EFFECTIVENESS OF BROAD SCALE FUEL REDUCTION BURNING IN VICTORIAN PARKS AND FORESTS

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INTRODUCTION

Fuel reduction burning (FRB) has been practised on a broadscale in Victoria for nearly 30 years. FRB involves the deliberate use of fire, under prescribed (or pre-determined) weather and fuel moisture conditions (generally in the autumn), to reduce both the amount, and vertical extent, of forest fuels, including surface litter, bark and understorey shrubs. FRB or "burning off", as it is more commonly known, is carried out reduce these fuel hazards, and thereby assist with the control of wildfires in later years. On average approximately 100,000 hectares, out of a total of 7.8 million hectares, of public land is burnt in the fuel reduction burning program each year. The Department of Sustainability and Environment (DSE) has most of the responsibility for fuel reduction burning on public land, due to its obligations for hazard reduction under the Forests Act 1958.

The majority of the area burnt is in areas identified in Fire Protection Plans as being of strategic importance. The Code of Practice for Fire Management on Public Land identifies five Fuel Management Zones (FMZs), with Zone 1 having the aim to protect life, property and assets, and therefore being of primary importance for fuel hazards to be kept at their lowest possible levels. Zones 2, 3 and 4 are then seen as being of decreasing importance, except that Zone 2 is intended to provide long strategic “strips” of fuel reduced area which can act as a barrier to large fast-moving wildfires. Zone 5 is not intended to be prescribed burnt.

Although a number of Victorian studies had looked at the effectiveness of fuel reduction burning in specific instances (Billing 1981, Rawson, Billing and Rees 1985, Grant and Wouters 1993) there had not been a broad evaluation of the effectiveness of the Statewide fuel reduction burning program.

Dwindling resources, and the establishment of more dwellings and other assets on private land close to forested public land, meant that it had become increasingly important to ensure that all fire protection works were effective. Therefore this study aimed to show fire managers how they could use their limited fuel management funds for maximum effectiveness.

METHODS AND RESULTS

This study was primarily done by sampling a relatively large number of fires (114) from a selection of fire districts using the FIRES database of DSE. Sampling was aimed at identifying fires from the range of Fuel Management Zones (FMZs), and also with a range of final fire sizes. Many wildfires known to be influenced by by FRB were studied, and a selection of those fires, where previous FRB did not assist in suppression, were also investigated to determine what differences there were in fuel or other conditions which contributed to this effect.

A larger number of wildfires -1653 and 2425 wildfires respectively - were studied in less detail to: firstly, look at trends between the FMZs; and secondly, to look at the more general influence of FRB on wildfires across Victoria. Wildfires sampled occurred between the 1990/91 and 1997/98 fire seasons

The main aims of the study were to both investigate how FRB had modified wildfire behaviour and assisted in fire control, and to investigate whether there were significant differences between the FMZs in terms of how likely a wildfire was to encounter a “helpful” FRB within each Zone.

A major finding of the study was that the maximum level of fuel hazard that would provide any assistance with suppression was that of ***High*** Overall. This reinforces some earlier work on the subject (Wilson 1992, McCarthy *et al*. 1999).

Two predictive models were constructed from the data. The first predicts that, as fire danger increases, the benefits of previous FRB start to reduce (particularly at FDIs 25-50, depending on the Overall Fuel Hazard). That is, at higher levels of fire danger, weather influences become more important than fuel conditions to suppression operations. This predictive model is shown in Figure 1.

