

**THE INSTITUTE OF FORESTERS OF
AUSTRALIA**

**SUBMISSION TO THE 2009 VICTORIAN
BUSHFIRES ROYAL COMMISSION**



May 2009

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BUSHFIRES ROYAL
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by

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APPENDICES

IFA Policy No. 3.1: The Role of Fire in Australian Forests and Woodlands

IFA Policy No. 3.2: The Management of Fire in Australian Forests and Woodlands

Cover Photo

North Kinglake burnt 7th February 2009. The green forest canopy on the left is area that was burnt in the Kinglake fire of 2006 and has since recovered. That it burnt at a far lower intensity without crown scorch by the 2009 fire demonstrates the impact of reduced fuels on fire intensity compared with the area with high fuels on the right which had either crown fire or crown scorch. (M.F. Ryan April 2009)

Executive Summary

The Institute of Foresters of Australia (IFA) is an independent, national body representing forest scientists, technicians and managers with professional and practical expertise. Bushfires are a day-to-day preoccupation of many of the Institute's members either through their practical work in the forest, or through involvement in research or the administration of forest management agencies or companies. Most foresters have had personal responsibility for bushfire mitigation and suppression at some stage during their career.

The IFA regards the current bushfire situation in Victoria as deeply unsatisfactory and believe this is reflected by the damage, devastation and cost of forest fires since 2003. We have for some time felt that the situation would not improve until there was a major stock-take of the current approach which has become skewed firmly in favour of 'emergency bushfire response' at the expense of traditional fire prevention activities. We sincerely hope that this Royal Commission will be the vehicle for a sensible revision of this approach.

The IFA has long advocated the need for a National Policy on bushfire mitigation and suppression in order for Australia to more satisfactorily manage bushfire risk¹. This would cover bushfire prevention and fire management which then flows on into State jurisdictions. This approach should be directed at minimising the cost of bushfires in terms of human life and valuable assets (including environmental assets), must be based on science, experience and facts, and should allow for cooperation and coordination across States and across land tenures. In our view a primary objective should be to place responsibility for bushfire management in the hands of land managers, both public and private, not emergency services. A critical ingredient which is lacking is political leadership.

We have observed major changes in forest management policies across Australia in recent years, and this has been magnified in Victoria where for at least the past decade there has been a political focus on expanding national parks and conservation reserves. The fact that 52% of Victoria's public lands are now contained in these tenures has led to a profound change in management focus away from active treatment to meet more passive conservation aims. With respect to bushfire management, this has led to a loss of fire management expertise, greater restrictions to public access due to track closures and declining levels of maintenance, and a demonstrable reduction in the broadscale use of prescribed fire as a management tool to mitigate the impact of summer bushfires.

This combination of factors has allowed forest fuels to accumulate to an extent that has raised the intensity of summer bushfires and increasingly forced a greater reliance on emergency fire-fighting. This has occurred at a time when there has been an increasing development of housing in bushfire prone areas both making the use of prescribed burning more difficult on adjacent public lands, and further entrenching the need for emergency capability to preserve life and property at the public/private land interface when it is inevitably threatened by fire.

The IFA sees the requirement for developing building codes for homes in fire-prone areas along with providing adequate separation between homes and bushland fuels (both public and private) and the maintenance of gardens and surrounds in a condition of low flammability. Properly prepared homeowners can do much to reduce bushfire damage and we believe they should be

¹ *A Nation Charred: Inquiry into the Recent Australian Bushfires*, Chapter 8 – Future directions for the Commonwealth: toward a national bushfire policy. House of Representatives Select Committee on the Recent Australian Bushfires, Commonwealth of Australia, November 2003.

given legislated rights to do what is required to best protect their own property in the event of fire.

This submission reviews the background to the bushfire situation in Victoria and responds to the Royal Commission's Terms of Reference. In total, we have made **44 recommendations** in responding to the Terms of Reference. These are contained in sections which separately address each TOR.

In addition, we make the following nine over-arching recommendations:

1. **That the Victorian Government give strong political support** to the active management of forest fuels on public lands within our national parks, conservation reserves, State forests, and water catchments.
2. **That Victoria's bushfire policy, plans and programs be reviewed** in light of the 2009 bushfires to ensure that they are based on the best science and experience, that they integrate all land tenures and administrative jurisdictions, and that they transcend ideology.

