Predicted Shifts in Tree Species Composition in a Mixed-Hardwood Forest Following a Native Insect Outbreak in the New Jersey Highlands

Abstract:

Oak tree populations in forests of the northeastern United States have been impacted in recent decades by a variety of invasive herbivores and diseases. For example, chestnut oaks (*Quercus montana*) recently experienced substantial mortality in the New Jersey Highlands due to an oak leafroller (*Archips semiferanus*) insect outbreak in 2015-2016. The purpose of this study was to determine whether the tree species composition of the forest canopy is likely to change in one forest stand where substantial tree mortality occurred. Surveys of tree seedlings and saplings were conducted beneath 21 large canopy openings where at least four neighboring chestnut oaks had died in a mixed-hardwood forest at Apshawa Preserve, West Milford, NJ. A model based on the largest saplings beneath each canopy opening was used to predict which tree species will likely replace the dead chestnut oaks. Results revealed that black birch (*Betula lenta*) and red maple (*Acer rubrum*) are likely to replace 30 % and 21 % of the dead chestnut oaks, respectively. Only 17 % of the dead chestnut oaks are likely to be replaced by other chestnut oaks, and only 35 % will likely be replaced by oak trees, in general. Substantial variation in the density of regenerating trees existed among the canopy openings, suggesting spatially complex ecological outcomes. A canopy opening area index was significantly, negatively correlated with juvenile tree density for the four most common tree species, likely due to the intense competition for increased light availability. Overall, this study provides strong evidence that tree species composition at the study site was impacted by the oak leaf roller outbreak. Given that oaks produce acorns that are critical for a wide variety of wildlife and oak leaves are host to a great diversity of insect species, declining oak populations are of particular concern.