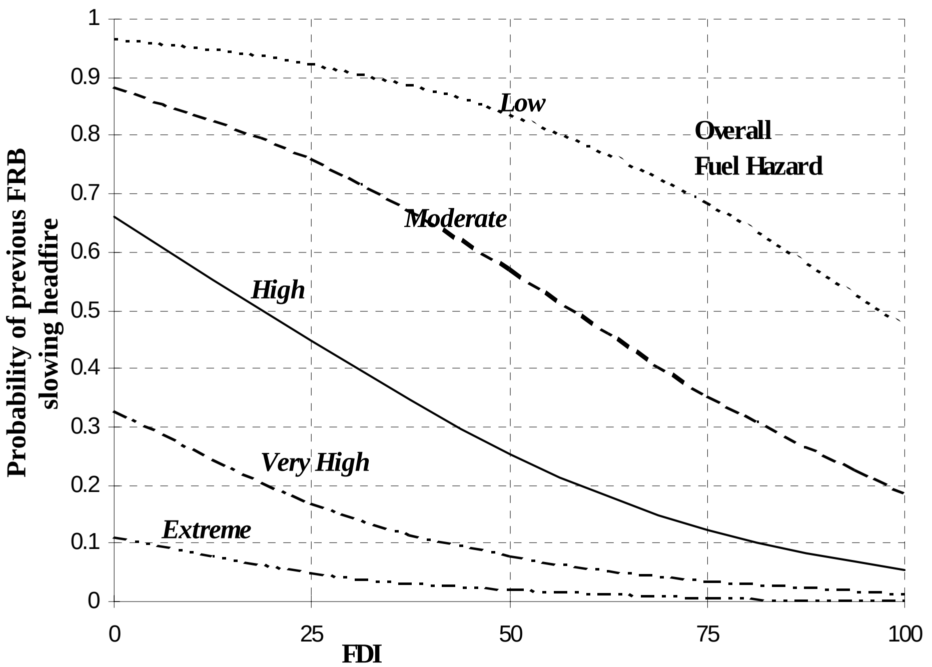

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Figure 1 Probability of previous FRB slowing the headfire of a subsequent wildfire as a function of Overall Fuel Hazard and Fire Danger Index.

The second model predicts that, beyond about 10 years post-fire, the probability of an FRB still being “helpful” for suppression operations decreases significantly. The highest probabilities of a previous FRB being helpful to subsequent suppression operations occur in the first 4 years following the FRB, with decreasing probabilities up to about age 10. Assisting effects of a previous FRB that is between 4 and 10 years old are most likely to be in terms of reduced bark and elevated fuel hazards, as surface fuels appear to re-accumulate to pre-burn levels within the first 4 years.

This second predictive model is shown in Figure 2.