This should include an independent cost-benefit analysis of the current Victorian approach to bushfire prevention and suppression which is weighted firmly in favour of emergency response. The methodology should be comparable with an earlier 1997 study undertaken at a time when there was a more equitable balance between prevention and suppression (see p.12).

3. **That the Victorian government review the chain of accountability at Ministerial level** for bushfire outcomes in Victoria, and refine the objectives, performance standards, targets, implementation of fire management plans, fire research and fire education programs. It should also conduct an independent annual audit and publicly report on bushfire preparedness, damage mitigation and suppression arrangements.
4. **That the Victorian government review existing fuel management policies, plans and programs** across all land tenures, especially private land and at the rural/urban interface. This should result in a firm commitment from Victorian land management authorities to reduce forest fuel levels under the direction of skilled personnel so as to improve the chances of controlling intense fires as part of a holistic integrated system of fire management which incorporates preparedness, prevention and suppression.
5. **That a professionally-conducted bushfire safety education program be developed** with the aim of achieving a well-educated community which understands bushfire risks to an extent that it is prepared to take and to support effective fuel reduction and fire prevention action at both the landscape and the householder levels (on private land), with sufficient information and support to achieve safety of their homes in major fires.
6. **That appropriate support be given to individual landowners** who wish to suppress fires on their own land and to protect their own homes, recognising that all aspects of asset protection play an important role in mitigating fires, mitigating the risks to citizens, and reducing the cost of bush fires and the damage they cause.
7. **That the Victorian government undertake an independent and expert review** of planning policies, housing construction, and powerline standards for bushfire prone areas, with a view to minimising risks and maximising the survival of the rapidly increasing number of dwellings and those who reside in them.
8. **That post-fire recovery programs be expanded** to encompass full regeneration of forests on all public land tenures.

9. **That bushfire education programs be developed or expanded** to include continuing education of forest practitioners, special interest groups, and the general public from primary school up, with a special focus on fire-prone communities. This would aim to engender knowledge and public support for all aspects of bushfire management. Programs would include fire ecology, fire behaviour, fire prevention, fire protection, fire suppression, and fire recovery. This initiative would be based on collaborative development of an experiential on-ground network of people, knowledge and practices at the local level in the forests, rural lands and communities of Victoria. There are existing networks which provide a starting point for an integrated approach (eg. CFA, Land Care) and facilities such as the Toolangi Forest Discovery Centre could be modified for this purpose.

This submission is accompanied by copies of the Institute of Foresters of Australia's national policies on bushfire management and the ecological role of fire in Australian forests and woodlands (see Appendices 1 and 2).

Introduction

The Institute of Foresters of Australia (IFA)

The Institute of Foresters of Australia (IFA) is the professional association representing Australian forest scientists and practitioners. It was formed in 1930, has active Divisions in all Australian states and the ACT, and is governed by an elected voluntary Board. A requirement of professional level membership is tertiary qualifications in forest science or a closely related scientific discipline, or alternatively, extensive relevant practical experience in forest management or forest science.

Currently the IFA has approximately 1350 members throughout Australia and overseas. Members are employed in a wide variety of positions including native forest, plantation and national park management, research, bushfire management, land care, education, public service administration, private forestry, and associated wood-based industries. Those involved in forest fire suppression and prescribed burning in native vegetation across the nation are strongly represented and there are linkages and collaboration with professionals engaged in these activities elsewhere in the world.

The age and experience profile of IFA members ranges from new graduates to retired men and women with over 50 years of experience in forested land and park management in Australia. In view of the training and experience of its members, the IFA deserves to be considered as the peak body concerned with Australian forest and woodland fire management.

Support for the Royal Commission

The IFA welcomes this Royal Commission as an opportunity to have some influence on long overdue improvements to forest and fire management in Victoria.

We believe that government policies for land, forest and park management in Victoria over at least the past decade have been overly influenced by urban-based political imperatives rather than the need for responsible land management.

We would also point out that we have made similar submissions to a number of previous inquiries and commissions and have subsequently watched with concern as the Victorian government has only partially implemented recommended changes. We sincerely hope that the work of this Commission leads to effective improvements to government and agency policies in Victoria.

