SPECIES-SPECIFIC MECHANISMS CONTRIBUTING TO THE MESOPHICATION OF UPLAND OAK STANDS IN THE ABSENCE OF FIRE

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Abstract—Upland oak forests of the Eastern United States are shifting dominance towards shade-tolerant, fire-intolerant species (i.e., mesophytes). This shift is hypothesized to lead to mesophication, a process where mesophytes create cool, moist understories, reducing flammability and promoting their own proliferation at the expense of pyrophytic, shade intolerant oaks. There are few empirical studies identifying mechanisms of mesophication, and these studies have yet to explore potential mesophytes other than red maple *(Acer rubrum*). To address this issue, we sampled four hypothesized mesophytes: red maple, sugar maple (*A saccharum*), pignut hickory (*Carya glabra*), and American beech (*Fagus grandifolia*) and two upland oak species, white oak (*Quercus alba*) and chestnut oak (*Q. montana*) across a gradient of diameter at breast height (dbh) sizes (20–60 cm) in western Kentucky. We quantified canopy, bark, and leaf litter traits that may lead to differences in forest floor flammability among upland oaks and mesophytes. Preliminary results showed that mesophytes had thinner and smoother bark than upland oaks and increased canopy volume to stem volume ratio, which could decrease forest floor flammability. Initial results from a decomposition bag study indicated that maple leaf litter had 37 percent mass loss after 6 months, with 32 percent, 22 percent, and 14 percent mass loss occurring in hickory, oak, and American beech litter, respectively. Delineating potential mechanisms by which mesophytes could alter forest flammability through their bark, canopy, and leaf litter traits is essential for understanding community stability and exploring options to successfully manage for conservation of upland oak forests before restoration is prohibitively expensive.

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