3

Fuel reduction and fire management

3.1 Three elements determine the intensity of a fire: fuel, oxygen and heat. Of these the amount of available fuel is the only factor that can be controlled.

Mitigation rather than prevention

3.2 The Fire Mitigation Officer with the BMCC stated that fuel reduction seeks to remove fine fuels that occur in the suspended layer of forest between 50 millimetres and three metres from the ground.[1] The CSIRO specified the 'fuel that contributes most to the dimensions of the flame front, and thereby contributes to the heat flux that ignites new fuel are the available fuels [less than] 6 [millimetres in] diameter.'[2]

3.3 Thus, the objective of fuel reduction strategies is not a scorched earth bereft of vegetation, but rather the alteration of 'the structure of the fuel bed and the load of the available fuel to make fire fighting safer and easier.'[3]

3.4 Just as fuel reduction strategies do not eliminate all vegetation, they cannot and should not be seen as a means to the complete prevention of wildfire.[4]

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1 Christopher West, *Transcript of Evidence*, 9 July 2003 (Katoomba), p. 11.

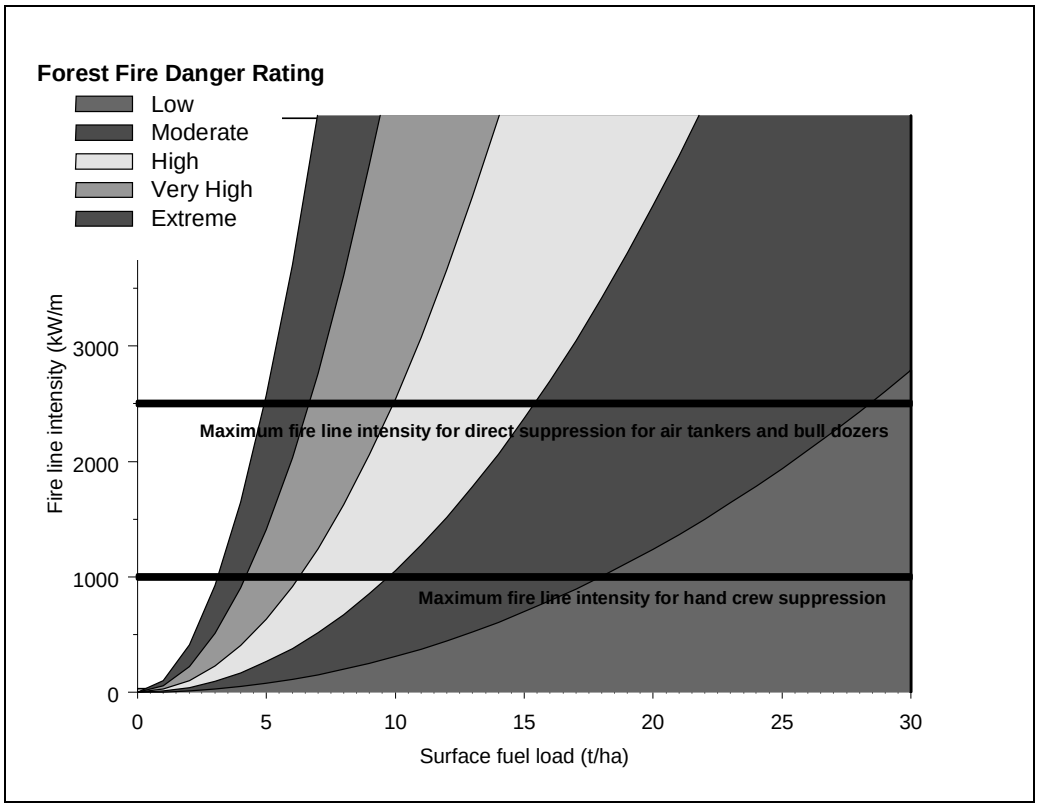
2 CSIRO, *Submission no. 434*, p. 38.

3 CSIRO, *Submission no. 434*, p. 49.

4 Victorian National Parks Association, *Submission no. 176*, p. 6.

3.5 The objective of fuel reduction practices is to increase the controllability of a fire event within a greater range of adverse weather conditions than would be the case had reduction not been carried out. This is demonstrated in the following figure.

Figure 3.1 Effect of reducing fuel on the efficiency of direct suppression



Source: CSIRO, Submission no. 450, p. 51

3.6 Hand crews can suppress a fire up to a maximum intensity of 1000 kilowatts per metre. If the fuel load is less than 15 tonnes per hectare this intensity will be exceeded under low to moderate fire danger conditions. If fuels are reduced to 10 tonnes per hectare fires will not develop an intensity of 1000 kilowatts per metre until fire danger gets into the moderate to high range.[5]

5 CSIRO, *Submission no. 434*, pp. 50–51.

3.7 In 2003 fires burning in extreme weather conditions were reported to be uncontrollable even where fuel levels were low. The VNPA referred to fuel reduced areas that were not protected from severe fire damage. These included:

- Areas south of Mount Buffalo that were regularly fuel reduced, some within the previous three years.
- A hillside east of Swindlers Valley at Mount Hotham that was severely burnt twice on successive days.
- Some areas of Kosciuszko National Park that had been subject to prescribed burning only eight months previously yet they experienced crown fires.[6]

3.8 However, Mr Vic Jurskis, an experienced forester, maintained the importance of fuel reduction for effective fire management:

> if it is harder to control a fire in moderate conditions, it will still be going when the bad conditions arrive, when you can do nothing about it.[7]

3.9 The purpose of fuel reduction, then, is not to prevent wildfires but rather to mitigate the potential of their threat to life, property and the environment. The restriction of the level of available fuel, decreases the:

- intensity at which the fire burns;
- flame heights and depths; and
- rate of spread of the fire;[8]

from what they would otherwise be in the same conditions.

3.10 Fuel reduction can be implemented in two distinct but certainly not incompatible ways. First, fuel reduction strategies may be employed to reduce fuel loads over broad expanses of land. Second, fuel reduction strategies may be used to create specific strategically placed fuel reduced areas around assets and through known fire paths.

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6 Victorian National Parks Association, *Submission no. 176*, p. 6.

7 Vic Jurskis, *Transcript of Evidence*, 10 July 2003, p. 68.

8 CSIRO, *Submission no. 434*, pp. 49–50.

3.11 The Committee received a considerable body of evidence outlining the advantages and disadvantages associated with the implementation of broad scale fuel reduction as part of an effective fire mitigation program in forests. While all evidence on fire mitigation endorsed the implementation of strategic fuel reduction there was disagreement on the effectiveness and desirability of broad scale fuel reduction as a fire mitigation measure.

Broad scale fuel reduction

3.12 The two methods of implementing broad scale fuel reduction most commonly referred to in evidence were the implementation of regimes of prescribed burning and grazing by livestock. A wide range of views was expressed on the effectiveness in mitigating wildfire damage and the economic and environmental advantages and disadvantages of these methods.

Prescribed burning

3.13 The Committee received a significant body of evidence on the place of fire in the Australian landscape, for instance, the extent and frequency of Aboriginal burning practices in various areas of the continent. Views and arguments diverged on this subject. It is a debate that has a way to run before practical conclusions, if any, can be drawn from it, at least in the south east and south west areas of the country.

3.14 The Committee notes the CSIRO's acknowledgment that:

> A complete fire history of Australia is not available and hence it is difficult to assess how human intervention (pre and post European) impacts on 'natural' fire regimes (season, frequency and intensity).[9]

3.15 While the Committee is not in a position to make definitive conclusions based on suggested methods of Aboriginal burning practices, the debate does bear out that fire, and its absence, is a significant factor in all the varied ecological communities and that fire regimes (including the exclusion of fire from sensitive areas) is a land management consideration of primary importance.

9 CSIRO, *Submission no. 434,* p. 15.

3.16 The CSIRO stated that 'The cheapest and most ecologically sound way to [manage fuel] is by prescribed burning.'[10] Prescribed burning is:

> The controlled application of fire under specified environmental conditions to a predetermined area and at the time, intensity and rate of spread required to attain planned resource management objectives.[11]

3.17 To be effective, broad scale management of fuel by prescribed burning requires a program or regime of burns be implemented. A burning regime refers to 'three main components [of fire events in an area]: intensity, frequency and season …'[12] Regimes of prescribed burning seek to decrease the intensity of fire events by increasing their frequency. Some evidence received by the Committee contested the effectiveness of a regime of broad scale prescribed burning in protecting life and property. Professor Robert Whelan, Dean of Science at the University of Wollongong, raised three orders of concern about the effectiveness of broad scale burning in protecting assets:

- Whether a regime of broad scale burning could be implemented with a high enough frequency to provide the desired protection.
- Whether land managers could obtain the resources to apply the regime.
- Whether it would actually protect property and life in a high intensity wildfire.[13]

10 CSIRO, *Submission no. 434*, p. 49.

11 Australasian Fire Authorities Council, *Glossary of Rural Fire Terminology*, March 1996, p. 22.

12 CSIRO, *Submission no. 434*, p. 16.

13 Robert Whelan, *Transcript of Evidence*, 8 July 2003, p. 44.

Effects of broad scale burning on life and property

3.18 The Committee received a considerable body of evidence arguing that a regime of broad scale prescribed burning is both successful and necessary in protecting life and property. Regimes of broad scale prescribed burns were recommended as increasing the security of personnel involved in fighting fires on the ground through a number of means. Mr Athol Hodgson, one of the most knowledgeable and experienced forest fire fighters in Australia, stated that through broad scale burns:

> The height of the scrub layer is lowered … Visibility is increased and fire fighters can work closer to the edge of the fire and in greater safety.[14]

