

# **Tree Water Relations and Hydraulic Architecture: A Crisis in the Science**

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**Abstract.** Current theory describes plant water transport as a cohesion-tension mechanism of sap ascent. Plants transport water from the soil to the atmosphere in a hydraulic continuum. If the atmospheric demand for water becomes too great, or the water supply too limited, plants may experience water stress. One of the possible outcomes of water stress is the cavitation of xylem vessels. Xylem cavitation is the formation of an embolism in a vessel, prohibiting water transport in that vessel resulting in a loss of hydraulic conductivity. If the cohesion-tension theory is an accurate representation of tree water transport, then a positive pressure is required to refill cavitated vessels for the recovery of hydraulic conductance. However, vessels appear to refill on a daily basis despite the lack of evidence identifying positive pressures in the hydraulic conducting system. My research of *Populus* water relations in northwestern Colorado provides an example of this mystery.