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From tree to stand: Scaling relationships of water uptake and climate in a reclaimed boreal mixedwood stand.

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Soil water availability is a key factor in determining tree's transpiration and sap flow rates, and varies with topography and soil depth. Reclaimed landscapes provide us with the unique opportunity to address the effects of those two variables independently on trees' water uptake, and their relationship to climatic variation. We explored the relationship between individual tree water uptake and atmospheric variables for trembling aspen (*Populus tremuloides*) and white spruce (*Picea glauca*), and assessed how this relationship changed across different hillslope positions and rooting space. Growing season (May to September) sap and transpiration fluxes were monitored using heat ratio method sap flow sensors on trembling aspen and white spruce trees in 2014 and 2015 on a reclaimed hillslope in northern Alberta, Canada, with two different soil cover depths providing different rooting spaces. Both species' sap flow rates and transpiration rates were strongly correlated to climatic variables such as vapor pressure deficit, precipitation events, air temperature, with slight differences in the relationship between topographical positions and soil depths. Site-level atmospheric water fluxes were obtained through eddy covariance measurements at the top of the hillslope. This allowed for a direct linkage of individual tree water uptake measurement to water flux measurements taken at the landscape-level. Understanding how distinct rooting and physiological characteristics of tree species and their growing conditions can be extrapolated to different scales, is crucial to our understanding of both atmospheric and edaphic water fluxes.