3.19 Furthermore, a regime of prescribed burning reduces the possibility of wildfires crowning because:

> A canopy (crown) fire occurs when heat from a very intense ground fire raises the temperature of the leaves in the tree canopy to ignition point and burning embers from the ground fire are lifted into the canopy by the convection plume and ignite the leaves. A tree canopy cannot, on its own, support a fire. In the absence of an intense ground fire, crown fires do not occur.[15]

3.20 At a public hearing in Ballarat Mr Hodgson qualified and amplified this comment:

> The distance to which a crown fire will advance ahead of the ground fire can increase if it is going uphill, because the convection column and the heat is going up there, and the crowns are up there instead of vertically above. But it is still a matter of, I do not know, a few hundred metres – it is not a long way.[16]

14 Athol Hodgson, *Submission no. 450*, p. 3.

15 Athol Hodgson, *Submission no. 450*, p. 4.

16 Athol Hodgson, *Transcript of Evidence*, 30 July 2003, p. 84.

3.21 On level ground a crown fire will not move ahead of an understorey fire beyond one and a half times the height of the trees.[17]

3.22 Fires that enter the crown or canopy of a forest are of great concern because they:

- Escalate the level of damage, especially in wet sclerophyll forest.
- Threaten the safety of fire fighters below.[18]

3.23 Broad scale prescribed burning also restricts the rate of spread of a bushfire by other means. An additional advantage of eliminating the fire brands that are capable of being carried on convection currents from the suspended layer into the crown is the limiting of the potential for a wildfire to spot out in front of itself in extreme fire weather. Broad scale burning eliminates the hanging eucalypt bark which in the windy conditions that accompany extreme fire weather conditions can act as firebrands spotting a fire several kilometres beyond the actual front.[19]

3.24 The Mountain Cattlemen's Association of Victoria (MCAV), many members of which were involved in fighting the 2003 fires, argued that if an adequate program of prescribed burning had been implemented by land managers, 'the fire would not have spotted so far and frequently in front of itself.'[20]

3.25 The IFA confirmed the significance of fire brands throughout the areas affected by the 2003 fires:

> in the mountain forests of the ACT, southern NSW and Victoria, spot fires were a significant factor in the breaching of containment lines during an unprecedented summer period of 10 days of mild weather with easterly winds. These fires would have been effectively contained, and firebrand spotting reduced had strategic hazard reduction burning been routinely carried out in previous years.[21]

17 Athol Hodgson, *Transcript of Evidence*, 30 July 2003, p. 84.
18 Institute of Foresters of Australia, *Submission no. 295*, p. 12.
19 CSIRO, *Submission no. 434*, p. 49.
20 Mountain Cattlemen's Association of Victoria, *Submission no. 424*, p. 2.
21 Institute of Foresters of Australia, *Submission no. 295*, p. 12.

3.26 The IFA argued that a refusal to implement a regime of broad scale prescribed burns posed a threat to life and property even when a bushfire occurred in a remote area:

> Under bad fire weather conditions, fires in remote wilderness areas can become very large very quickly, can coalesce and can result in massive fires driving out into state forests, plantations, country towns and even suburbia.[22]

3.27 The McLeod Report stated that:

> fuel reduction burning – although it is the only element in the 'fire triangle that can be manipulated – is never going to be a fail-safe remedy for bushfire risk in all circumstances.
>
> In relation to the January 2003 fires, the real significance of fuel reduction rests with the potential to control fires immediately after the lightning strikes on 8 January.[23]

Environmental consequences

3.28 The Committee received a wide range of views on the environmental effects of implementing regimes of prescribed burning. At a public hearing in Ballarat Dr Peter Attiwill, current Principal Fellow and Associate Professor in Botany at University of Melbourne, appearing on behalf the Institute of Public Affairs estimated the balance of academic opinion for and against prescribed burning for ecological reasons in the following proportions:

> If we are talking about the management of low heath lands like those we have at Wilson's Promontory, I think every ecologist would agree that they have to be burnt every 10 years. I think the Shea-Tolhurst group would be 90 per cent in favour and maybe 10 per cent against. When it comes to forests, again there is ideological opposition to burning – even among ecologists. But I would think that they would represent – I would have to guess – about a 75 per cent view.[24]

22 Institute of Foresters of Australia, *Submission no. 295*, p. 15.

23 Ron McLeod, *Inquiry into the Operational Response to the January 2003 Bushfires in the ACT*, August 2003, pp. 84-5.

24 Peter Attiwill, *Transcript of Evidence*, 30 July 2003, p. 47

3.29 Those passages of evidence which challenged the effectiveness and feasibility of broad scale prescribed burning suggested that increased frequency of burns in large areas could have deleterious effects on the environment through loss of biodiversity. They suggested that a regime of too frequent burning could alter the constitution of an existing ecological community increasing its flammability.

Effect on biodiversity

3.30 Professor Whelan suggested that the question of whether or not to implement a regime of broad scale prescribed burning, particularly in national parks, 'ought to be looked at as an issue of conflicting assets.'[25]

3.31 If a regime of burning to a single frequency was applied across the landscape biodiversity values would suffer:

> if a particular fire regime were uniformly applied across the landscape one particular group of species would be favoured. … Among those [species] that are lost are [those] listed as rare and endangered.'[26]

3.32 Concerns that a high frequency, low intensity fire regime would lead to a uniform ecological community were summed up by Professor Whelan in specifying different meanings of the phrase 'mosaic burning':

> This term 'mosaic burning' has been used colloquially to have two separate meanings. In discussions with the state government in New South Wales after the 2001 fires, evidence was given in the Blue Mountains using the term mosaic burning to mean that across the landscape we will have some patches of vegetation that are burned frequently and within the mosaic other patches that are burned infrequently.
>
> 'Mosaic burning' is more commonly used to describe a situation in which every patch in the landscape gets burnt … [for instance] every five years but not the whole landscape in any one year; so it is rotational.
>
> The consequence of that, if it were effectively applied across the landscape, is that after your first cycle of five years when the next fire was applied, no patch in the landscape would be

25 Robert Whelan, *Transcript of Evidence*, 8 July 2003, p. 35.

26 Robert Whelan, *Transcript of Evidence*, 8 July 2003, p. 37.

> older than five years – which is, after all, the intention of an effective hazard reduction program. The consequence of that is a change in the habitat to eliminate dense shrubs from the mid-storey, probably remove shrubs from the understorey, and therefore eliminate species like the long-nosed potoroo and the eastern bristlebird, which are common in [the Shoalhaven] region. It is not even an issue of their being able to escape the patch where the fire has burned now and then recolonise some other patch. Fire at that frequency changes the structure of the whole landscape.[27]

3.33 He contrasted the emergence of a less diverse ecological community that accompanies the implementation of a regular prescribed fire regime with the results of occasional high intensity wildfires:

> we always hear in news reports after big fires … that the landscape, the vegetation or the ecological community are destroyed. Even in the most intense fires, this is not the case. Individual organisms die in fires … but populations of organisms survive even high-intensity fires because they are able to recover afterwards, given enough time.[28]

3.34 However, he acknowledged the possibility that a regime of frequent low intensity fire may serve to protect environmental assets by reducing the possibility of a high intensity bushfire event:

> if it is indeed shown that high-intensity fire has caused the sort of damage from which species in the Snowy … will not recover, then obviously it is a fire regime that needs to be prevented in those areas.[29]

3.35 The BMCS specified some of the local fire sensitive species that had survived the effects of infrequent high intensity wildfire but may be threatened by regimes of more frequent low intensity fire:

> the Wollemi Pine and the dwarf creeping pine … are fire-sensitive species which live in restricted areas where they are protected from fire … They predated Aboriginal people … It would seem that in the absence of human management these species have survived.[30]

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27 Robert Whelan, *Transcript of Evidence*, 8 July 2003, p. 41.

28 Robert Whelan, *Transcript of Evidence*, 8 July 2003, p. 36.

29 Robert Whelan, *Transcript of Evidence*, 8 July 2003, p. 42.

30 Hugh Paterson, *Transcript of Evidence*, 9 July 2003 (Katoomba), p. 22.

3.36 The BMCS related how populations of mountain ash, brown barrels and black ash could be killed by a high intensity wildfire but, on maturity, can withstand low intensity fires. A high fire frequency when a population is younger could lead to the forest being killed and not replaced because there would not be any seed available. A very aged forest could be replaced by other species if a high intensity fire didn't occur before the trees stopped producing seed:

> Their natural fire regime is probably similar to the mountain ash forests in Victoria. They are forests that tend to be killed by very hot fire and then regenerate. There is seed release from the canopy and seedling recruitment … If there is a second burn when the forest is very young, those species will be lost.[31]

3.37 However, at a public hearing in Richmond an experienced fire fighter suggested that, in fact, there is evidence that intense wildfires rather than high frequency burning regimes are altering the structure of ecological communities. The:

> area west of Mount Tomah is now a completely different place from what it was before it was made a dedicated park …
>
> I believe that it is entirely due to National Parks and Wildlife doing no hazard reduction here. The only fires in this area since that time have been monster, out-of-control wildfires. I strongly believe that, unless in the unlikely event that National Parks and Wildlife completely change direction in their hazard reduction policy, it can never recover. This also applies to other national parks – for instance, the Royal in Sydney. This park has had a succession of enormous fires which are quite unnatural in this area. The proof they are unnatural can be seen by the size of the trees that have been killed. They have been there all that time and withstood thousands of low-intensity fires which have contributed to their growth. They did not evolve to withstand these monster fires …[32]

31 Hugh Paterson, *Transcript of Evidence*, 9 July 2003 (Katoomba), p. 22.

32 Brian Hungerford, *Transcript of Evidence*, 9 July 2003 (Richmond), p. 45.

3.38 Dr Peter Attiwill acknowledged the possibility of losing species locally in any fire regime but he set local losses in a broader context:

