

FIRES AND HYDROLOGY OF SOUTH 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 parameterise our recently published model (Buckley *et al.* 2012) to predict future tree water-use in regenerating mixed-species forests at a landscape level.

Site description

Our “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), and *E. mannifera* (Brittle gum) 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. Branch dimensions and leaf structure and physiology have been measured in April 2010, 2011 and 2012.

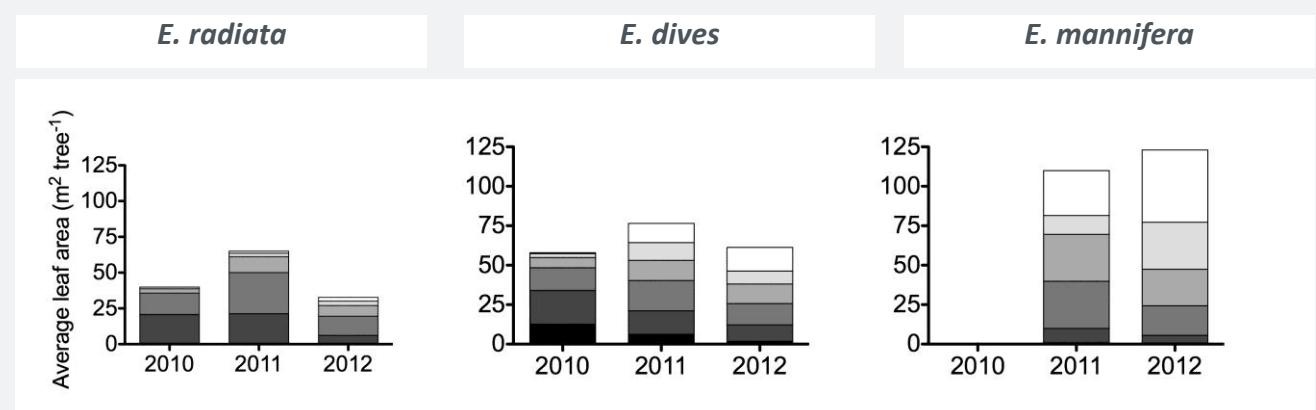
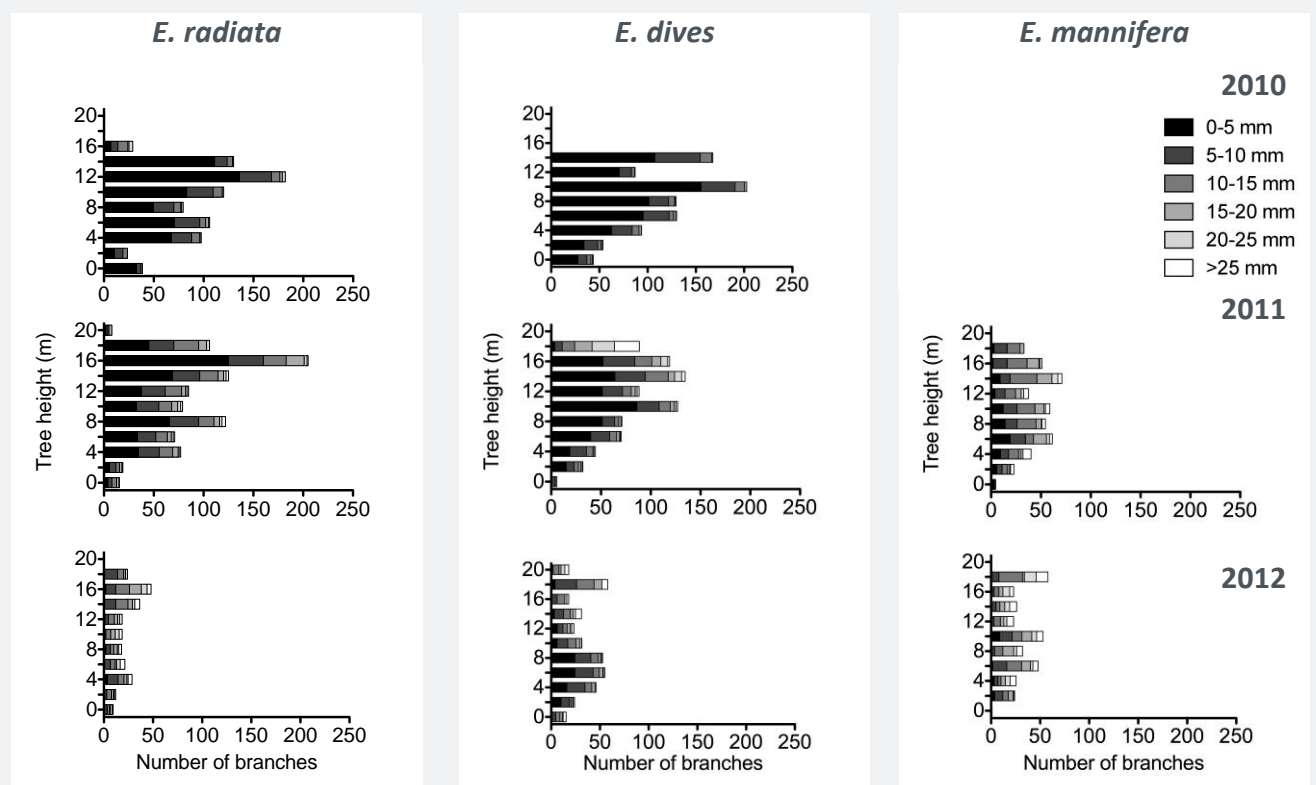
References

Buckley TN, Turnbull TL, Adams MA. 2012. Simple models for stomatal conductance derived from a process model: cross-validation against sap flux data. *Plant, Cell and Environment*, DOI: 10.1111/j.1365-3040.2012.02515.x

Methods & Results

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

Three years after crown-removing fires the tree structure is still epicormic, and the leaves are still of juvenile form and physiology (upper set of graphs). The branch structure is tending towards formation of larger branches at the tree apex, and these support the greatest leaf area (lower set of graphs).



Upcoming work

Data from 2010, 2011 and 2012 has been collected and analysed. Remaining work includes preparing manuscripts for publication as Firenotes and peer-reviewed journal articles.

Research outcomes

(1) Characterisation of whole-plant physiology of water-use in epicormic trees, (2) publication of new model to predict water use of trees regenerating via epicormic branches, and (3) parameterisation of new model to predict vegetation water-use at a landscape level in the mixed species forests of south east Australia.