

# FIRES AND HYDROLOGY OF NORTH EASTERN AUSTRALIAN MIXED-SPECIES FORESTS

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## Introduction

In 2009 the fires in Victoria mainly burnt in mixed-species foothill forests. This forest type makes up much of the watersheds for catchments for Victoria and New South Wales and can be quite diverse, containing up to 10 species of *Eucalyptus* per hectare. Other forest types, such as open jarrah forest in south western Australia, are dominated by only one or two species.

It is well known that water yield from catchment areas is coupled with water use by trees. Older more established trees have a relatively lower water requirement than young, regenerating trees growing after a disturbance such as wildfire. As an example, a 5% change in water use of the vegetation (e.g. age-related, seasonal variation) is equivalent to 20% reduction in the return of water to stream flow.

There is no doubt that the fires in 2009 in mixed-species forest will cause a change in hydrological cycles and therefore water yield. The question is how big will that change be?

## 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 and topographies and climates.

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

## Background research

Vegetation water-use in Ash-type forests (i.e. *Eucalyptus regnans*, *E. delegatensis*) has been studied extensively. Mixed-species forests differ from Ash-type forests in that they regenerate via sprouting shoots (Figure 1) rather than seed (Figure 2).

Juvenile leaves on epicormic sprouts are physiologically and phenologically different to mature leaves. Little is known about the water-use of resprouting eucalypts and how this varies among species, topography, age.

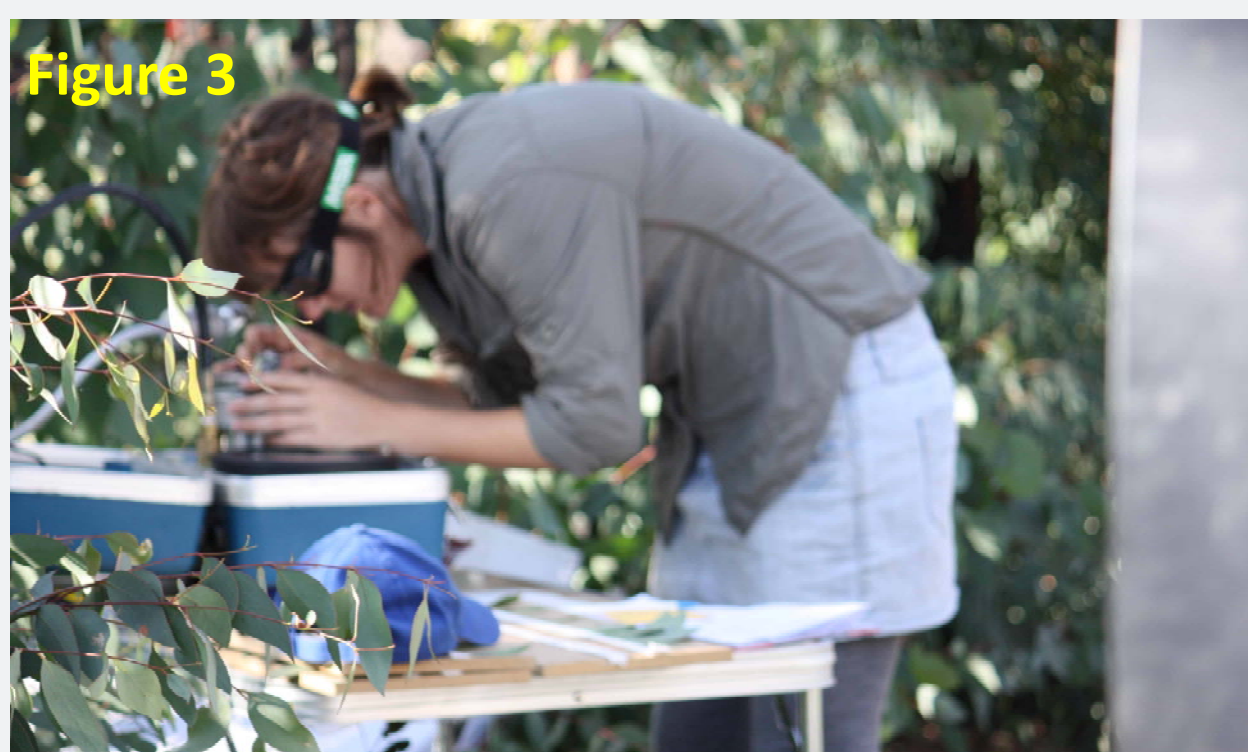
**Figure 1**



**Figure 2**



**Figure 3**



**Figure 4**



**Figure 5**



## Research sites

Four pairs of sites in north eastern Victoria have been selected according to age since fire (2006/07 and 2009) and elevation (300 and 900 m above sea level).

All sites have the dominant eucalypt species present (*E. dives*, *E. radiata*, *E. mannifera*, *E. globulus*) and are readily accessible for canopy-level measurements.

## Preliminary measurements

Early physiological measurements (e.g. photosynthesis, gas exchange, water potential) have been made (April 2010) to assess variation in patterns of water-use within the canopy (Figures 3 and 4).

## Data collection

(1) Sapflow probes will be installed in dominant species over a range of diameter classes to continuously log tree water use (Figure 5). Maintenance for this equipment and processing of data will be ongoing.

(2) Local meteorological conditions will be constantly recorded via with micro-weather stations.

(3) Routine monthly measurement of leaf water potential and stomatal conductance in instrumented trees will be undertaken.

(4) Targeted campaigns will be used to examine physiological processes and anatomical features governing leaf-level water-use.

(5) We will use controlled experiments to contrast leaf ontogeny with water-use characteristics.

(6) Hydrological assessment of soil using standard gravimetric techniques and soil moisture meters.

## Research outcomes

**Characterisation of whole-plant physiology of water-use in epicormic trees.**

**Refinement of existing model (SPA) so it accurately predicts water use of trees regenerating via epicormic branches**

**Use of improved SPA model to predict vegetation water-use at a landscape level**