This submission

This submission comprises:

- an overview of the bushfire situation in Victoria from the perspective of professional forest managers and scientists;
- makes specific recommendations against selected Terms of Reference for the Royal Commission;
- makes over-riding recommendations on critical issues associated with bushfire management in Victoria.

If required, this written submission can be supported by a verbal presentation to the Royal Commission. If this was to occur, the Institute would be pleased to respond to any questions that this submission may have raised.

Background

The IFA and fire

The Institute of Foresters of Australia is one of the few organisations to have developed formal national policies on bushfire management and the ecological role of fire in Australian forests and woodlands.

In the 30 years since the IFA first developed a bushfire management policy it has been reviewed several times. It is now contained in two separate policy papers – one dealing with fire management, and the other with the ecological role of fire in Australian forests and woodlands. These policies are a sound representation of our thinking and approach to these issues. They underpin this submission and are attached in Appendices 1 and 2.

The basis for our contribution

Our contribution to the Royal Commission's investigation into Victoria's 2009 bushfires and related aspects of forest and fire management is founded on the following factors:

1. Training, experience and responsibility

Since the early years of the last century bushfire management in Australian forests and woodlands has predominantly been the responsibility of forestry agencies managed almost exclusively by professional foresters. Most IFA members have received university-level training in the science underlying bushfire behaviour, fire suppression and prevention, as well as in fire ecology, and land use planning which incorporates fire management.

Many IFA members spend virtually their entire careers in field-based forest, park and plantation management roles where bushfire prevention and suppression is a day-to-day preoccupation. This includes practical experience with prescribed burning for ecological, silvicultural, or fuel reduction purposes. We know the business, from the sharp end.

2. Pioneers in bushfire research and operational application

Professional foresters have pioneered and became leaders in nearly every aspect of bushfire research and applied management under Australian conditions. This includes research into fire behaviour and fire prevention, and its application via prescribed fuel reduction burning, fire suppression, bushfire safety, fire training, fire ecology and fire weather forecasting.

3. Historical lessons learned

Australian foresters know the history of bushfire disasters in this country –from Black Friday in 1939, Ash Wednesday in 1983, and the 2003 Alpine fires; to the Great Divide fires in 2006/2007, the Eyre Peninsular and south-east forest fires in South Australia in 2006, the Dwellingup and Karridale Fires in Western Australia in 1961, and the Hobart (1967) and Sydney (1994) fires. Many IFA members fought these fires, took part in subsequent inquiries and Royal Commissions, and have been involved in the application of improved fire management systems designed to minimise the risk of their re-occurrence.

4. Professional concern for environmental and community values

Foresters have a professional concern for Australia's forested lands and parks and the values that are threatened by high intensity bushfires. At the same time we are members of the community, and wish to see land management practices which effectively strive to protect human life and property from the ravages of fire.

A brief review of the context of bushfires in Victoria

Victoria is naturally fire-prone

Victoria forms part of the south-eastern Australian region which due to the flammability of its indigenous forests and its climatic characteristics, is regarded as one of the most fire-prone areas in the world. It endures an annual fire season whose severity peaks in the warm summer months and is largely dependent on the extent of rainfall deficit during preceding months or years. Inevitably, every 10 – 13 years, usually under the influence of an El Niño weather pattern, the rainfall deficit becomes such that in our native forests:

- normally moist vegetation (such as in wet montane and alpine forests) substantially dries out;
- accumulated ground fuels become highly flammable;
- natural barriers to fire become less effective (ie. swamps, moist gullies and streams); and
- stressed trees shed foliage thereby further adding to forest floor fuel loads.

Under these circumstances, despite the best intentions and efforts of fire prevention on-ground suppression personnel, bushfires will invariably occur. Dry lightning is a major source of ignition in most seasons; while human error, carelessness, or deliberate arson are all significant agents of bushfire.

Most of Australia's indigenous native vegetation and much of the exotic vegetation introduced by farmers, gardeners, and plantation-growers, is highly flammable. Accordingly, bushfires are inevitable in the Victorian landscape with fires of low and moderate intensity occurring almost every year, and major high-intensity conflagrations every few years when dry fuels and rainfall deficits combine with days of high temperature and wind. This has been the case throughout our recorded history.

