

SHEDDING LIGHT ON OAK DOMINANCE IN SOUTHERN APPALACHIAN FORESTS UNDER MODERN NITROGEN CONDITIONS

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Historically, oaks have dominated forests in the Eastern United States, but forest composition is shifting with disturbances such as intensive logging, fire exclusion, loss of key species such as the American chestnut (*Castanea dentata*), increases in frugivores, recent pluvials, and chronic nitrogen deposition. Forests increasingly contain red maple (*Acer rubrum*) and yellow-poplar (*Liriodendron tulipifera*), with the latter characterized by rapid growth under high-light conditions. Oaks provide significant ecosystem services, and managers have few tools to promote recovery of oak-dominated forests. Here, we examined how two abiotic factors, light and nitrogen, influence competition between three oak species (white, chestnut, and red [*Quercus alba*, *Q. montana*, and *Q. rubra*]), yellow-poplar and red maple. In a greenhouse, we grew seedlings for 12 weeks along gradients of light and nitrogen, both alone and sharing a pot with two competitors. All oaks were competitive in 10 percent light regardless of their fertilization, but as light increased, white oak and chestnut oak only maintained dominance until 40 percent light when not fertilized. This study shows that oaks are most competitive in dark shade. In moderate shade, white and chestnut oaks can outcompete red maple and yellow-poplar in nitrogen-poor conditions. However, in brighter light, red maple and yellow-poplar outcompete all oaks in both nitrogen scenarios. Our findings may help promote oak recovery with tools such as selective harvest and prescribed fire that create a mosaic of light gaps and shade under modern, high-nitrogen soil conditions.

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