Effects of Throughfall and Fertilization Manipulation on Water Use of 8-Year-Old Loblolly Pine

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Abstract: The atmosphere's water holding capacity increases as it warms, potentially leading to higher intensity rainfall events. These events may lead to greater surface-water runoff and reduced soil-water availability that has been shown to decrease stand productivity. However, fertilization has been shown to increase stand productivity and transpiration. The objective of this study is to show the effects of reduced soil-water and fertilization on water use of loblolly pine (*Pinus taeda* L.) at the stand level. The experimental design is a 2x2 factorial combination of throughfall manipulation (30% rainfall exclusion) and fertilization treatments replicated in four blocks in the Piedmont physiographic region near Washington, GA. Thermal dissipation probes were used to calculate sap flux which relates to transpiration. Whole-tree hydraulic conductance was calculated by using a pressure chamber (PMS Instrument Co., Corvallis, OR) to measure leaf level water potential. Fertilization combined with the throughfall reduction decreased stomatal conductance and the rate of stomatal closure by 37% and 44%, respectively. This interaction also reduced transpiration from 18.6 to 13.4 mm per month. This shows a related trend of more conservative water use by loblolly pines in times of water stress. With 2012 and 2013 being abnormally dry and wet years, additional data are needed for more conclusive results.

Keywords: Transpiration, drought, stomatal conductance, thermal dissipation