Victoria's most damaging fires occur under weather patterns which draw hot dry air from central Australia to the south-east corner of the continent. A feature of these patterns is the propensity for the initial high temperatures, low humidity, and powerful northerly winds to be suddenly changed by the arrival of a cold front bringing cooler, but gusty west to south westerly winds. Under these circumstances, any uncontrolled eastern flanks of already-going fires burning under a northerly influence, can quickly become broad head fires. This is a predictable set of circumstances which, as so often in the past, was arguably the major factor impacting on human life and property on 'Black Saturday'.

The exclusion of fire from naturally fire-prone landscapes inevitably results in heavy fuel accumulations that consign forests to a regime of periodic large, high intensity fire. It is the small number of large-scale high intensity fires that result in the greatest loss of life, and damage to property and environmental values. It is widely recognised that less than 5% of bushfires cause more than 95% of damage.

Community attitudes to fire

Traditionally, those Victorians residing in rural areas have had a better appreciation of bushfire because they both use fire and are directly threatened by it, whereas those residing in the city tend to assume that all fire is bad and display little appreciation of the past culture of Aboriginal burning. Today, after more than 150 years of increasingly urbanised settlement, this view is still prevalent in a community that has generally little appreciation of the natural relationship between fire and Australian ecosystems and largely fails to recognise that Victoria comprises some of the most fire-prone landscapes in the world.

There is also seemingly little understanding of the vagaries of fire – that it can vary in intensity from mild, with trickling flames less than a metre high, to a raging inferno with huge flame heights. Unfortunately, the prevailing community belief that all fires are environmentally damaging has disproportionately influenced land management policies and practices. In particular, it has somewhat constrained the use of prescribed fire as a sensible means of mitigating bushfire intensity.

The historical context of forest and fire management

Aboriginal burning and the consequences of European settlement

Prior to European settlement, south-east Australia supported the country's highest population density of indigenous people, but in stark contrast to non-Aboriginal settlement, Aboriginal Australians had adapted to every environment across the continent.²

The Aboriginal people saw themselves as part of the land and had adapted to every environment across the country during over 50,000 years of occupation. As a consequence they had developed duties and obligations directed at the conservation and protection of their particular 'country'.

There is a range of opinion on how much this interaction between Aboriginal people and the landscape impacted physically and biologically on that landscape. David Horton argues that Aboriginal people have had little or no environmental impact. At the other end of the spectrum, one of the most extreme views is that of Rhys Jones, who first coined the term 'fire-stick farming' for the way in which he believed fire was used by the Aboriginal people as a tool for modifying their environment.³

Essentially, Jones believes that Aborigines dramatically modified the distribution and abundance of Australia's flora and fauna by their intensive and systematic use of fire. This is supported by ethno-historical research, the records of early explorers and settlers, reconstruction of the fire record from grass trees, knowledge about frequency of lightning, and a simple understanding of fire dynamics.

Aboriginal people had little capacity for suppression of any but the mildest of fires but obviously understood the potential for large conflagrations to burn thousands of hectares where fuels were heavy and continuous. Very large intense bushfires could damage or eliminate food sources for a considerable period, and could be potentially life-threatening.

It is likely that their frequent and extensive burning created a mosaic of light fuels that limited the extent and intensity of fire spread even under severe weather conditions. In addition to anthropogenic sources, fires ignited by lightning would have also burned unhindered through the landscape and so added to a pattern of light forest fuels.

From about 1840, European settlement, initially through agricultural expansion and then built-upon by the gold rushes of the 1850s, progressively resulted in the development of vulnerable, permanently-located human communities and their private assets scattered through a fire-prone landscape. This led to an associated decline of Aboriginal influence and the eventual cessation of their traditional burning practices which in turn led to accumulations of forest fuels that were relieved only by occasional wildfire. Accordingly over time, fire has progressively become a greater threat to Australian society, exacerbated by the thickening of formerly open forests by regrowth encouraged by a lack of regular fire.

² *Aboriginal Environmental Impacts*, by J.L. Kohen (1995)

³ *Aboriginal Environmental Impacts*, by J.L. Kohen (1995)

Early forest and fire management – up to 1939

The period from white settlement until the early 1900s was notable for largely unrestrained clearing of forests for agricultural expansion and exploitation for timber. Forests close to Melbourne such as the Wombat and the Otways were particularly affected. A Royal Commission in 1897 brought the problem sharply into focus and eventually led to the drafting of a *Forests Act* which was passed into legislation in 1907.