> When you go into the high country and see large bare patches within a forested area, that is undoubtedly where there has been a second fire after a previous one and the second fire has come too early for the community to have set seed. [However] that is a component of biodiversity itself. The idea that we should have all of this area entirely covered with 10 points of biodiversity is wrong because a major component of biodiversity is the difference between this bit of land on this ridge, that bit of land on the northern ridge and the other bit of land in the gully.[33]

3.39 The CSIRO stated that:

> Alpine Ash (*Eucalyptus delegatensis*) … do not resprout after crown scorch but will regenerate en masse from canopy stored seed released from capsules after a hot fire. However, this species can withstand very low intensity burns if there is no canopy scorch. This contrasts with other high altitude dominant species such as Snow Gum (*Eucalyptus pauciflora*), Mountain Gum (*E. dalrympleana*) and Broad-leaved Peppermint (*E. dives*) which will repsrout from epicormics and lignotubers … Stands of Alpine Ash are therefore found in more protected situations … where the frequency and intensity of intense fires is low and stands tend to be even aged … catastrophic fires may be necessary for stand replacement. However, the long term effects of hazard reduction burns are not known.[34]

3.40 During its inspections through the Omeo area on 22 May 2003 the Committee witnessed the wide ranging devastation of Alpine Ash forests. The Committee was concerned that, in fact, infrequent high intensity fire storms are more likely to devastate these forests than a carefully researched and applied regime of low intensity frequent burns which takes into account regeneration of juvenile populations after a high intensity fire.

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33 Peter Attiwill, *Transcript of Evidence*, 30 July 2003, p. 50.

34 CSIRO, *Submission no. 434*, p. 29.

3.41 Mr Cheney of the CSIRO stated that:

> There were certainly areas, burnt under the extreme conditions, which not only suffered a fire effect, but where extraordinarily strong winds moved a lot of material off the surface to the degree that the bark on certain species had been sandblasted off by the moving soil. … In those areas, a certain amount of the seed that was in the topmost layer of the soil will disappear. Other seeds, deposited lower in the profile, will undoubtedly regenerate. It is difficult to generalise, but probably there will be strong legume regeneration through a lot of those areas.
>
> Whether the ash forests regenerate will depend a bit on whether they were carrying seed at the time and then what happens to it. In the areas west of the ACT the forest will … conservatively … take more than 200 years to return to anything like their original condition because many of the trees have not shot; only the largest have shot from the base. That means you will have a coppice forest … in that area. It will be a long time before it comes back to a single-stemmed forest.[35]

3.42 Dr Kevin Tolhurst, a senior lecturer in Fire Ecology at the University of Melbourne, stated:

> The fire that we had this summer did not, in a lot of areas including the Big Desert and eastern Victoria, leave … unburnt patches. The time of recovery in some of those areas is going to be enormous. Up on some of the high plains it is not too bad, but down in some of the foothill country it has been quite comprehensive in the way it has burnt those areas. What I am suggesting is that if we have more prescribed fires across the landscape, not only does it provide opportunities to suppress fires, it provides refuge for plants and animals during the fire event and provides boundaries from which you can actually help suppress fires. There have been quite a few examples over the summer of where prescribed burns were quite useful in the suppression operation.[36]

35 Phil Cheney, *Transcript of Evidence*, 22 August 2003, p. 38.

36 Kevin Tolhurst, *Transcript of Evidence*, 30 July 2003, p. 60.

3.43 This view was supported by Mr Cheney:

> if there is a frequent fire regime which is applied basically under moderate weather conditions, these niches [rocky outcrops, deep valleys and deep gullies] are more likely to be left behind. As these recent fires showed, when you get extensive fires under drought conditions, the burning is also very uniform. It goes into just about every niche. It is only very remote niches that miss out.[37]

3.44 Mr Peter Bentley, a consultant in natural resources management, specified time periods for recovery of some of the fire affected ecological communities:

> Some of those plant associations … will probably start to recover within one to three years. For some of the older classes – for instance, *Eucalyptus delegatensis* – you are looking at recovery time frames of 15 to 25 years. For some of the snow gum country you are probably looking at in excess of 50 to 75 years before you will see full recruitment and composition of those communities that existed before.[38]

Effect on flammability

3.45 Ms Susie Duncan of the Wilderness Society referred to the possibility of prescribed burning increasing fuel loads:

> In our local Chiltern-Pilot area, we have dry forests that merge into woodlands. They tend to have a very rapid leaf drop afterwards [a fire]. Some of the moister forest types have some resilience to fire and may be less inclined to drop as much, unless they have a particularly large amount of bark that will fall.[39]

37 Phil Cheney, *Transcript of Evidence*, 22 August 2003, p. 33.

38 Peter Bentley, *Transcript of Evidence*, 30 July 2003, p. 54.

39 Susie Duncan, *Transcript of Evidence*, 25 July 2003, p. 69.

3.46 Mr Evan Rolley of Forestry Tasmania acknowledged the possibility that the implementation of a too frequent regime of prescribed burning could have the undesirable consequences of increasing the flammability of the landscape through changes of species from those that are non flammable fire intolerant, such as those for instance that are found in rain forests, to those that are flammable fire tolerant:

> Too frequent a burning will just produce more flammable material on a regular basis, so you lock yourself in to having to burn every couple of years.[40]

3.47 The VNPA provided an example of a regime of prescribed burns increasing the flammability of an area by altering the constitution of the ecological community to increase its flammability:

> The alpine and sub-alpine area is one of these [environments where prescribed burning will actually increase rather than reduce fuel loads]. The removal of grass cover encourages the germination of shrub seedlings and regular fire will favour those species that can take advantage of the bare ground … Some of these shrubs such as *Bossia foliosa* and *Ozothamnus hookeri* can increase rapidly after fire and will burn fiercely in any subsequent fire.[41]

3.48 Obversely, the CSIRO stated that in alpine and subalpine environments the long term absence of fire appears to encourage ecological communities that are fire resistant:

> In the absence of fire in the longer term, the shrub layer senesces and becomes replaced by snow grass and herbaceous species.[42]

3.49 Mr Ian Haynes confirmed the resistance to fire of grassland as opposed to heathland:

> I walked through Kosciuszko after the fire … As the ember storm went through it started fires anywhere the plant communities were slightly open, wherever there were some woody plants.

40 Evan Rolley, *Transcript of Evidence*, 1 August 2003, p. 3.

41 Victorian National Parks Association, *Submission no. 176*, p. 8.

42 CSIRO, *Submission no. 434*, pp. 29–30.

> If the grass thatch was very tight and close there was hardly a mark on the grass. You might find a piece the size of these coasters where the fire was starting to go out. In other places it roared straight through. Anywhere amongst the trees where there was woody material it would burn straight through.[43]

3.50 The Committee also received suggestions that with a regime of frequent fire:

> There is … a possible impact on soil invertebrates … that may result in the rate of breakdown of leaf litter being reduced.[44]

3.51 The Convenor of the Albury-Wodonga Environmental Centre and lecturer with the Department of Environmental Management and Ecology at La Trobe University expressed concern that:

> there is a danger that future fuel reduction programs might become a bit overzealous, in an attempt to compensate for alleged deficiencies in previous management approaches. I think that this could be extremely ecologically harmful, if it occurs. The soil and litter organisms … are really critical aspects of the health of forest ecosystems … They are critically involved in the decompositional and nutrient recycling processes.[45]

3.52 However, Dr Attiwill claimed that:

> there is no doubt that we should prescribe burn under most conditions – the situation is the same the world over, not just in Australia – otherwise organic matter builds up. This organic matter eventually locks up nutrients, and ecosystems become less productive. This was the experience in Yellowstone. The fire rejuvenated not just the plants and animals but the ecological processes on which sustainability depends.[46]

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43 Ian Haynes, *Transcript of Evidence*, 14 July 2003, p. 52.

44 Victorian National Parks Association, *Submission no. 176*, p. 8.

45 Dennis Black, *Transcript of Evidence*, 25 July 2003, pp. 63–64.

46 Peter Attiwill, *Transcript of Evidence*, 30 July 2003, pp. 50–51.

3.53 The General Manager of the Snowy River Shire Council, Mr Ross McKinney, who has extensive experience in land and fire management emphasised the paucity of knowledge on the effect of invertebrates on fuel loads:

> if you want to ask someone, 'What is the number of insects per square metre in leaf litter and what contribution does that make to the overall ecology?' you will not get an answer. The reason you will not get an answer is that the work is not being done. There is no real definitive research being conducted here which would lead anyone to a scientific direction on the role, the use or the frequency of fire in that area.[47]

3.54 Claims of prescribed burning increasing the flammability of an ecological community by compromising the rates of breakdown of fuels were countered by claims that high intensity wildfires, which eliminated forest canopy, increased the flammability of ecological communities. The Kurrajong Heights Brigade stated that in implementing a regime of prescribed burning:

> we have encouraged the big trees at Kurrajong Heights – the canopies tend to interlock. That suppresses the sunlight, retains the moisture in the ground and the humus rots down quicker. If you get a wildfire through, it kills your big trees. Once you kill your big trees off, it is a whole different process, because it then tends to come back as scrub. The scrub burns hotter next time because the fuels are more compacted …[48]

Weeds and fire

3.55 The relationship between weeds and fire is mutually beneficial. Weeds accumulate quickly seizing opportunities in open ground following high intensity fire. They dramatically increase fuel loads and thus the intensity as well as the rate of spread of any fire subsequent to the infestation.

