The Influence of Dense Understory Shrubs on the Ecology of Canopy Tree Recruitment in Southern Appalachian Forests

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ABSTRACT

Suppression of canopy tree recruitment beneath rapidly spreading thickets of *Rhododendron maximum* L. (Ericaceae) in southern Appalachian forests is an issue of major concern because of the potential impacts on forest productivity, hydrology and wildlife habitat. Many studies have investigated the causes of seedling inhibition beneath dense shrub understories, but few have uncovered specific mechanisms leading to seedling decline. In this study, I have examined the influence of the evergreen understory (*R. maximum* and *Kalmia latifolia* L.) on tree recruitment processes at multiple stages – seed rain, seed bank, and post-establishment seedling growth and survivorship. Effects of dense shrub cover on seed rain and seed bank density and composition were examined using a paired treatment design in which samples were collected beneath shrub-influenced and open understories. A second experiment investigated the influence of *R. maximum* and *K. latifolia* density on the growth and survivorship of *Quercus* seedlings, resource availability, and the rates / causes of seedling damage. I found that neither seed rain, nor seed bank density or species richness was inhibited by the presence of *R. maximum* or *K. latifolia*. Forest seed banks were dominated by sweet birch (*Betula lenta* L.), and were compositionally disparate from the overstory. Analysis of resource competition between shrubs and seedlings indicated that seedling performance and survivorship was a negative function of *R. maximum* density. Open-canopy light availability, nitrogen content in the organic horizon (litter and humus), and soil nutrient availability were potential resource-related mechanisms. Further, I found that the rates of insect herbivory on *Quercus* seedlings were positively correlated with *R. maximum* density. *Kalmia latifolia* had little influence on resource availability, seedling performance or herbivory rates, and does not appear to have a suppressive effect on tree seedlings. Overall, this research indicates that resource competition is the primary mechanism by which seedling suppression occurs beneath *R. maximum*, and that increased herbivory on seedlings may be an additional mechanism that demands further study.
FOREWORD

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