

Behind the Flaming Zone

J.J. Hollis^{1,4}, W.R. Anderson¹, J. Chapman¹, J.S. Gould^{3,4}, S. Matthews³ and W.L. McCaw^{2,4}

1. School of Physical, Environmental and Mathematical Sciences, University of New South Wales at the Australian Defence Force Academy, ACT

2. Science Division, Department of Environment and Conservation, WA

3. Bushfire Dynamics and Applications, CSIRO Sustainable Ecosystems, ACT

4. Safe Prevention, Preparation and Suppression, Bushfire Cooperative Research Centre, VIC

Background & Research Objectives

After the passage of a fire front it is the larger, coarse woody fuels (>6mm diameter) that once ignited by fire, will greatly influence:

- total energy output
- convection column development
- fire behaviour
- greenhouse gas emissions
- air quality
- damage to biotic elements
- soil heating
- habitat quality
- suppression/mop-up difficulty
- potential for re-ignition

This research focuses on determining the rate and proportion of coarse woody fuel consumed as functions of fire intensity, Fire Danger Index, Soil Dryness Index, fuel type and fuel condition in southern Australian eucalypt forests. The research also includes testing current empirical and physics-based models of woody fuel consumption and the development of a fuel consumption model suitable for Australian eucalypt forests.

Field Data Collection

Research so far has focused on field data collection in the jarrah forest (*Eucalyptus marginata*) of southwest Western Australia. By collaborating with the Dept. of Environment and Conservation it has been possible to conduct 6 experiments at 3 prescribed burns that target specific seasonal and fuel conditions.

Preliminary Findings- Fire intensity & coarse fuel consumption

The table below shows the impact that fire intensity has on coarse fuel consumption. Variations in fire intensity were achieved by varying the fire direction and rate of spread across the site at the Hester burn (April, 2008).

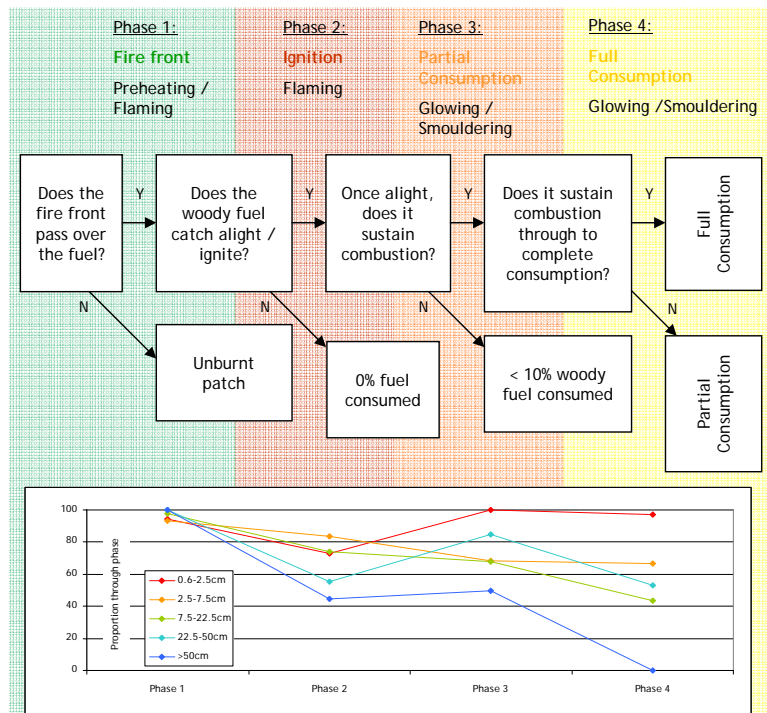
Fire Intensity (kW/m)	679	381	284	53
Coarse Fuels Consumed(%)	57	55	42	43
Heat Release fine & coarse fuels (kj/m ²)	144,257	123,796	112,090	87,939

Mean coarse fuel load pre-fire: 113t/Ha Mean fine fuel load pre-fire : 6.6t/Ha Heat of combustion: 18,000kj/kg



Preliminary Findings- Fuel size & coarse fuel consumption

Fuel size (and it's relationship with fuel moisture content) can also be used to predict coarse fuel consumption for both spring and autumn burns in the southwest WA jarrah forest. The figure below illustrates the phases of coarse fuel consumption with an example showing the effect of fuel size through each phase from the Hester burn.



Where to from here?

Over the next 2 years, field data collection will be extended to different forest types and some of the physical properties of coarse fuel consumption will be analysed in fire tunnel experiments. Current coarse fuel consumption models will also be tested.