47 Ross McKinney, *Transcript of Evidence*, 10 July 2003, p. 53.

48 Brian Williams, *Transcript of Evidence*, 9 July 2003 (Richmond), p. 22.

3.56 Typical of evidence received on the effect of weeds on fire was the observation of the Captain of the Dartmouth Rural Fire Brigade:

> noxious weeds along streams and throughout the bush … were the greatest heat zones in the fire due to the amount of fuel they created.[49]

3.57 In addition to evidence of the contribution made by weeds to fire intensity, the Committee heard that weeds reduced the effectiveness of rivers as fire breaks. A land holder in the area to the west of the Australian Capital Territory stated that:

> The black berries in the park are incredibly invasive and border all along the Goodradigbee River. They are … of considerable threat to neighbouring property owners because of their volatile nature in the event of a fire in the summer.
>
> The river is not a firebreak in any sense. There is a canopy over the entire river, and the park side is very dense – in some areas, up to 200 metres thick – with blackberries.[50]

3.58 Another landholder from the area described explicitly how blackberry infestation made obsolete expectations that the Goodradigbee River would operate as a fire containment line:

> They may say that they put firebreaks in on the western front, but that was only for a very short distance. The majority was left unprotected. I believe the river was thought of as a containment line. Having numerous trees across it and blackberry infested riverbanks in some areas spanning less than two metres apart, it made an ineffective containment line.[51]

3.59 However, fire also aids the spread of weeds. The National Association of Forest Industries (NAFI) referred to the effect of bushfire on weeds:

> All that is happening [in the wake of the 2003 fires] is that blackberries are taking over in those areas that have been burnt. You can see them to the south of Canberra … [and] as you move through Kosciuszko National Park …[52]

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49 John Scales, *Submission no. 162,* p. 6.

50 Katja Mikhailovich, *Transcript of Evidence*, 14 July 2003, pp. 85–86.

51 Wayne West, *Transcript of Evidence,* 14 July 2003, p. 32.

52 Phil Townsend, *Transcript of Evidence*, 14 July 2003, p. 15.

3.60 The significance of some weeds for the implementation of regimes of prescribed burning was explained by Mr Donald Matthews with reference to the life cycles of Blackberry (*Rubus fruticosus*) and Bracken Fern (*Pteridium aquilinum*):

> Both are perennials with biannual foliage, [that is] the first years growth is lush vegetation which in the second year becomes hardened and highly flammable and then dies…[53]

3.61 The germination of Blackberry seed is stimulated by heat. Bracken Fern has an extensive underground rhizome system and its foliage is allopathic, that is it inhibits the growth of other species, thus ensuring it out competes them after a fire. Mr Matthews' submission stresses the importance of applying herbicide to these weeds within the first year of a fire in reducing fuel.

3.62 Fuel reduction of weeds through the application of herbicide was supported by the Conservation Council of Western Australia (CCWA):

> there are different ways of reducing the flammable vegetation and it is not necessarily through fire, because you get this immediate response from the fire weeds, whether it is exotic weeds or our plants, which respond massively to fire. You get a very quick build-up so that the protection offered by this burning reduction is very short-lived.[54]

3.63 Mr Alan Walker, the Director of Regional Services with CALM indicated that the impact of fire regimes on levels of weeds was an important consideration of the implementation of prescribed burns in Western Australia:

> On the Swan coastal plain, where there are mostly woodland species – banksia woodlands and tuart woodlands – we recognise that frequent fire will increase the risk of weed invasion and other threatening processes associated with frequent disturbance, so we adopt a very different regime for fire on the Swan coastal plain …[55]

53 Donald Matthews, *Submission no. 43*, p. 1.

54 Beth Schultz, *Transcript of Evidence*, 6 August 2003, p. 35.

55 Alan Walker, *Transcript of Evidence*, 6 August 2003, p. 79.

Effect on soil erosion and water siltation

3.64 Advocates of broad scale prescribed burning referred to the environmental damage following a high intensity wildfire:

> Major intensity wild fires … create conditions for an enormous loss of topsoil and humus due to erosion and with it the resultant loss of nutrients. The silt run off after rain finds its way into all the gullies, creeks and rivers, adding to the environmental damage[56]

3.65 The Department of Environment and Heritage recalled the reason for the institution of many national parks was the maintenance of good quality catchment areas:

> The area that is now Namadgi National Park was included in the Australian Capital Territory to provide catchment for Canberra's water supply. Kosciuszko National Park was established in 1944 to protect the catchments.[57]

3.66 Mr Bentley reported that in the wake of the fires in north eastern Victoria that the health of the catchments had been compromised:

> You are … seeing effects where you will get excessive nutrient sediment run-off. You will see changes in hydrology: certainly the streams will take one to five years to recover, particularly after flash flooding events. There are myriad effects that come to the community downstream.[58]

3.67 A manager of the North East Catchment Management Authority, a Victorian statutory authority which manages the Upper Murray, Mitta, Kiewa, Ovens and Kings Rivers, confirmed an increase of silt in water ways:

> The initial monitoring events … were indicating that the turbidity readings were at about 50 NTU—NTU being the measurement unit. Normally we would expect that to be in the tens.[59]

56 Kurrajong Heights Rural Fire Brigade, *Submission no. 158,* p. 7.

57 Bruce Leaver, *Transcript of Evidence,* 22 August 2003, p. 40.

58 Peter Bentley, *Transcript of Evidence,* 30 July 2003, p. 54.

59 Geoff Robinson, *Transcript of Evidence,* 25 July 2003, pp. 81–82.

3.68 The Committee observed first hand the graphic effect of soil erosion and siltation of waterways at Junction Shaft during its inspection in Kosciuszko National Park on 21 May 2003. The surrounding area was observed as having been clearly subjected to an intensely hot fire and the subsequent affect on the water storage was depicted by a red 'oily' sludge.

3.69 A landholder in the Naas district of the Australian Capital Territory described the effects of siltation following the bushfire:

> We have two creeks [on our property]… Before the fire, they were typical mountain streams. They had rocky holes and everything else. At the top of our place, adjoining the National Park, it looks like somebody has poured concrete there. The creek is now two or three inches deep and there is just silt and gravel. It is like somebody has got concrete and poured it there. You can just see it and screed it off. All of the holes have filled up. We had people clearing the trees and excavating down to the hole that we pump from below the house. They pulled out roughly 40 cubic metres of soil, they estimated.[60]

Grazing

3.70 An alternative method of broad scale fuel reduction is through the implementation of grazing. Grazing leases were not renewed in the Kosciuszko National Park from 1969 with 'Permissive occupancies allowed to run their term to 1975'.[61] Pastoral activities are allowed, but at a much diminished level, in Victorian national parks.

3.71 Evidence from the Gippsland and north east regions of Victoria and the south east region of New South Wales, included calls for the reintroduction and expansion of grazing in national parks as a fire mitigation strategy.

60 Stephen Angus, *Transcript of Evidence*, 15 July 2003, p. 83.

61 Robert Maguire, *Transcript of Evidence*, 10 July 2003, p. 95. The Department of Environment and Heritage, stated that permissive occupancies expired in New South Wales in 1972.

3.72 The MCAV made two general observations on the effect of grazing on the 2003 fires:

- grassed and grazed areas of members' licences did not burn; and
- former licence areas that have been excluded from grazing, especially in areas where heath has flourished since the removal of grazing, did burn.[62]

3.73 As with fuel reduction strategies in general, 'The cattlemen do not claim that grazing prevents fire, only that it reduces fire.'[63] A member of the MCAV, suggested that grazing played an important role in preventing the emergence of a fire tolerant, flammable ecological community immediately following a wild fire event:

> Directly after the '39 fires … vast numbers of sheep and cattle were grazed on the Bogong High Plains. This post fire grazing helped to control an explosion of woody species thus preserving these highly sought after alpine meadows …[64]

3.74 The importance of grazing immediately after fire as a control of woody weeds was emphasised:

> I do not believe cattle have a direct impact on weeds … blackberry, broom, or whatever it is in that area—cattle grazing probably would not have had a big impact on them until after the fire. As for the short new growth of those weeds, the cattle will graze them. Prior to the fire, the cattle would not go near them.[65]

3.75 It was also suggested that an explosion of woody weeds and the loss of grassland would result in a:

> loss of water quality, as woody species can't hold back soil as effectively as grass during the torrential downpours commonly experienced in the high country.[66]

62 Mountain Cattlemen's Association of Victoria, *Submission no. 424,* p. 2.
63 Mountain Cattlemen's Association of Victoria, *Submission no. 424,* p. 2.
64 Mountain Cattlemen's Association of Victoria, *Submission no. 424,* p. 9.
65 Jack Hicks, *Transcript of Evidence,* 24 July 2003, p. 66.
66 Mountain Cattlemen's Association of Victoria, *Submission no. 424,* p. 10.