There then followed a period where increasing efforts were made to permanently reserve a substantial public forest estate and bring it firmly under government control. However, it was not until the establishment of the Forests Commission in 1918, that a dedicated area of public native forest came under the control of trained professional foresters. At that time, the accessible forests were the state's major source of wood for construction and fuel, and the relatively few foresters of the time were probably almost fully engaged in controlling timber yield and regeneration.⁴

Fire was generally frowned upon for its destructive capacity but realistically little could be done to guard against fires entering the forest from uncontrolled pastoral burning on adjacent private lands or burns lit to promote grazing in the reserved forests themselves. In addition, there were huge areas of remote forest in Gippsland where there was little or no access.

As early as 1923, the Forests Commission warned the Victorian government that fire protection would continue to be a major threat and was indeed “a tragedy waiting to happen”. Major efforts were made to exclude fire from forests and educate the public in its safe use on adjacent lands, but with only moderate success. All the while, small advances were being made to fire management, but these were focussed on improving the capability to locate fires (including from the air) and develop effective fire-fighting tactics which were nevertheless primitive by today's standards.⁵

During this period two schools of thought developed about the use of fire as a forest management tool. Most field-based forestry personnel were of the belief that regularly using fire to ‘clean up’ the forest floor and maintain a light fuel load was the key to controlling bushfires. However, this was heresy to the more academic professional foresters – particularly those with exposure to European training. They believed that bushfires would largely vanish as tangled wilderness was converted to organised, tended forest.⁶

The result of this confusion was that some burning was done but not in accord with any organised plan or approach. This continued until 1939, when the huge ‘Black Friday’ conflagrations burnt over 1.5 million hectares of Victorian forest, along the way razing many settlements and killing 70 people. Paradoxically, these fires heralded the beginning of a new era of forest fire management.

Gradual improvement – 1940 to 1982

The Stretton Royal Commission placed the blame for the 1939 fires squarely on “the hand of man” – a reference to the human mismanagement of deliberately lit fire often at the most inopportune times. Judge Stretton clearly recognised the absurdity of claims that fire could ever be excluded from forests and saw the sense in using fire against itself. He concluded that the problem was not controlled burning itself, but poorly done controlled burning.⁷

⁴ *The Dynamic Forest: A history of forestry and forest industries in Victoria*, by FR. Moulds, Lyndoch Publications (1991).

⁵ *The Dynamic Forest: A history of forestry and forest industries in Victoria*, by FR. Moulds, Lyndoch Publications (1991).

⁶ *The Still-Burning Bush*, by Stephen Pyne, Scribe Publications (2006), pp.54-56

⁷ *The Still-Burning Bush*, by Stephen Pyne, Scribe Publications (2006), p.57

The Stretton Royal Commission resulted in a revised and strengthened *Forests Act* which greatly increased the powers of the Forests Commission in regard to fire protection.⁸ But, it was not until after the war, under a new generation of foresters, that there was real reform. Pyne credits the 1951-52 fire emergency in the NSW Snowy Mountains as the catalyst for Australian forestry to firmly adopt controlled burning – rather than bushfire suppression – as the basis for protecting its forests and wildlands.⁹

This was a strategy that no other developed nation had dared to adopt, but was rooted in a sensible recognition and acceptance of factors such as:

- the adaptation to fire of the country's indigenous flora and fauna;
- the long tradition of Aboriginal burning;
- the on-going use of burning in other rural land uses; and
- an admittance that Australia could never afford a paramilitary campaign against fire such as was then emerging in North America.¹⁰

Gradually, integrated systems of controlled burning were introduced into public forests – firstly in Western Australia, but then extending throughout the country. By the mid-1960's, the use of aerial incendiaries had been developed, thereby enabling large areas to be lit quickly and inexpensively when conditions were right. In Victoria's forests between 1972 and 1982, the gross area annually treated by fuel reduction burning varied from 37,000 hectares in (1973-74) to 477,000 hectares (1980-81).¹¹ This large variation reflects the variability of seasonal conditions and highlights the structures, resources, and political backing that enabled the then Forests Commission to effectively take advantage of suitable conditions.

