FIRES AND HYDROLOGY OF NORTH EASTERN AUSTRALIAN MIXED-SPECIES FORESTS

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Introduction

Most of the research investigating relationships between catchment water yield and water use by trees in eastern Australia is located in mono-specific Ash-type forests, where fire kills the overstorey trees and the forest regenerates via seedlings.

However, the Black Saturday bushfires in 2009 in Victoria predominantly burnt mixed-species foothill forests – a forest type that occupies much of the watersheds for Victoria's and New South Wales' water catchments. The majority of eucalypts that comprise mixed-species forests regenerate from fire via epicormic sprouts; sprouts that bear foliage of juvenile form akin to that found on seedlings of Ash-type species that regenerate after fire.

Research aims

We aim to develop our existing methods of quantifying overstorey water-use so they can be applied to resprouting mixed-species forests.

We will characterise the physiology of resprouting eucalypts for a range of species, soils, topographies and climates.

With this information we will refine our existing model (the Soil-Plant-Air or SPA model) to predict future tree water-use in regenerating mixed-species forests at a landscape level.

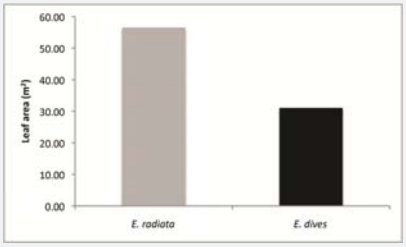
Site description

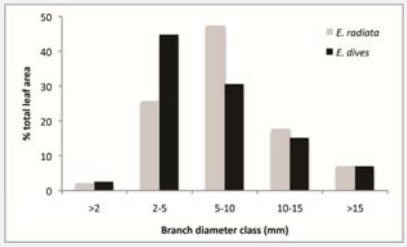
The "Stanley" site is located on a ridge (~800 m ASL) in a native forest comprised of mixed eucalypt species; *Eucalyptus radiata* (Narrow-leaved Peppermint), *E. dives* (Broad-leaved Peppermint), 5 km from Stanley, NE Victoria. Crown fires passed through the region in February 2009 and shortly thereafter trees sprouted from epicormic shoots.

The six trees sampled (three replicates per species) were, on average, 20 m tall and 24-55 cm in diameter. We chose sample points at three heights on each tree: low (<2 m), middle (7-11 m) and top (14-17 m).

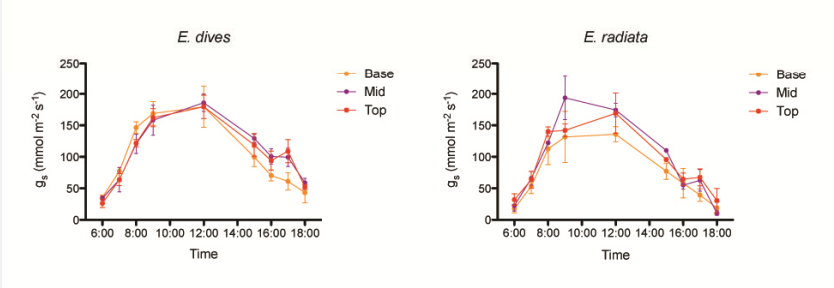
Methods and preliminary data

Leaf biomass: branch inventory – the number of epicormic shoots per diameter class were recorded for the entire height of each tree. Allometric relationships between branch diameter and leaf area were characterised for each tree. Leaf area for each tree was then calculated using the branch inventory and tree-specific allometric relationships.

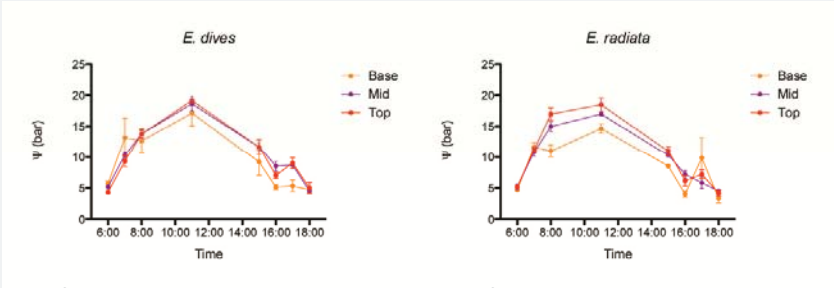




Leaf water status: conductance of leaf surfaces to water vapour – Stomatal conductance is a function of size, degree of opening and density of stomata on the epidermal surfaces of leaves. Stomatal conductance to water vapour was measured hourly in situ pre-dawn to post-dusk with a porometer.



Leaf water status: water potential – Measurements of the water potential (Ψ) in the plant-soil system are useful since they provide us with an indication of the gradients for water movement, which may determine water uptake by the plant. Ψ was measured hourly (pre-dawn to post-dusk) on recently (<10 seconds) excised leaves with a pressure chamber.



Upcoming work

(1) Instrumentation of a further three sites during 2011, (2) targeted and intense characterisation of physiology and biomass of sample trees during field trips planned for late January 2012, and (3) routine bimonthly measurement of leaf physiology at all sites during 2012.

Research outcomes

(1) Characterisation of whole-plant physiology of water-use in epicormic trees, (2) refinement of an existing model so it accurately predicts water use of trees regenerating via epicormic branches, and (3) use of the improved model to predict vegetation water-use at a landscape level.