3.76 A landholder and Group Captain in the Snowy River area stated that:

> The Gungahlin River … and I have land there – has been grazed … We stopped the fire on that particular front. The Gungahlin River is the only river in the Snowy catchment area that was not affected by fire … There is a piece taken over by the national park … that burnt.[67]

3.77 The New South Wales Manager of Timber Communities Australia (TCA), Mr Peter Cochran stated:

> In these recent fires the only area that was not burnt to any extent was the area where the brumbies run in the northern end of the Kosciuszko National Park. The fact that brumbies graze the areas up there unquestionably prevented the area from being burnt out.[68]

3.78 The effectiveness of grazing in reducing fuel was not simply limited to the action of livestock on the biomass of an area. A landholder explained that the land management practices of graziers also contributed to the mitigation of fire:

> From 1972 to 1988 there was a 16-year fuel build-up in Byadbo, with the only successful hazard reduction burn in Jerrys Flat area – approximately 350 hectares. From January 1998 to December 2002 very little success with the autumn burns resulted in another wildfire. I believe the significance of these two periods relates to the lack of burns – which had been conducted by local graziers from Tingaringy Mountain to the south-west and Kangaroo Ground Creek to the north prior to 1972 – and the fact that, up until this time, cattle grazing was permitted.[69]

3.79 The VNPA rejected calls for an increase of grazing in national parks pointing out that:

> Of the 62 grazing licences in the Alpine National Park 42 were burnt or partly burnt. In the surrounding state forests, 92 licences were burnt out of a total of 129. A total of 240,000ha under grazing licences within the Park that was burnt

67 Darvall Dixon, *Transcript of Evidence*, 10 July 2003, p. 5.

68 Peter Cochran, *Transcript of Evidence*, 14 July 2003, p. 29.

69 Clive Cottrell, *Transcript of Evidence*, 10 July 2003, p. 4.

> amounting to approximately 93 percent of the area of all national park grazing licences within the fire area.[70]

3.80 In the 2003 fires on the Bogong High Plains of north east Victoria:

> The most flammable parts of the alpine / treeless subalpine landscape are the heathlands … because of fuel architecture. The closed heathlands also occur on the steeper slopes and intensity and rate of spread increase with increased slopes.
>
> Grasslands, on the other hand, occur on the gentle slopes, and the grass fuels are less flammable than the shrub fuels … There are even examples on steep slopes, where 0.2-1 ha areas of snow patch herbfield / grassland were unburnt, even though the surrounding heath was severely burnt.
>
> Cattle prefer the open grassy communities, where there is the greatest abundance of palatable species.'[71]

3.81 In response to claims that grazed areas had allowed bushfires to be brought under control and extinguished the Centre Director of Asset Protection, Forestry and Forest Products of the CSIRO, Mr Tim Vercoe stated:

> Without looking at the particular cases, the comments I would have would be that it is possible that those areas would have stopped the fire anyway in the absence of grazing – the issue being that grazing normally occurs on the wetter and boggier areas. The other thing that grazing can do is increase accessibility to some of the areas, and accessibility is certainly a factor in tackling the fires.[72]

3.82 The CSIRO qualified many of its statements on grazing as a successful fire mitigation strategy by stating that more research was needed in this area. However, as an example of the apparent ineffectiveness of grazed land in stopping wildfire, the CSIRO cited the fire event:

> from Spion Kopje of the unburnt snow patch herbfields on steep slopes surrounded by severely burnt heath was from country that had been ungrazed for 12 years.[73]

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70 Victorian National Parks Association, *Submission no. 176*, p. 9.

71 CSIRO, *Submission no. 434*, pp. 22–23.

72 Tim Vercoe, *Transcript of Evidence*, 14 July 2003, p. 65.

73 CSIRO, *Submission no. 434*, p. 23.

3.83 On the issue of cattle grazing in national parks, the CSIRO concluded its consideration in the following terms:

> Stock reduce the rate of recovery of vegetation, at least in the early recovery phases of regeneration … It will be impossible to keep stock out of burnt bogs and off steep, burnt slopes – areas that will be particularly susceptible to trampling. Thus, continued grazing post-fire is a threat to both catchment and biodiversity values.[74]

3.84 During a public hearing at Wodonga the ongoing status of the CSIRO's conclusions was emphasised:

> Like all scientific work, [CSIRO research] is ongoing, and to have a straight conclusion from that is very unlikely … I believe the CSIRO will go back now and probably include this in their studies on from here. The fact is that CSIRO did not do studies straight after 1939. There has not been a wildfire in a grazed area of the Bogong High Plains since then, so I think they are going to learn a lot from the grazing of the alpine area.[75]

3.85 Dr Kevin Tolhurst summed up the contradictory evidence of the impact on grazing on mitigation of bushfire damage:

> I do not think there is any definitive answer to that. A few months ago I saw some … plots up on the Bogong High Plains. You can go to one plot which has been a grazing exclusion plot … I think they were established in about 1944 so they have been ungrazed a long period of time – and see that inside the fence area has been burnt and it has not been not burnt outside. You go to the next plot and you can see the reverse: it has burnt up to the fence and gone out.
>
> I guess for a bigger contrast you can compare the fire that burnt in Caledonia in the 1997 which burnt through an area that had been under grazing and which burnt very intensely. Looking at the area that was grazed this year, it was quite patchy. It was more about how the fire got to those areas and how it burnt. In the Caledonia fire it ran up from a low valley up and across the high country and out. Whereas the fires

74 CSIRO, *Submission no. 434*, p. 24.

75 Jack Hicks, *Transcript of Evidence*, 25 July 2003, p. 3.

> that started this year basically started in the high country and burnt down … I do not think that grazing can clearly be defined as being massively helpful or massively unhelpful from a fire suppression point of view.[76]

3.86 Clearly, a great deal more research is required on the effects of grazing on the environment and as a land management practice that mitigates the bushfire damage, both immediately following a fire event and in the long term.

Strategic fuel reduction

3.87 Passages of evidence that raised concerns about the environmental impact of regimes of broad scale prescribed burning on the environment offered an alternative strategic fuel reduction program of mitigating wildfire damage. This involves the implementation of fuel reduced asset protection zones through known fire paths and around assets to be protected.

3.88 Professor Whelan stated:

> Hazard reduction, including hazard reduction by frequent burning, has its place. It is very important in protecting lives and property and should be used that way. It should not be used as a technique uncritically applied right across the landscape, because we would then undermine all the things we have tried to achieve in the area to protect other assets.[77]

3.89 The VNPA stated that:' 'In general for fuel reduced areas to be useful, they need to be near to the assets to be protected …'[78]

3.90 Because of the smaller area and greater accessibility of such zones fuel reduction could be implemented through an array of methods including burning, grazing, the application of herbicide, mowing and slashing.

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76 Kevin Tolhurst, *Transcript of Evidence*, 30 July 2003, p. 64.

77 Robert Whelan, *Transcript of Evidence*, 8 July 2003, p. 44.

78 Victorian National Parks Association, *Submission no. 176*, p. 8.

3.91 The Manager of the Fire Services Branch in CALM indicated the maximum frequency of burning required for effective asset protection zones in Western Australia:

> In the last 10 years, the shortest would be about five or six years. There are very few cases, but they would be particularly around high-value town sites.[79]

3.92 A representative of the Alpine Shire Council alluded to an understanding of strategic fuel reduction in its most comprehensive sense as a strategy that goes beyond the establishment of protection zones immediately adjacent to assets:

> we have had a history of fires in certain locations where, strategically, areas should be perhaps maintained to a higher standard … strategically you should look at some of your key assets to prevent it spreading to other areas of the national park or to towns and population centres. We believe there could be improvements to a strategic plan – trying to improve those containment lines or containment areas more so than containment lines.[80]

3.93 Dr Tolhurst referred to a study into the effectiveness of strategic burning:

> The result of that work basically showed that the burning in the fuel management's zone ones – the areas closest to private property or high value assets – was good value for money in that the fires were running into those zones and were actively helping fire suppression efforts more than would have been expected just on the basis of chance. Zone ones represent somewhere between three percent and five percent of the parks and forests, a pretty small and very localised area – up against people's back fences, effectively. So that is good value for money. We did not address whether enough of that was being done but what was being done was effective.
>
> Similarly, in fuel management zone twos, which are strategic corridors, it was good value for money in the sense that it was assisting in the suppression effort. Fuel management zone two might represent up to 20 percent of the estate, so that

79 Rick Sneeuwjagt, *Transcript of Evidence*, 6 August 2003, p. 80.

80 Ian Nicholls, *Transcript of Evidence*, 24 July 2003, p. 51.

> leaves us with about 80 percent of the public land. But the issue for protection is less clear there. We found that there is an even chance as to whether a fire would run into a prescribed fire across that other 80 per cent of the landscape. We were getting benefits from those fires in the landscape but only in proportion to the number that had been done.[81]

3.94 The CSIRO questioned the effectiveness of fuel reduced asset protection zones as, by themselves, providing an adequate level of protection:

> Grazing by livestock, either present (Victoria and areas close to Canberra) or absent (much of the Kosciusko area), made little difference to the spread or intensity through alpine (high altitude treeless) regions.
>
> Certain parts of Canberra received substantial ember attack where hundreds of meters of well grazed paddocks existed between them and the forest fuels.'[82]

3.95 The implementation of protection zones, like fuel reduction strategies more generally, do not aim at creating a desert area devoid of vegetation: 'Overclearing can result in serious erosion issues.'[83] Further advantages of maintaining some vegetation in fuel reduced asset protection zones were pointed out by the BMCS:

> It is not good to remove every tree around the house … because some trees … can reduce wind speed and can intercept ember attack and provide some protection for the house. So it is not necessarily appropriate to remove every tree… but it is certainly not appropriate to have a continuous canopy of trees from the bush right up to the house and overhanging it.[84]

3.96 The Committee received evidence referring to areas where regimes of strategic prescribed burning have been successfully implemented. The Kurrajong Heights Brigade outlined details of its Strategy of a Zoned Approach to Hazard Reduction that it has developed over the last 25 years.

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81 Kevin Tolhurst, *Transcript of Evidence*, 30 July 2003, p. 59.

