

MESOPHICATION OF OAK LANDSCAPES: MECHANISMS AND MANAGEMENT

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Across the Central and Eastern United States, historically fire-adapted oak savannas and woodlands are shifting to closed-canopied forests with increased dominance of fire-sensitive and/or opportunistic tree species. These changes in forest structure and composition are promoting a positive feedback known as mesophication, whereby encroaching species (i.e., mesophytes) create cool, moist understory conditions with low flammability fuels. Our recent work highlighted how mesophytes contribute to declining flammability of oak landscapes through 1) crown and bark traits that alter precipitation distribution, increase relative humidity, and decrease light availability; 2) leaf litter traits that lower fuel loads and increase fuel moisture; and 3) generalist traits that allow regeneration to persist regardless of fire history. Our research also demonstrated that open-canopied oak landscapes with frequent, low-intensity surface fires promoted a bilayer structure with high plant biodiversity that contains lower stocks of highly vulnerable aboveground carbon pools in live trees, snags, and coarse woody debris. Restoring fire to historically fire-adapted oak landscapes through the application of repeated prescribed fire in combination with silvicultural practices that open the canopy, increase understory light, and promote flammable herbaceous and leaf litter fuels is critical for preserving biodiversity and preventing catastrophic wildfires.

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