

QUERCUS REPRODUCTION RESPONSE TO A MULTIPHASED SHELTERWOOD ON THE DANIEL BOONE NATIONAL FOREST, KENTUCKY, USA

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PURPOSE AND SCOPE

Broadleaved forests of the east-central United States are dominated by the *Quercus-Carya* forest type and can include 8 species of *Quercus* and 6 of *Carya*, as well as over 30 other canopy-dominant species. These forests are characteristically older and closed canopied, with requisite management to maintain *Quercus* in the reproduction cohort. Mesophication, the shift to shady understories and the establishment of species that thrive under these conditions, is a serious threat to recruiting *Quercus* seedlings into competitive positions. Managers of the U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest partnered with Forest Service researchers to study intensive management aimed at creating conditions to recruit *Quercus* and deter *Acer rubrum*, the primary mesophytic competitor (Schweitzer et al. 2020).

METHODS

Stands selected for this study are part of a larger study examining treatments to increase forest resiliency and resistance to spongy moth (*Lymantria dispar*) defoliation (Schweitzer et al. 2014). Our goal was to use even-aged silviculture in a shelterwood regeneration prescription to increase light to advance oak reproduction to stimulate height growth and competitive advantage once released. Six shelterwood and six control stands, all dominated by *Quercus-Carya*, were used. Two herbicide treatments were implemented over 10 years. The first treatment removed 445 midstory stems/ha (SPH) of 8 different tree species that averaged 7.6 cm in diameter at breast height (d.b.h.) (fig. 1). The second treatment targeted *A. rubrum* stems in the 1.3–30.2 cm d.b.h. size class. Following the second herbicide treatment, a commercial harvest that retained 5.3 m²/ha of basal area was done in the shelterwood treatment.

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Figure 1—Oak shelterwood treatment in 2016 after midstory herbicide treatment in 2009; dominant *Quercus* in overstory and *Acer rubrum* in the reproduction layer of the understory (USDA Forest Service photo by Callie Schweitzer).

FINDINGS AND IMPLICATIONS

Reproduction changes were compared over time and to control stands. From 2005 to 2022 the largest *Quercus* seedling size class increased for both treated and control stands, from 49 to 445 SPH for the control and from 198 to 353 SPH for the treated stands. In 2009 and 2016 total *A. rubrum* seedling densities were not different between control and treated stands. However, in 2022 control stands

had a greater density of total *A. rubrum* stems (50,137 SPH) than treated stands (27,058 SPH). Mesophication coupled with changes in disturbance regimes has complicated historical expected responses of *Quercus* to management (Schweitzer et al. 2024). Additional treatments may be warranted to maintain *Quercus*.

LITERATURE CITED

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