands. Although the primary competitor (maple) has been dramatically reduced, the proportion of oaks in the regeneration stage is moderate. Oak seedlings are too small to compete with other midstory trees and non-oak regeneration. These results are preliminary, but management techniques may require more aggressive removal of midstory competitors beyond the primary competitor.