82 CSIRO, *Submission no. 434*, pp. 7–8.

83 Frank Garofalow, *Transcript of Evidence*, 9 July 2003 (Katoomba), p. 2.

84 Hugh Paterson, *Transcript of Evidence*, 9 July 2003 (Katoomba), p. 24.

3.97 The strategy involves conducting burns of 500 to 1000 hectare through 18 designated blocks on different years through a seven to 15 year cycle in an interlocking mosaic pattern.[85] The Brigade stated that within this regime there is further variation of fire frequency:

> Our main fire paths are from the north north westerly direction. we burn areas on the eastern side of the mountain a lot less frequently, because on the eastern side of the mountain the moisture is contained more, it is not exposed to the same winds, the build up on the forest floor rots down quicker …[86]

3.98 The Kurrajong Heights Brigade suggested that asset protection zones consist of three blocks, burnt in different years, lying between bushland and the assets to be protected. An effective system of asset protection zones involves significant maintenance and involves more than maintaining a narrow deforested area of 30 or even 100 metres around assets. It requires the implementation of a carefully planned strategy over many years and significant areas of land.

3.99 The Program Leader in Natural Systems with the BMCC stated that the Council's long term fuel reduction plan involves attempting to:

> hazard reduce everything between a set period. That period ranges, depending on the severity of the location, between once every 10 years and once every 20 years …[87]

3.100 According to Professor Whelan, a regime such as that proposed by the BMCC is environmentally sustainable:

> a fire every 10 years on the ridge tops in the Hawkesbury sandstone – and by the Hawkesbury sandstone I mean the plateau vegetation surrounding Sydney and surrounding this region … at that frequency is at the lower end but it is within the realms of survivability, if you like, for most of the species we know about.[88]

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85 Kurrajong Heights Rural Fire Brigade, *Submission no. 158*, p. 11 and Brian Williams *Transcript of Evidence*, 9 July 2003 (Richmond), p. 17.

86 Brian Williams, *Transcript of Evidence*, 9 July 2003 (Richmond), p. 22.

87 Frank Garofalow, *Transcript of Evidence*, 9 July 2003 (Katoomba), p. 18.

88 Robert Whelan, *Transcript of Evidence*, 8 July 2003, p. 38.

A comprehensive strategy of fuel management

The implementation of a program of prescribed burns in south western Australia

3.101 Mr Alan Walker of CALM acknowledged the importance of tailoring regimes of prescribed burning to local requirements:

> In terms of some of the species that occur in wetlands and in areas where there are deep peat deposits, we need to adopt a more precautionary approach in ensuring that those habitats are afforded proper protection, for fairly obvious reasons. Similarly, where there are species known to us that have longer periods of time to first flowering, and there is the need to take those life attributes into account in the interval between fires, that is part of the biodiversity project that we are building at the moment, which will take into account the special needs of particular species.
>
> I would also have to say, though – and this is a generalisation – that many of the species that require the longer intervals between fires occur in riverine areas or riparian areas – moister areas in the landscape – around rock outcrops and so on. We would not aim to burn those every time the area is burnt. We would plan for a longer interval in those parts of the landscape in a prescribed burning regime. That is very much a generalisation and a simplification of what happens, but where we understand and know that there are special needs of species or ecological communities we are building that into the fire regime.[89]

3.102 The Committee was informed that CALM had;

> left a couple of areas for more than 60 years, because it is very important for research. We have a significant number of designated areas, where we have planned not to burn in the foreseeable future.[90]

89 Alan Walker, *Transcript of Evidence*, 6 August 2003, p. 78.

90 Rick Sneeuwjagt, *Transcript of Evidence*, 6 August 2003, p. 81.

3.103 The development of prescribed burning plans needs to be flexible, taking particular account of the impact of other unprescribed fire events:

> It makes no sense … with the limited opportunities we have, to reburn something right next to it, after a wildfire. It is an automatic part of our review and future planning that we take account of past fires, current fires and our achievements in that prescribed burning program.[91]

3.104 The Executive Chair of the Division of Environment and Natural Resources of the CSIRO, Dr Stephen Morton, referred to specific burning guides that had been developed with CALM:

> These burning guides attempt to show what sorts of outcomes you might achieve under different burning regimes, both on the biodiversity side and on the hazard reduction side.[92]

3.105 Mr Walker stated that:

> to some extent the scientific underpinning of the planning and implementation of a managed fire regime in the south-west is still a work in progress. We have settled on the principles and the objectives for how we are going to manage biodiversity and other values through our fire management program, but the proper underpinning of that, the scientific underpinning for what happens in practice, is still to be written up and peer reviewed. The form that will take was subject to discussions earlier today about the importance of having the proper scientific peer review of the methods that are going to be applied. To that extent we have not got to that point yet, so we are not at a point where we can communicate with confidence the full extent of the way we are going to go about implementing this planning and management approach.[93]

91 Rick Sneeuwjagt, *Transcript of Evidence*, 6 August 2003, p. 81.

92 Stephen Morton, *Transcript of Evidence*, 22 August 2003, p. 32.

93 Alan Walker, *Transcript of Evidence*, 6 August 2003, p. 69.

3.106 The Committee was impressed at the level of detail and accuracy in reporting and mapping of achieved areas of prescribed burns during a presentation by officers from CALM on its inspections of the Manjimup area on 5 August 2003. At a public hearing in Perth on the following day the acting Executive Director of CALM explained in greater detail the status of and relation between areas affected by prescribed burning and wildfires:

> We reached about 150,000 hectares in round figures of prescribed burning in the area in question, and wildfires burnt – and the figure is in our submission – 133,000 hectares. I just comment, though, that while future planning will certainly take account of what has been burnt by wildfire, we do not see the two figures as adding up to exceeding the prescribed burn target, because the wildfires are not in a pattern or in locations equivalent to what we would plan.[94]

The implementation of a program of prescribed burns in south eastern Australia

3.107 The level of endeavour apparent in the cooperation between the CSIRO and CALM and the accumulated knowledge of fire behaviour in specific locations was starkly contrasted with the situation in mainland eastern states:

> In Western Australia, the Department of Conservation and Land Management has been conducting prescribed burning to meet fire protection, forestry and ecological objectives in a scientific way since the mid-1960s. The planning process starts seven years in advance of each prescribed burn. Individual burning guides have been developed through empirical research for all their major fuel types including dry Jarrah, to tall wet Karri forest, conifer plantations and Mallee shrublands.
>
> In the eastern states prescribed burning is largely carried out using rules of thumb based on a MacArthur's original burning guide for dry eucalypt forests produced in the 1960s.

94 Keiran McNamara, *Transcript of Evidence*, 6 August 2003, p. 75.

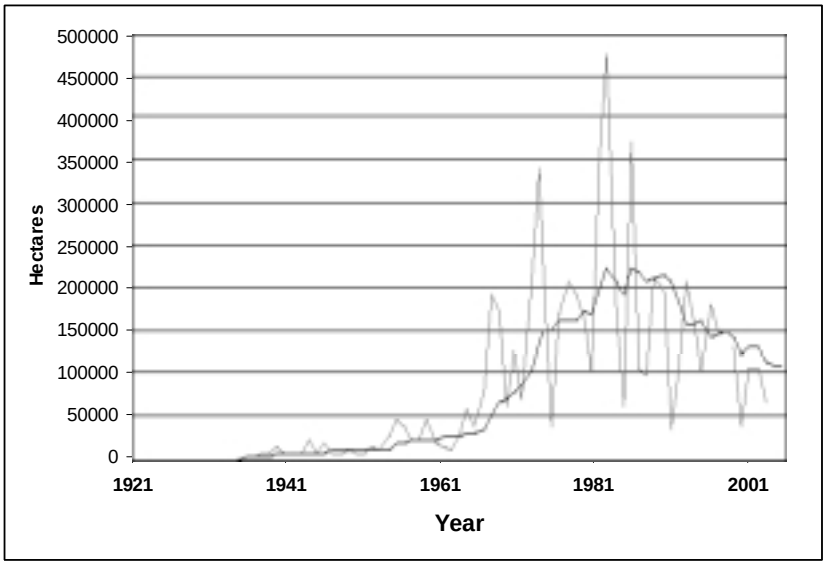
> Only one specific new burning guide has been developed and that was for burning under young regeneration of silver top ash in New South Wales State Forests. Clearly, if prescribed burning is to be conducted in a more professional way in New South Wales there is an urgent need for new and better burning guides that can be applied to a whole range of different fuel types.[95]

3.108 This state of affairs was echoed by the IFA:

> the states are more or less advanced in the development of basic fire behaviour information. In some states, principally WA, there are excellent fire behaviour models that allow precision burning to be controlled.[96]

3.109 The Committee received a considerable body of evidence claiming that prescribed burning programs across all jurisdictions had declined. Of particular concern was the decline of the programs in Victoria.

Figure 3.2 Area of fuel reduction by prescribed burning on public land in Victoria from year to year and as a 10 year average



Source: Athol Hodgson, Submission no. 450, p. 5. Cited from K. Tolhurst, 'Prescribed Burning in Victoria: Practice and Policy', Bushfires Conference, Institute of Public Affairs, Melbourne 11 March 2003. The paper is available at http://www.ipa.org.au/pubs/special/bushfires/tolhurst.pdf.

95 CSIRO, *Submission no. 434,* p. 52.

96 Institute of Foresters of Australia, *Submission no. 295,* p. 14.

3.110 The Committee received evidence that, in some jurisdictions, the reporting of the success of a prescribed burn in terms of area burnt was inflated beyond the areas actually burnt. The Captain of the Mitta CFA alluded to the problem of over-reporting in Victoria:

> When a fire has been started as part of a reduction burn but it does not 'take', the area cannot be set aside as 'burnt'. It can be classified as burnt only if, in fact, the fuel has been burnt effectively.[97]

3.111 The situation appeared to be no better in New South Wales where Mr David Glasson reported: 'In a recent situation National Parks claimed an 80 percent burn and a local volunteer claimed that 20 percent was burnt.'[98]

3.112 Besides constituting a significant problem in gauging the effectiveness of particular prescribed burns in mitigating the threat of future bushfires to life and property, inaccurate reporting of achieved areas means that no steps towards an environmentally sustainable program have been taken.

