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Growth From and Leaf Traits Influence Susceptibility to Drought Across Tree Species

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Growth Form and Leaf Traits Influence Susceptibility to Drought across Tree Species

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Anthropogenic climate change is predicted to make natural disasters such as drought more frequent and extreme. More than just a threat to agriculture, extreme summer drought can cause tree mortality and habitat destruction. Though droughts are predicted to worsen with climate change, there is little synthesis analyzing the relative importance of species traits on drought-induced tree mortality. Like forest fires, floods, and invasive species, drought has the potential to be an agent of long-term forest community change due to differential species mortality. The Forest Dynamics Plot at the Tyson Research Center is a large Ozark oak-hickory forest site in which every stem at least one centimeter in diameter at breast height has been tagged, mapped, measured, and identified. These censuses have been conducted regularly over the last decade, capturing the Midwest's largest drought since the Dust Bowl in 2012. We tested the relative influence of three important traits, habitat preference, growth form (canopy vs. understory trees), and specific leaf area (an important trait linked to photosynthetic capability and water retention in leaves) on the mortality of 24 tree species during this severe drought. We found that understory trees had higher mortality than canopy trees over the time period spanning the drought (2011-2015). Because canopy trees generally have deeper roots than understory trees, this result suggests that root depth mediates the susceptibility of tree species to drought. We also found that trees with greater specific leaf area had higher mortality during the drought, suggesting that water loss associated with greater specific leaf area also mediates the susceptibility of tree species to drought. An understanding of how different traits affect mortality of tree species will advance our understanding of how severe drought might affect forest communities in the Ozark region and across the world.