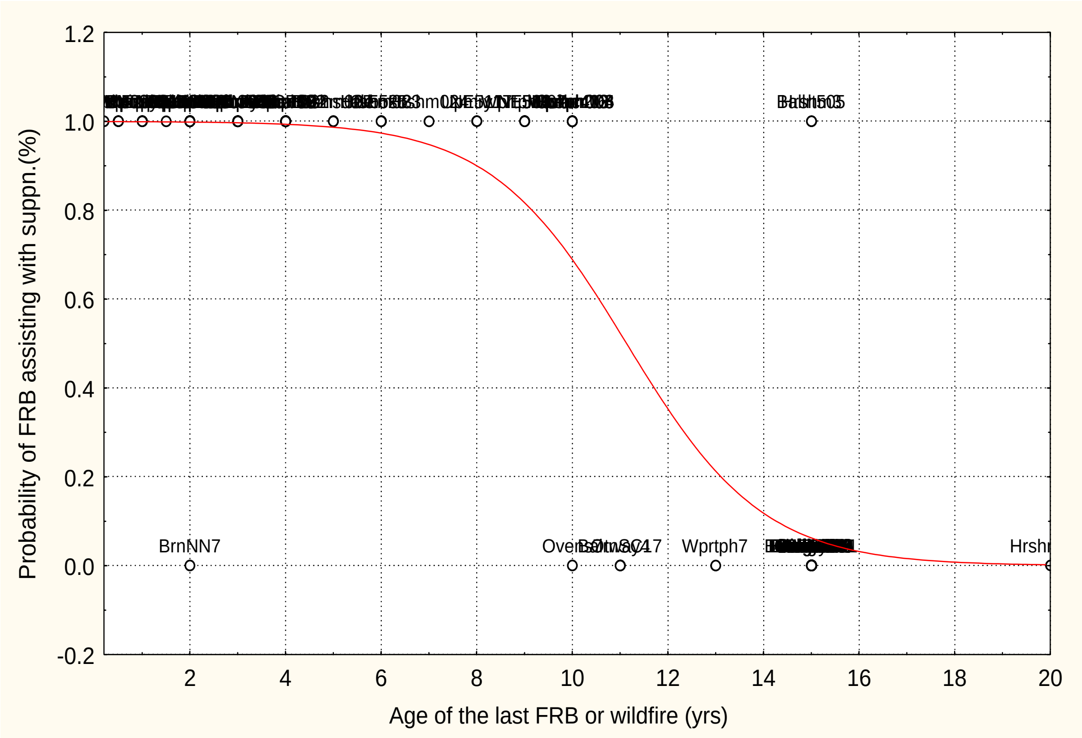

Figure 2 Probability of a previous FRB assisting with the suppression of a subsequent wildfire on the same site as a function of the time since the last FRB (or wildfire). Actual data values also shown as e.g. “ WtptPh 03”, to illustrate trends in raw data.

This study identified that FMZ 1 and FMZ 2 are the two Fuel Management Zones where a subsequent wildfire has the highest likelihood of running into a previous FRB which will both slow the headfire and assist with suppression. Depending on the fire district, between 1 in 5, and 1 in 2 wildfires will be likely to run into a “helpful” FRB in FMZs 1 and 2. The frequency of burning in these Zones is important, with the important areas in FMZ 1 being burnt every 5 years on average, and the important areas in FMZ 2 being burnt every 7 years on average.

On average, only about 1 in 20 of the fires sampled in FMZ 3 ran into a “helpful” FRB. This result may not be any better than if fuel reduction burning had been carried out randomly, rather than being directed into FMZ 3 areas.

A major problem in FMZ 3 appears to be the frequency of burning, with much of FMZ 3 only being burnt about every 11 years. This time interval of 11 years appears to be sufficient to allow all fuel components (surface, bark and elevated) to increase to levels of more than ***High***. Fire behaviour may be moderated by reduced bark and elevated fuels for up to 25 years after burning, but once ***Very High*** and ***Extreme*** Overall Fuel Hazard levels are reached, the effect of previous FRB on the ease of wildfire suppression is substantially reduced.

The qualified results, from this Statewide analysis of the effectiveness of broadscale FRB in assisting with subsequent wildfire control, will be used to guide future policy development on fire management in Victoria, and to improve on-going operational practice. On-going research is clearly warranted on this subject, particularly given the limitations of the available data as encountered during the study period, and also given that much better computerised data is now being collected.

CONCLUSIONS

Maintaining Overall fuel hazard levels at ***High*** or less by fuel hazard reduction, is significant to providing a situation where there will be assistance to the suppression of a subsequent wildfire. Levels of ***Moderate*** to ***High*** or less, as found in most FMZ 1 and 2 areas, give higher probabilities of there being an assisting effect. Models have been produced to illustrate this effect.

Increasing fire danger indices tend to reduce the probability of there being an effect of slowing rates of spread from previous fuel hazard reduction burning on most sites, even on sites where Overall fuel hazards have been kept at ***Moderate*** or less. The predictive model constructed indicates that, on ***High*** Overall fuel hazard sites, the probability of a previous FRB slowing rates of spread drops to less than 50% at FDIs over 25.

The maximum period of usefulness of an FRB appears to be about 10 years, after which bark and elevated fuels add to surface fuels to produce fire behaviour which is not readily controllable. Effective fuel reduction in the future should be aimed at reducing particularly bark and elevated fuel hazards to produce the most lasting fuel reduction effects.

Prescribed burning for fuel hazard reduction has had a significant effect in assisting with the suppression of subsequent wildfires in Fuel Management Zones 1 and 2, with often between 20% and 50% of wildfires (depending on the fire district) in these zones encountering a previous fuel hazard reduction burn which can slow the headfire and assist with suppression.

In Fuel Mangement Zone 3, the general effect across this zone is such that only approximately 5% of wildfires in this zone encounter a previous fuel hazard reduction burn which is useful in assisting with suppression. Lack of effectiveness of previous FRBs in FMZ 3 appears to be mainly related to frequency of burning.

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