

ADAPTIVE STRATEGIES OF WHITE OAK (*QUERCUS ALBA*) IN RESPONSE TO CLIMATE CHANGE: INSIGHTS FROM A 40-YEAR STUDY OF GROWTH AND PHENOLOGY

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This comprehensive 40-year study investigated the adaptive capacity of white oak (*Quercus alba*) in a southern Indiana common garden setting. We documented notable variations in growth, survival, and phenological responses among different white oak provenances, emphasizing the crucial role of white oak genetic adaptation to climate in forest management strategies. Our findings suggest that white oak provenance significantly influences characteristics of growth and phenology. In particular, these findings underscore the potential of southern provenances for central hardwood reforestation and the poor competitive ability of northern seed sources in warmer and longer growing seasons. Southern provenances experienced very little mortality while exhibiting superior growth and form. Conversely, northern seed sources widely experienced competition-induced mortality, even after thinning at age 12, with most trees dying or languishing in the understory by age 40. This study also showcases the common garden's high yield and site index, despite overstocking and the presence of low-performing provenances. The remarkable productivity of the plantation underlines the efficacy of plantation forestry for quality timber yield. The comprehensive data from this long-term study provides a robust framework for predicting white oak responses to environmental changes, informing adaptive management practices in forestry.

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