

PRESCRIBED FIRE AND OAK SEEDLING DEVELOPMENT IN AN APPALACHIAN FOREST

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In recent decades considerable research has focused on the use of prescribed fire in oak-dominated forests with the management objective of promoting oak regeneration for future overstory dominance. These studies typically focus on the response of oak seedlings and saplings already in place when experimental prescribed fires are set because it is difficult to time fires to coincide with the production of an acorn mast crop. We examined the development of white oak (*Quercus alba*) and chestnut oak (*Q. prinus*) seedlings growing from seed after a mast crop in 2005. At the time the mast crop occurred, an experiment was already in place with three treatments: Fire-excluded (control), 1x-burn (burned in 2003), and 3x-burn (burned in 2003 and 2004, with an additional fire in 2006 when acorns were on the ground). We tracked seedling survival and growth over two growing seasons, in 2006 and 2007. Litter depth and percentage open sky were significant predictors of oak seedling mortality after the first and second growing seasons. As litter depth increased, so did oak seedling mortality. In contrast, as percent open sky increased, mortality decreased. White oak seedlings growing in low-light conditions (5 to 10 percent canopy openness) had higher mortality rates than did chestnut oak. Higher litter depth associated with fire-excluded and 1x-burn treatment led to greater stem lengths during the first growing season, likely due to excess stem elongation to breach the litter layer for available light. However, relative growth rate of stem length after 2 years revealed that oak seedlings on three-burn treatments far exceeded that of seedlings on fire-excluded treatments. Percent open sky and oak seedling diameter were positively correlated, and basal diameter of oak seedlings on three-burn and one-burn treatments had significantly greater diameters than fire-excluded seedlings after the second growing season. This study reveals the importance of light and litter depth on the early survival and growth of oak seedlings. Newly developing oak seedlings originating from acorns on recently burned sites displayed greater survival and growth rates than seedlings growing under the nearly closed canopy found on fire-excluded sites.
