Journal & Proceedings of the Royal Society of New South Wales, vol. 154, part 1, 2021, p. 123. ISSN 0035-9173/21/010123-01

Thesis abstract

Hydraulic traits and drought mortality risk of tree species

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Abstract of a thesis for a Doctorate of Philosophy submitted to Western Sydney University, Australia

Increased drought frequency and severity associated with global climate change has contributed to large-scale forest dieback on all vegetated continents. Forest dieback may alter community composition, leading to cascading negative impacts on ecosystem function and service, and creating a positive feedback loop between biosphere and atmosphere. Traits-based approaches have emerged as a promising way to accurately predict the impacts of climate change on vegetation dynamics. Yet predicting the forest mortality pattern resulting from drought stress remains challenging, largely because of a lack of knowledge of the plant traits determining the risk and modulating the process of drought-induced mortality, and how these traits vary across and within species. Hydraulic traits define species distributions along local or regional gradients of water availability, and recent advances in modelling forest dynamics highlight the critical role of hydraulic traits in improving model predictive power with respect to mortality events. Using various ecologically and economically important tree species from New South Wales, Australia, my PhD thesis was designed to examine inter-specific variation of various hydraulic traits across a wide range of species native to five different vegetation types: Rainforest (*Acmena smithii*), Wet sclerophyll forest (*Eucalyptus grandis*, *E. viminalis*), Dry sclerophyll forest (*Angophora costata*, *Corymbia gummifera*, *E. sideroxylon*), Grassy woodland (*E. blakelyi*, *E. macrorhyncha*, *E. melliodora*) and Semi-arid woodland (*Acacia aneura*, *E. largiflorens*, *E. populnea*). In addition, intra-specific variation of key hydraulic traits was examined for *Banksia serrata*. The primary objective of my work was to provide trait values that will help to predict the dynamics of tree species upon climate change with vegetation models. Furthermore, the correlative relationships among hydraulic traits and between traits and climate presented in this study broaden our understanding of plant hydraulic strategies and plant adaptation to low-rainfall environments.

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