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**PHENOLOGICAL PATTERNS OF MATURE LONGLEAF PINE (*PINUS PALUSTRIS*) TREES
ACROSS AN ENVIRONMENTAL GRADIENT**

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ABSTRACT: Components of tree crowns and their structural arrangement are important variables in forest ecology studies because they relate to tree growth and productivity through their relationship with light interception. Environmental variables are known to influence crown structure, however the way the environment affects shoot and needle phenology, as well as needle demography, of mature longleaf pine trees is not well understood. This study was initiated to evaluate patterns of shoot and needle phenology in a mature longleaf pine forest both within canopies and across a soil moisture gradient. Towers were used to access mature tree canopies for bi-weekly measurement of shoot and needle elongation, as well as needle abscission, over a growing season at two sites representing the extremes of a natural soil moisture gradient. Soil moisture and predawn leaf water potential were also measured at the two sites. Shoot growth patterns were determinant at both sites. Final shoot length, duration of shoot growth and rate of shoot growth were found to be significantly greater at the wet/mesic site than at the xeric site. Needle initiation, start of linear growth, and growth cessation were also significantly earlier at the wet/mesic site. Needle demography patterns were similar at the sites, and early growing season needle demography (June-September) was related to predawn needle water potential. These findings indicate that water availability influences patterns of phenology in mature longleaf pine trees across the soil moisture gradient, thus productivity at these sites may be influenced by differences in resource availability.