The changing face of bushfire management - 1982 to 2008

By the early 1980s, fire management had become a finely-honed core activity for Victoria's foresters who still retained responsibility for the management of nearly all of the state's public forests. There was at that time a healthy balance between expenditure on fire prevention activities in the off-season against that spent on summer bushfire suppression.

However, the 1982 election of the Cain government signalled the start of an enduring period of profound change which continues today. One of the new government's earliest acts was to incorporate the Forests Commission's multiple use forest management role into a mega-department that also amalgamated a range of previously separate departments including the Ministry for Conservation (Fisheries & Wildlife, National Parks), Soil Conservation, and Crown Lands (including pest and weed control).

This also coincided with a new era of environmental concern in which the views of activist groups have increasingly been allowed to influence government policy and planning. With regard to public forests, this has especially impacted on their productive use, including for timber production, and has increasingly led to a regime of passive management. In addressing community concerns, successive state governments have increasingly overlooked the importance of land management in conservation outcomes. Instead, they have largely embraced the environmentalists' view that Victoria's forests needed to be 'saved' and that this would be achieved simply by changing public land tenure from State forest to national park.

⁸ *The Dynamic Forest: A history of forestry and forest industries in Victoria*, by FR. Moulds, Lyndoch Publications (1991).

⁹ *The Still-Burning Bush*, by Stephen Pyne, Scribe Publications (2006), p.58

¹⁰ *The Still-Burning Bush*, by Stephen Pyne, Scribe Publications (2006), p.58

¹¹ *Report of the Task Force Appointed to Examine Fire Protection and Fuel Reduction Burning by the Forests Commission to the Hon. R.A. McKenzie, Minister of Forests* (April 1983)

In the 18 years from 1988 to 2006, the area of nature conservation reserves in Victoria (including national parks) more than doubled from 1.83 million hectares¹² to 3.75 million hectares.¹³ Most of this involved forested lands. A more recent and definitive figure regarding the loss of State forests is that in the decade from 1998 to 2008, the area of forested national parks and other nature conservation reserves in Victoria increased by 800,000 hectares from 2.71 million hectares¹⁴ to 3.51 million hectares.¹⁵

The IFA supports measures that improve the conservation of biodiversity and acknowledges that much of this expansion of formal conservation reserves was underpinned by legitimate scientific needs unearthed during the Regional Forest Agreement process of the mid to late 1990s. However, it is clear that a substantial part of this expansion has had little or no rational conservation-based foundation, and has been undertaken simply to serve a political need to gain the support of ‘green’ voters. This is clearly illustrated by the fact that government commitments ostensibly designed to ‘save’ the Otways (2002), the Wombat (2002), the Goolengook (2006), and the Murray valley red gum forests (2006) were announced at the height of state election campaigns.

The effect of re-badging so much State forest as National park (or some other form of conservation reserve) has been to substantially reduce the influence of the forestry profession in Victorian forest management. From being responsible for managing almost all of the state’s public forests up until the late 1970’s, by 2008, less than half of Victoria’s public forests (~48%) were in land tenures managed by the government forestry agency.

These figures somewhat understate the influence of foresters in bushfire management given that they still dominate the Department of Sustainability & Environment’s central Fire Management Branch which retains overall control of planning and policy. However, in the field, with so much forest now under the jurisdiction of the park management agency, Parks Victoria, the influence of foresters with a background and experience in fire management has declined. In reality, the extent of this decline varies across the state given that some forest practitioners work for Parks Victoria, and others working for DSE still effectively retain control over small park and reserve areas interwoven with larger areas of State forest.

Bureaucratic changes associated with the massive changes to public land tenures appear to have played a substantial part in reducing fire management capability. A 2005 investigation noted that from 1982 to 1995, the Victorian public land management agency endured four functional rationalization restructures. These had led to respective 37% and 44% reductions in head office and field-based personnel with native forest management skills. Since 1995, demarcation between activities in the substantially amalgamated responsible Department has blurred more recent changes that are alleged to have further reduced forest and fire field management capability.¹⁶

Arguably, this has played a key role in the declining area of forest annually treated by fuel reduction burning that has been evident since the mid-1980s. The Esplin *Inquiry into the 2002-03 Victorian Bushfires* acknowledged this decline, particularly during the 1990s, but would do no more than ponder that it may

¹² *Striking a Balance!: Australia’s Development & Conservation*, Core Material for Earth Studies, Australian Bureau of Statistics, Commonwealth of Australia (1992) – Table 5.27 (p. 220).

