# NEW DIRECTIONS FOR MANAGING FIRE IN STATE FORESTS: A DISCUSSION PAPER

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## Introduction

Broadacre fuel reduction burning has been applied to most of the forest estate since the late 1950's. This practice, together with expanded technology, resources and expertise, has resulted in a high level of protection from the undesirable effects of wildfires. We are now in a position to consider innovative and more sophisticated fire management practices. Today, a fire management programme must have at least three important ingredients;

i. it must be congruous with the Departmental fire management policy,
ii. it must be cost effective,
iii. it must be based on sound scientific principles.

Here, I present concepts (no details!) for further refining our current fire management, particularly prescribed burning. This discussion paper is unreferenced and does not contain complicated data sets or analysese. Rather, it is an integration of how I perceive fire managmenet, fire ecology, the fire interested community based on almost 11 years as a fire research scientist. I am still in

the process of compiling hard data, but I believe we can start the thought process and debate on the concepts before we have perfect knowledge.

The Challenge

Simply put, we must minimise (prevent?) the undesirable effects of wildfires (on human and conservation values), maintain the ecological integrity of the forest and do this within budget and resource limits.

For a whole range or reasons, we are falling behind our self imposed fuel reduction burning programmes (at least this is the case in the Southern Forest Region). There is a tendancy to do the easy burns (eastern country) and not the important protection burns. This led to my developing a Mark 1 hazard rating system which was designed to identify those forest areas most in need of protection expenditure. Schuster and others have further developed this sytem and have used it to rank or "prioritise" fuel reduction burns.

In its original form, the hazard rating system was designed to rank areas requiring protection from wildfire, not for rating the necessity for fuel reduction burning. Burning may have been the appropriate strategy. Having produced regional hazard maps (along

similar lines to Roger Good, NSW National Parks Service) using our hazard rating system, decisions could then be made about fire management boundaries and appropriate strategies for each hazard class. These may range from intense fuel modification near towns or other high value areas where the hazard index is very high, to doing nothing in and around areas where the hazard index is very low. The hazard rating system identifies factors which contribute to creating the hazard and appropriate strategies to ameliorate hazard can be based on contributing factors. This may be reducing fuels or improved access or better detection etc. Remember, the hazard index reflects the potential loss or diminishment as a result of a wildfire burning the area in question. Ideally, hazard rating and generating hazard maps should be done annually and by computer - the CALMIS system may be the appropriate place for doing this. As resource allocation and fire management is largely handled at the Regional level, Regional hazard plans would be prepared each year and works programmes scheduled accordingly. It would be possible to generate forecast hazard maps based on fuel buildup, cutting, roading etc. Several alternative futuristic strategies could be developed, based on expected changes in factors likely to affect the hazard status and on expected available resources. This would also serve to identify areas where protection expenditure may have to be forgone, but which are a high hazard. Protection expenditure based on an objectives assessment of hazards and the most appropriate strategy rather than on an attempt to conduct fuel reduction burns over the entire State Forest will pay off.

Fuel Reduction Burning and Ecological Considerations

Naturally, fire ecology is a very complex, diverse and highly sensitive field. Frequent, cyclic and broadacre spring burning is costly (in dollar terms) and claims have been made that it is environmentally damaging (or will be in the long term).

While I am still gathering data from 6 fire effects study sites I have recently (1985) set up throughout the Southern Forest Region, my experience, intuition and what data I have (little at this stage!) indicate that sustained spring burning will eventually result in a loss of species diversity and structural homogeneity.

It is not appropriate to go into great detail here, but my hypothesese are as follows;

1. Low intensity cool spring burns may not always stimulate massive and synchronised seed release and dispersal, especially from capsule store species such as most of the tree and lower tree species. There is little or no regeneration in the absence of fire or other disturbance.

2. When there is adequate synchronised seedfall, then it is not always on the best seedbed. Mineral earth or ashbeds are not a feature of spring burning.

3. If seeds happen to fall on ashbed (or mineral earth), then a proportion will be predated by ants etc. which may still be in large numbers.

4. Seeds which have been induced to fall from capsules or which have been heat treated in the upper soil horizons or which have, in some other way been induced to germinate following the spring fire, are most unlikely to become established to survive the ensueing summer drought and grazing pressure.

Usually, germination takes place some 2 - 3 weeks following a spring burn which means that the seedling is only about 4 - 6 weeks old by the time the SDI is in excess of 1200 (or the top soil is very dry). Seedling mortality over summer is very high for seedlings which have germinated in spring. The level of seedling germination following a spring burn is considerably lower than following a summer or autumn burn, so the chances of survival and recruitment into the mature population is reduced.

Rootstock species continue to persist, but at same time, they too must regenerate from seed. Frequent burning (5 - 7 years) for extended periods will gradually reduce plant and species numbers, especially on the drier sites. Soil stores of seed will gradually be depleted. Species which take a long period to reach flowering age and which are fire sensitive, will be the first to dwindle

(e.g. *Banksia quercifolia*, *Banksia seminuda*). Tree species (jarrah, marri, bullich etc.) will never reach flowering age if seedlings/saplings are burnt every 5 - 7 years.

Autumn burn-induced seedling regeneration is most likely to be successful as germinants have 5 - 6 months of winter rains to become established. Also, autumn burning generally provides a better seedbed (ashbed or mineral earth) than spring burning.

Following an autumn regeneration burn, I am advocating a "spelling off" period of about 3x normal rotation, i.e. 15 - 20 years. This is a fire free period to allow tree and lower tree species regeneration to mature and grow to a fire resistant stage (in terms of low intensity fire). This fire free period will also allow time for the replenishment and restocking of the soil seed store. There may be additional nutritional benefits in allowing recycling of litter.

Putting it Together

When determining the most appropriate fire management for a Region, we should first construct Regional Hazard maps, as discussed earlier. Those areas where the hazard index exceeds, say 180, should receive highest priority and the best hazard reduction strategy should be determined. This may mean fuel reduction burning every three years

around towns or other areas of high hazard index. Other areas where the hazard index is very low to moderate should be considered for "spelling off" after an autumn burn. Hazard management boundaries may need to be re-defined on the basis of the hazard maps. There may be no need or requirment to stay with historical management boundaries if they are inappropriate. Areas being "spelled" from burning should not be contiguous.

Ideally, each hazard management block where the hazard index is low or less than 180 (say) could then be given the following fire regime;

1. Three or four rotations of low intensity fuel reduction spring burning (the number will depend on fuel accumulations - generally 3 in dry country and 4 in wetter country).

2. Then a late summer, autumn regeneration burn.

3. Then, the area should be left unburnt ("spelled") for three or four rotations or 15 - 20 years to allow growth of tree species, replenishment of seed store and nutrient re-cycling.

4. Then, back to three or four rotations of low intensity spring burning, etc.

The distribution and size of blocks which are being "spelled" will need to be reviewed critically in terms of protection requirements

(use the hazard maps for planning) and trade operations etc. Likewise, the location of fuel reduced areas needs to be planned to ensure protection objectives are met and to ensure the break-up of a major fire run. This can be achieved with planning and juggling.

I believe we can safely plan and implement such a regime. This will meet both protection and environmental requirements and should satisfy most of the community. It will also amount to cost savings if say 15 - 20% of the Region is being "spelled" at any one time and with safety.