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Using Tritium as a Tracer to determine differences in Tree Water Uptake within the Soil Profile

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Characterizing the distribution of tree roots with soil depth in forests is important for understanding how plants compete for below ground resources and may have practical applications for stand management. Using tritium as a tracer, we examined whether shade tolerant, late successional laurel oaks (*Quercus laurifolia*) take up water at a different depth in the soil profile than shade intolerant, early successional pines (*Pinus elliottii* and *Pinus taeda*).

This study took place on Coastal Plain soils in the south-eastern United States, where we irrigated a mixed pine-oak forest with tritium-enriched water. Tritium can be considered an ideal tracer of water movement in the soil-plant-atmosphere continuum because it is incorporated in the water molecule and therefore it is non-distinguishable from water. We measured tritium activity in leaf water of trees by bagging branches of leaves followed by liquid scintillation analysis. We related the leaf water tritium activity to the distribution of tritium activity in the soil profile. Laurel oak had a significantly higher tritium activity in leaf water compared to pine, indicating that the early successional, shade-intolerant pine took up water from a deeper part of the soil profile than the late successional, shade tolerant laurel oak.