The root distribution, architecture, transpiration and root sapflow dynamics of mature trembling aspen (*Populus tremuloides*) growing along a hillslope.

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Abstract

The objectives of this study were to explore comparative controls by atmospheric and belowground variables governing transpiration of trembling aspen (*Populus tremuloides*) growing along a water limited hillslope. Vertical and horizontal root distribution, intra- and inter-clonal root connections, soil moisture and transpiration and root water uptake dynamics of several aspen clones growing along a gradient of soil moisture availability were investigated. Fine root surface area was greatest at the lower portion of the hillslope and in the surface soil layers where soil moisture was greatest. Root water uptake capability was positively and strongly correlated with transpiration where trees at lower slope positions transpired twice the water per unit leaf area than trees in upper slope positions. The description of comparative atmospheric and belowground variables on water economy of trees is novel and provides significant insight into growth and water use strategies of trees growing in water limited environments.