The way forward

3.113 The Committee commissioned a consultant with 20 years of practical experience in fire ecology, management and planning and an extensive knowledge of vegetation in south eastern Australia, Mr Nic Gellie, to report on what might reasonably be achieved in fuel reduction programs through prescribed burning. The area covered by the survey was encompassed by a line drawn from Nowra on the south coast of New South Wales inland to Gundagai and then along the Hume Highway to Melbourne. Data to complete the study was available only for the New South Wales section of the study area. The results of Mr Gellie's inquiries are contained in appendix E of the Committee's report.

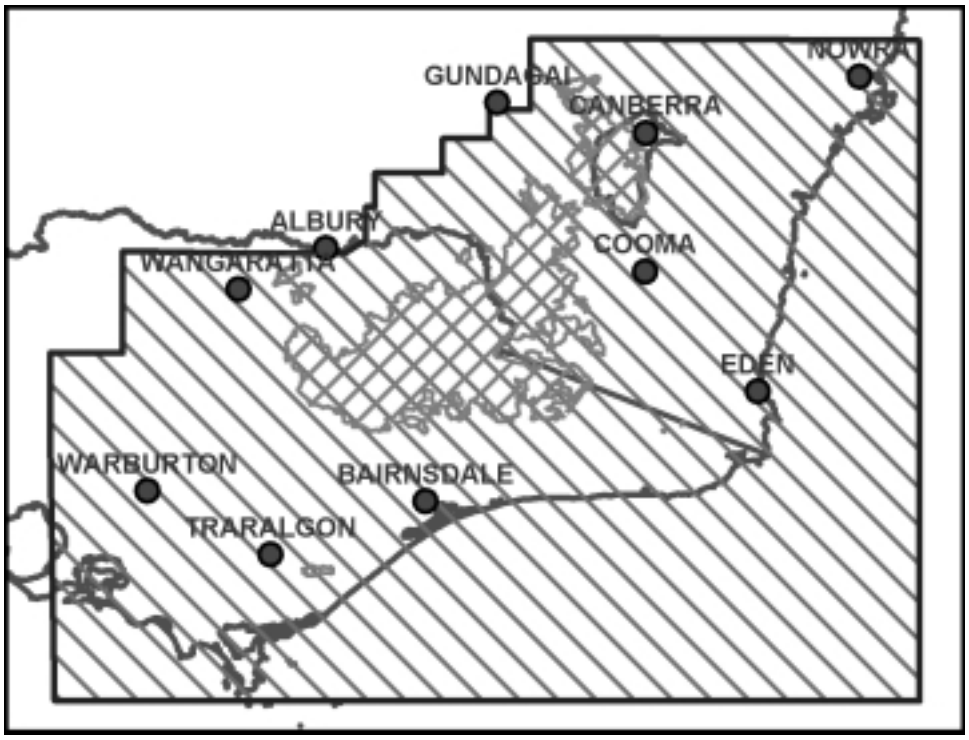
3.114 The consultant's analysis identified significant variations across the region in determining the possible application of fire regimes. For instance, coastal vegetation and climate requires different burning regimes to alpine vegetation. Furthermore, a change in vegetation associated with geological factors means that the prescriptions that can be applied in the Shoalhaven to the south of Nowra are different

97 John Cardwell, *Transcript of Evidence*, 24 July 2003, p. 24.

98 David Glasson, *Transcript of Evidence*, 10 July 2003, p. 27.

to those that can be used for the sandstone areas of the Blue Mountains and Hawkesbury surrounding the Sydney basin.

Figure 3.3 Analysis area for estimation of fuel management targets



Source: Nic Gellie, Report on: Causal Factors, Fuel Management including Grazing and the Application of the Australian Incident Management System, p. 16.

3.115 There were also constraints on what could be done, including weather conditions and ecological considerations. The consultant's analysis takes into account the:

- Type of fuel treatment.
- Amount of treatable vegetation.
- Past fire history.
- Number of suitable days on which to conduct prescribed burns.
- Complexity of land tenure.
- Capacity of land management agencies to do the work.
- Political and community will to undertake prescribed burning.

3.116 An analysis of the vegetation in the study area found that 70 per cent of the vegetation (by area) could be classed as potentially treatable by fuel management burning. The study assumed that within the area of potentially treatable vegetation a fuel management program would be broken down into asset protection, strategic fuel reduction and broad scale fuel reduction in the following proportion:

- Five per cent of the area could be targeted as asset protection zones.
- 15 per cent as strategic fuel reduction zones.
- 40 per cent of the area could be subject to broad scale fuel reduction programs.

3.117 This means that overall 60 per cent of the treatable vegetation would be subject to fuel reduction regimes of varying intensity. Areas subject to asset protection and strategic burns require fuel reduction more frequently than those targeted for broad scale fuel reduction.

3.118 The above figures leave 40 per cent of the treatable area not included in such a program. The consultant explained that:

> The non treatment category recognises that there will be areas of each vegetation type in a reserve which will have special management requirements, threatened species or could be burnt by summer wildfires of moderate to high intensity, without much damage to soils , fauna habitat or vegetation structure.[99]

3.119 Within the study area, the 30 per cent of the vegetation deemed not suited to inclusion in regimes of prescription burning include:

- Rainforest.
- Moist montane forest.
- Fire sensitive callitris, acacia or casuarina forests.
- Regrowth forest regenerating after wildfire or harvesting.
- Riparian vegetation.
- Pine or eucalypt plantations except when mature or thinned.[100]

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99 Nic Gellie, *Report on: Causal Factors, Fuel Management including Grazing and the Application of the Australian Incident Management System*, p. 18.

100 Nic Gellie, *Report on: Causal Factors, Fuel Management including Grazing and the Application of the Australian Incident Management System*, p. 18.

3.120 The IFA summarised the types of vegetation in which regimes of prescribed burning are not appropriate:

> in some wet sclerophyll forest types hazard reduction burning is not appropriate … Some forests, such as cypress pine, some inland eucalypt woodlands and rain forests should not be burned … [as well as regenerating forests].[101]

3.121 The consultant's analysis concluded that in south eastern New South Wales on a 10 year cycle, the annual target for asset protection would be 13,000 hectares, strategic burning would be 38,850 hectares and broad scale burning 96,278 hectares (see Table 3.1).

Table 3.1 Broad setting of fuel management targets in south eastern New South Wales

Category	Overall Area	Annual Target (10 Year Period)	Annual Target (15 Year Period)
Asset Protection	130,000	13,000	8,667
Strategic Wildfire	388,500	38,850	25,900
Broad Area Ecological Burning	962,776	96,278	64,185
Sub-Total	**1,481,276**	**148,128**	**98,752**
% of Total Vegetation	**42%**	**4%**	**3%**
Non-Treated	**2,007,900**		
Total	**3,489,176**		

Source: *Report on: Causal Factors, Fuel Management including Grazing and the Application of the Australian Incident Management System*, p. 20.

3.122 However this is only part of the analysis. Climatic factors and the capacity of agencies to actually carry out fuel reduction burning programs were also considered. The report utilised data from Bureau of Meteorology weather stations reflecting the diversity of conditions throughout the study area to obtain averages for suitable days on which prescribed burns could be conducted. The results varied from an average of three suitable burning days in sub alpine areas such as Falls Creek to an average of 23 suitable days in the coastal areas and Eastern Gippsland as indicated by the figures from Combienbar (see Table 3.2 below).

101 Institute of Foresters of Australia, *Submission no. 295*, p. 14.

Table 3.2 Number of Burning Days in Spring and Autumn

	Falls Creek		Combienbar		Omeo		Canberra	
Burning Day Parameter	**Autumn**	**Spring**	**Autumn**	**Spring**	**Autumn**	**Spring**	**Autumn**	**Spring**
No of Years of Records	***8***		***8***		***42***		***47***	
Average Number of Burning Days	***3***	***0***	***11***	***12***	***18***	***3***	***13***	***5***
Predominant Months			***March, April***	***Sep, Oct***	***March, April***	***Sep, Oct***	***March, April***	***Sep, Oct***

Source: *Report on: Causal Factors, Fuel Management including Grazing and the Application of the Australian Incident Management System*, p. 23.

3.123 In comparison to the average of 18 days per annum identified for Canberra, the McLeod report stated that when weather conditions are taken into account 'as few as 25 to 30 days a year (including weekends) might be assessed as suitable in eastern Australia.'[102]

3.124 Agency capability was also considered along with the different conditions required for different types of burning. The final result shows that over a 15 year period that some 655,000 hectares could be treated, amounting to about 44,000 hectares of public land on average each year in the study area in New South Wales. In addition some areas of private land could also be treated.

