

EFFECTS OF MIDSTORY REMOVAL TIMING ON NATURAL OAK REGENERATION IN ARKANSAS, USA

Natalie A. Clay, Mike McGowan, and Kyle Cunningham

PURPOSE AND SCOPE

Oak (*Quercus*) reproduction failure in the Eastern United States is largely attributed to competition from faster growing seedlings that shade out oak seedlings. Thus, there is a need to determine and evaluate effective management strategies that facilitate oak seedling success. Shelterwood regeneration methods promote natural oak regeneration by maintaining an overstory, i.e., shelter, of mature conspecifics while creating a relatively open canopy through an establishment cut of select mature trees. The efficacy of this process can be enhanced through removal of midstory (MR) competitors. However, there are few tests to determine the optimal timing of MR implementation. We tested the hypothesis that 1) MR has an effect on oak regeneration (OR), 2) MR differs in efficacy on north- and south-facing slopes, and 3) MR timing impacts OR.

METHODS AND APPROACH

In 2017, initial abundance of OR was measured from 18 plots on 5 treatment blocks that included both north- and south-facing forests (n = 9 plots on each slope) in Arkansas. Treatments were MR in relation to establishment cut: 1) 2 years before, 2) 1 year before, 3) year of, 4) 1 year after, and 5) control (no MR). Three years after the establishment cut (4 years after initial measurements), OR was measured. Data were analyzed using generalized linear mixed models to test for effects of MR timing, slope direction, and their interaction.

FINDINGS AND IMPLICATIONS

Three years after establishment cuts, black oak (*Q. velutina*) seedlings, including advance regeneration, were most abundant (≥ 2 -fold) on north-facing slopes with MR 1 year before establishment cut compared to all other treatments ($P = 0.005$). This was the only treatment where black oak seedlings increased in abundance. Southern red oaks (*Q. falcata*) were generally more abundant on south-facing slopes, but this was dependent on treatment ($P = 0.03$). Specifically, 3 years after establishment cuts, north-facing slopes with an MR 1 year before the establishment cut was the only treatment where southern red oak seedlings increased in abundance ($P < 0.001$). White oaks (*Q. alba*) were most abundant on plots overall, but did not significantly differ by treatment timing or slope direction ($P \geq 0.132$) although they had marginal increases on south-facing slopes.

Natalie A. Clay, Department of Entomology and Plant Pathology, University of Arkansas, Fayetteville, AR 72701, USA

Mike McGowan, University of Arkansas System Division of Agriculture, Batesville, AR 72501, USA

Kyle Cunningham, Arkansas Department of Agriculture, Forestry Division, Little Rock, AR 72205, USA

with MR the year of the establishment cut ($P = 0.072$) and on north-facing slopes with MR 1 year prior to the establishment cut ($P = 0.089$). Northern red oak (*Q. rubra*) seedlings were the least abundant and showed no effect of treatment timing or slope direction.

These results suggest MR can be an effective silviculture tool to help promote OR, and MR was generally most effective when implemented 1 year prior to the establishment cut on north-facing slopes. However, effects differed among oak species and slope direction.