¹³ *Conserving Australia: Australia’s national parks, conservation reserves, and marine protected areas*, Senate Inquiry by the Environment, Communications, Information Technology, and the Arts Committee, Parliament of Australia (April 2007) – Chapter 3, Table 3.1

¹⁴ *Australia’s State of the Forests Report 1998*, National Forest Inventory, Bureau of Rural Sciences, Commonwealth of Australia (1998) – Table 5 (p. 36)

¹⁵ *Australia’s State of the Forests Report 2008*, Bureau of Rural Sciences, Department of Agriculture, Fisheries and Forestry, Australian Government (2008) – Table 6 (p. 10)

¹⁶ *The Facts Behind the Fire: A scientific and technical review of the circumstances surrounding the 2003 Victorian bushfire crisis*, by BD Dexter and A Hodgson, Forest Fire Victoria, June 2005.

have been due to *‘either a reduction in resources available for the delivery of burn programs (for example, a reduction to staff numbers and budget) and/or a strategic diversion of resources to other activities deemed to be more important.’*¹⁷

It is also acknowledged here that the difficulty of conducting fuel reduction burning throughout this period has in many areas been compounded by the increased propensity for people to build residences in bushland adjacent to or surrounded by public forests. In regions such as the Wombat Forest, this plus active opposition to planned burning by local environmentalists, has created an extra layer of bureaucratic planning and approval which significantly stymies fuel reduction operations.

Whilst, off-season fire prevention activities have significantly declined (in hectare terms), there have been major technological advancements in summer fire suppression during the past 15 years. This is most evident in the development of aerial fire-fighting capability. This, coupled with more rigorous training, better communication, better weather forecasting, stronger linkages with other emergency organisations, improved co-operation with other state and international fire agencies, and greater attention to community liaison, underpins government claims (made prior to 2009) of best-ever capability.

However, whilst these advances may have helped to reduce the danger to life and property and improved fire-fighter safety, the harsh reality of over 3 million hectares burnt by summer bushfires since 2003 suggests that these advancements have done little to improve bushfire control or outcomes. This is particularly so in remote areas where fires ultimately have the greatest potential to burn extensive areas of public forest (as in 2003 and 2006-7) and subsequently emerge to threaten private lands and communities.

It is fair to conclude that since 1982, changing government priorities in relation to public forests has reduced the influence of foresters in bushfire management. This has manifested itself in a progressive reduction of traditional fire prevention activities in lieu of a much stronger emphasis on emergency bushfire suppression. International fire expert Steven Pyne has observed this trend occurring in other developed nations and noted that increased expenditure on fire suppression at the expense of fire prevention does not improve outcomes.¹⁸ The massive areas of Victorian forest burnt by bushfire over the past six years seem to be supporting this view.

¹⁷ *Report of the Inquiry into the 2002-03 Victorian Bushfires*, chaired by Bruce Esplin, Emergency Services Commissioner, Department of Premier and Cabinet, Victorian Government (October 2003), p.96 s.10.36.

¹⁸ *The Still-Burning Bush*, by Stephen Pyne, Scribe Publications (2006)

The current state of bushfire management in Victoria

The Institute of Foresters of Australia has for some time been concerned about the direction of forest fire management in Victoria, particularly the reducing emphasis on fire prevention activities, such as controlled fuel reduction burning, and the shift in focus and funding towards an emergency bushfire suppression model that we believe will always fail to justify its huge expense.

We would contend that this shift has been driven by a range of political and social factors, including the evolution of a more litigious society which demands that protection of human life and private property must be the top priority. While this priority has always been paramount, it can become problematic where it is allowed to override the focus on sensible preventative activities and/or unreasonably diverts the focus from controlling going fires.

Arguably, this has become the case in Victoria as State land management agencies have become increasingly focussed on asset protection at the public/private land interface at the expense of extensive fire prevention across the broad sweep of public lands, and particularly in the 52% that is now being passively managed for conservation.

