# Hydroscapes, hydroscape plasticity, and relationships to plant functional traits and mesophyll photosynthetic sensitivity in Eucalyptus species

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## Abstract

The isohydric-anisohydric continuum describes the relative stringency of stomatal control of leaf water potential ( $\psi_{\lambda\epsilon a\varphi}$) during drought. Hydroscape area ( *HA*) – the water potential landscape over which stomata regulate $\psi_{\lambda\epsilon a\varphi}$ – has emerged as a useful metric of the iso/anisohydric continuum because it is strongly linked to several hydraulic, photosynthetic, and structural traits. Previous research on *HA* focused on broad ecological patterns involving several plant clades. Here we investigate relationships of *HA* to climatic conditions and functional traits across ecologically diverse but closely related species while accounting for phylogeny. Across a macroclimatic moisture gradient, defined by the ratio of mean annual precipitation to mean annual pan evaporation ( $P/E_p$), *HA* decreased with $P/E_p$ for ten *Eucalyptus* species. Greater anisohydry reflects lower turgor loss points and greater hydraulic safety, mirroring global patterns. More isohydric species have mesophyll photosynthetic capacity that is more sensitive to $\psi_{\lambda\epsilon a\varphi}$, consistent with an earlier model for optimal stomatal behavior. Hydroscapes exhibit little plasticity in response to variation in water supply, and the extent of plasticity does not vary with $P/E_p$ of native habitats. These findings strengthen the case that *HA* is a useful metric for characterizing drought tolerance and water-status regulation.

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