102 Ron McLeod, *Inquiry into the Operational Response to the January 2003 Bushfires in the ACT*, August 2003, p. 87.

3.125 In discussing the effectiveness of fuel management on the intensity of wildfire the consultant considered a range of studies and observations that indicated fire behaviour under extreme conditions is less likely to be moderated by fuel reduction programs but that even under very high fire danger conditions hazard reduction can have an effect:

> As the forest fire danger rating subsides to values between 40 and 50, recently burnt fuels start having an effect on lowering the rate of spread and intensity of fires on their flanks. Several well documented studies in Victoria demonstrate the effectiveness of recently burnt areas, generally than 5 years of age (Rawson et al 1985) have on the overall behaviour of a wildfire at this range of forest fire danger ratings. Long distance spotting potential is also reduced.
>
> As the fire danger rating further drops to between 20 and 30, some further effect on the flame height and rate of spread occurs, in situations where fuels are between 3 and 5 years of age. Some breaking up of the head-fire can occur.
>
> At forest fire danger indices less than 20, which either occurs on mild days with little wind, mild temperatures, and moderate relative humidity, vegetation with low fuels less than 12 tonnes per hectare can be worked on safely.[103]

3.126 The conclusion drawn from this information is that for fuel management to work during the management of a major wildfire, there needs to be periods when the forest fire danger rating drops below 20 for a sufficiently long enough period for crews to work safely along a fire-trail, or on a constructed rake-hoe line. The diurnal pattern of forest fire danger rating usually shows an increase in fire danger rating till mid evening and then there is a rapid fall after about 9pm. The period between 9pm and 9am the following day is when fires can be worked on safely. Lower fuel loads in forest will considerable help to reduce spread and intensity while working on fires during this overnight period. As discussed in chapter 4 there were long periods during the January fires when such conditions did occur.

103 Nic, *Report on: Causal and Risk Factors, Fuel Management, including Grazing and the Application of the Australian Incident Management System*, p. 26.

3.127 A further conclusion to be drawn from this is that lower fuel loads in strategic zones could have enabled fire fighters during the January fires to work on fire flanks in slightly worse conditions during the middle of the day when fire danger usually peaks and enable some strategic flanking of fires to limit the sideways growth of some of the fires. This tactical flanking could have deferred the possible coalescence of fires on the peak days of 17, 18, 26, and 30 January. Between 16 and 18 January there would have been limited opportunity to work in the forest at lower elevations. At higher elevations, fire were observed going out between 9pm and midnight, once the air moisture started being adsorbed by fine fuels on the forest, woodland, or grassy plains.[104]

3.128 The Committee believes that this type of analysis taking into account vegetation types, weather, agency capability and management objectives could be undertaken for other parts of south east Australia and would probably lead to similar results. The Committee concludes that increased prescribed burning throughout south east Australia to reduce fuel and achieve acceptable ecological outcomes is achievable. The consultant's report taken together with consistent evidence throughout the area that prescribed burning is not taking place shows that within the study area fuel reduction through prescribed burning could be increased significantly. This would require a planned scientific approach on a regional scale, taking consideration of vegetation types, hazard reduction needs and ecological effects. It would require much greater levels of inter-agency cooperation and commitment, and would play a considerable role in mitigating the threat posed by bushfire.

3.129 Besides the limits imposed by natural conditions, prescribed burns have been subject to a number of limits stemming from community concerns about the impact of smoke on health and tourism.

104 Nic Gellie, *Report on: Causal and Risk Factors, Fuel Management, including Grazing and the Application of the Australian Incident Management System*, p. 27.

3.130 Mr Peter Webb stated that one of the reasons for not conducting prescribed burning was 'in fact smoke pollution of an urban area.'[105] A forester with thirty five years experience in New South Wales forests recounted an occasion:

> in 1952 … we covered Eden with smoke. The tourist operators and everyone else were up in arms, saying that we should not do it. It was only hazard reduction burning. Even people who lived in Eden said, 'You can't do it now; we don't like it.' So we now dodge Easter and the school holidays, even if they are ideal times to burn.[106]

3.131 A more contemporary example of the way in which tourist and ceremonial occasions can limit available days on which to conduct prescribed burns was provided in Canberra:

> No burns could occur [in September / October 2000] because of concern about the image of Canberra during the Olympics …
>
> [On another occasion in 2002] ACT Forests were very keen to conduct burns of heaped windrows in the Stromlo forest … However, it took much negotiation to find any time in the diary of the then Governor-General – when he did not have some form of function at Government House…[107]

3.132 Smoke emission from prescribed burning are likely to be greater in the Autumn (when most prescribed burning occurs in Australia) during which there is an increased probability of:

> the onset of the inversion layers. So, rather than smoke dispersing, it will sit under cold layers and linger for quite some time.[108]

3.133 The Vice President of the CCWA said there may be considerable environmental and practical liabilities in moving prescribed burns to the Spring:

> In Western Australia 60 percent of the burning occurs in spring, which is the worst time for most species of flora and fauna … Serious effects on fauna might be expected from

105 Peter Webb, *Transcript of Evidence*, 14 July 2003, p. 6.

106 George Dobbyns, *Transcript of Evidence*, 10 July 2003, p. 65.

107 *Exhibit 55*, p. 3.

108 Bruce Leaver, *Transcript of Evidence*, 22 August 2003, p. 46.

> burning in spring which, as it is when most of the birds are nesting, is the worst time for birds in Western Australia.[109]

3.134 An officer from the Bureau of Meteorology informed the Committee of the Bureau's efforts to address the problem of smoke pollution from prescribed burns:

> we have developed, in collaboration with the fire agencies, some smoke dispersion forecasting capability. This is to forecast, using our numerical models, the direction in which smoke will flow, and of course that has environmental concerns for the community if agencies are to manage prescribed burning.[110]

3.135 The Committee accepts the almost unanimous testimony affirming the desirability of implementing fuel reduced asset protection zones and endorses the idea of strategic fuel reduced zones along known fire paths. However, it accepts that the strategic implementation of regimes of prescribed burning in designated asset protection zones and along known fire paths are not, particularly in conditions of extreme fire weather, of themselves capable of providing the most effective mitigation of threat by bushfire.

3.136 Based on the evidence, the Committee has concluded that the implementation of regimes of prescribed burning is the most environmentally and economically effective method of fuel reduction. To be effective the planning and implementation of prescribed fire regimes require the highest possible level of detail concerning the location and extent of past prescribed and unprescribed burns. The Committee is aware of the possibility of counter-productive consequences flowing from the implementation of an ill conceived regime in which burns are either too frequent, thus increasing the flammability of the environment and degrading local biodiversity, or too infrequent, thus being ineffectual.

109 Beth Schultz, *Transcript of Evidence*, 6 August 2003, p. 25.

110 Kevin O'Loughlin *Transcript of Evidence*, 21 August 2003, p. 31.

Recommendation 12

3.137 **The Committee recommends that the Commonwealth through the National Heritage Trust, offer assistance to the states and the Australian Capital Territory to develop specific prescribed burning guides, at least to the quality of Western Australia, for national parks and state forests through out the mainland of south eastern Australia.**

3.138 The Committee is of the view that the implementation of prescribed burning has fallen significantly behind the levels that are possible and required for the maximum possible protection of life, property and the environment in all areas affected by recent bushfires. It notes that although Tasmania and Western Australia have sustained significant damage through bushfires over recent years,[111] neither state has been subject to a repetition of the catastrophes of their worst fire years, 1967 and 1961 respectively, in more recent experience. This situation stands in stark contrast to the areas burnt out in recent fires that effected the Australian Capital Territory, New South Wales and Victoria.

Recommendation 13

3.139 **The Committee recommends that the Commonwealth seek to ensure that the Council of Australian Governments seek agreement from the states and territories on the optimisation and implementation of prescribed burning targets and programs to a degree that is recognised as adequate for the protection of life, property and the environment. The prescribed burning programs should include strategic evaluation of fuel management at the regional level and the results of annual fuel management in each state should be publicly reported and audited.**

111 The 2003 fire season in Western Australia was 'one of the heaviest or worst in the last 40 or so years.' Keiran McNamara, *Transcript of Evidence*, 6 August 2003, p. 82.

3.140 The Committee notes evidence of a significant range in the standard of reporting of the results of prescribed and unprescribed burns across jurisdictions. It views the upgrading of standards of verification of areas burnt as a matter of utmost urgency. Without accurate information on the location and extent of burns a program of prescription burning will fail to operate to the highest possible effectiveness.

Recommendation 14

3.141 **The Committee recommends that, as part of its study into improving the effectiveness of prescribed burning, the Bushfire Cooperative Research Centre establish a national database that includes areas targeted for fuel reduction, the area of fuel reduction achieved based on a specified standard of on ground verification and the season in which the reduction was achieved. The Committee also recommends that in developing this database the Cooperative Research Centre develop a national standard of fire mapping, which accurately maps the extent, intensity, spread and overall pattern of prescribed and wildfires in Australia.**

3.142 The Committee supports the inclusion of studies into the prediction of behaviour of smoke plumes and hazes in Program B of the Bushfire Cooperative Research Centre.

Recommendation 15

3.143 **The Committee acknowledges community concerns about smoke pollution as a result of prescribed burning and recommends that the Bushfire Cooperative Research Centre pursue its proposed study into smoke modelling.**

3.144 Clearly, not enough research has been undertaken to draw any conclusions about the effect of grazing on the flammability of landscapes both immediately after a bushfire event and in the long term.

Recommendation 16

3.145 **The Committee recommends that the Bushfire Cooperative Research Centre monitor the effect of grazing on mitigating the return of woody weeds to recently fire effected areas across various landscapes including alpine and subalpine.**

Recommendation 17

3.146 **The Committee recommends that the Bushfire Cooperative Research Centre conduct further research into the long term effects and effectiveness of grazing as a fire mitigation practice.**

3.147 The Committee is cognisant of the possible undesirable consequence of weed infestations following a fire event. It accepts that in some areas the removal of weeds by fire may not be the most environmentally sensitive procedure because of other biodiversity concerns.

Recommendation 18

3.148 **The Committee recommends that the Bushfire Cooperative Research Centre conduct further research on the impact of weeds on the flammability of land and the most economically and environmentally appropriate way to remove weeds after fire events.**

Recommendation 19

3.149 **The Committee recommends that the Commonwealth seeks to ensure that the Council of Australian Governments develop a mechanism that ensures that appropriate measures are taken by public and private land managers for the eradication of weeds following a bushfire event.**