1. Introduction

Project Vesta[1] is Australia's most recent and significant study of forest fire behaviour. The study derives its name from the Roman goddess 'Vesta' who tended the sacred hearth. Project Vesta has investigated the behaviour and spread of summer bushfires in dry eucalypt forest with different fuel age and understorey structures. The seven-year project was initiated in 1996.

Research Aims

The four main scientific aims of Project Vesta were:

- To quantify the changes in the behaviour of fire in dry eucalypt forest as fuel develops with age (i.e. time since fire).
- To characterise wind speed profiles in forest with different overstorey and understorey vegetation structure in relation to fire behaviour.
- To develop new algorithms describing the relationship between fire spread and wind speed, and fire spread and fuel characteristics including load, structure and height.
- To develop a National Fire Behaviour Prediction System for dry eucalypt forest.

These aims have been addressed through a program of experimental burning and associated studies at two sites in the south-west of Western Australia.

1 Project Vesta was a collaborative project between CSIRO Forestry and Forest Products (now known as Ensis) and the Department of Conservation and Land Management, Western Australia (now known as Department of Environment and Conservation, Western Australia).

Background

Fire behaviour guides for eucalypt forests were first developed in the early 1960s by Alan McArthur of the Commonwealth Forestry and Timber Bureau (1962, 1967), and George Peet of the Western Australian Forests Department (1965). These guides were developed from measurements of small experimental fires lit in open eucalypt forest with fuel composed of leaf litter and occasional low shrubs. Fires were generally ignited at a point and allowed to develop for periods of up to one hour or so. These models were designed primarily to predict the behaviour of fire for prescribed burning operations, but were extrapolated to predict the behaviour of high-intensity fire using observational reports of spread of wildfires.

Preliminary analysis of the behaviour of high-intensity fires burnt during Project Aquarius and work by Burrows (1994, 1999b) suggested that at high wind speeds, these models consistently under-predict by a factor of 2 or more. In the past these under-estimates have been attributed to more fuel burning under wildfire conditions or to the unpredictable effects of spotting (McArthur 1967). Spotting was clearly not a factor contributing to increased spread rates during the Aquarius experiments (CSIRO unpublished data) and the errors in prediction are more likely to be due to the experimental techniques used by McArthur and Peet to build the models. Case studies of wildfires have also shown that existing guides tend to under-predict rate of spread and fire intensity, particularly under more severe burning conditions