Fire suppression

There is little doubt that Victoria's bushfire management agencies have developed fire suppression technology, particularly aerial attack capability, to an extent that is equal to world's best practice. Despite this, bushfire outcomes since 2003 have been somewhat hampered by:

- **a lack of experienced fire-fighters particularly in on-ground leadership roles** fostered by frequent personnel turn-over and a relative lack of exposure to the use of fire for silvicultural or fuel reduction purposes compared to the past;
- **a relative lack of experienced machine operators** used to operating in forest conditions given the decline of the native hardwood timber industry; and
- **instances of less aggressive fire control tactics**, particularly in national parks and reserves, due to the philosophical concerns of park managers about the potential for aggressive suppression to cause what they deem to be unacceptable disturbance.

Since 2003, there has also been anecdotal evidence suggesting that operational health and safety requirements and overly bureaucratic system requirements may have at times frustrated attempts to take advantage of optimal suppression conditions. We appreciate that some of this view may have been formed because an increased emphasis on protecting life and property has diverted fire-fighting efforts from the primary task of controlling the fire.

Whilst we are aware of a considerable amount of effective on-ground fire suppression in 2009 and previous fire seasons, we believe there is reasonable basis for a belief that for some years optimal fire suppression efficiency has been constrained in Victoria.

Fire prevention

Fire prevention is a traditional term that refers to off-season activities such as fuel reduction burning and access track maintenance. As such, it is a misnomer as these activities do not so much prevent fires from starting, but make them easier to control once they start. However, under extreme conditions such as were experienced on February 7th, it must be acknowledged that lowering fire intensity and improving

access offers only very marginal assistance until conditions moderate, but then can greatly assist in facilitating fire control.

Some of the on-ground fire suppression issues mentioned above are likely to stem from inherently high fire intensities that are a direct consequence of inadequate fire prevention activities which over many years have allowed forest fuels to accumulate to high levels in much of the forest estate.

This has in fact been recognised in several earlier inquiries into bushfire disasters around the country. In Victoria, it was most recently acknowledged in a parliamentary inquiry which in June 2008 recommended a tripling of the current level of fuel reduction burning.¹⁹

While the Victorian government rejected this finding in December 2008, it has since the ‘Black Saturday’ fires committed \$52 million over the next five years to increase levels of fuel reduction burning. We believe this is a good move, but are unsure if it indicates support for the effectiveness of the practice or reflects a political imperative to be seen to be doing more in the wake of a disaster.

We believe that many of the problems noted with respect to fire suppression could be greatly alleviated by devoting greater resources to fire prevention activities. However, we are under no illusions about the difficulties of achieving this. These include:

- **The fact that the majority (52%) of Victoria’s public lands are now under the control of Parks Victoria,** an agency with a high focus on tourism and visitor management more so than on vegetation management. This is not to say that they do not support controlled burning, but it seems there is variable enthusiasm for the practice amongst staff who include many with philosophical objections to human intervention in nature.

An example of the questionable conservation outcomes that can result from adherence to the concept of ‘naturalness’ was the decision by Parks Victoria not to undertake any works to ensure the regeneration of large areas of fire-killed Alpine Ash (*E. delegatensis*) forest in the Alpine National Park burnt in the 2003 and 2006-07 wildfires. These areas are now regenerating to wattle and scrub whereas similarly affected areas on adjacent State forests which were incapable of naturally self-regenerating, were artificially sown and will regrow into tall forest.²⁰

- **The increased propensity for residential housing to encroach onto areas adjacent to public land boundaries** has made fuel reduction far more complex in terms of planning and approval, as well as conduct given the greater risks to property that it entails. Burning adjacent to these areas chews up high levels of resources and time for only small gains in hectares burnt. These semi-bush residential developments also feature native forest on private lands which is far closer to the housing. Almost no effort has been devoted to reducing these private land fuels which are generally most responsible for the loss of lives and houses.
- **Increasing community opposition to the practice of fuel reduction burning.** This includes residents living in close proximity to proposed burn areas (as above), environmental activists raising (often unreasonable) concerns about damage to biodiversity, and others concerned primarily about smoke including tourism operators and viticulturists.

¹⁹ *Impact of Public Land Management Practices on Bushfires in Victoria*, report of inquiry by the Environment and Natural Resources Committee, Parliament of Victoria (June 2008). The Government responded to its recommendations on 4th December 2008. Can be viewed at www.parliament.vic.gov.au/enrc/inquiries

²⁰ This has not been formally documented but is well known amongst DSE personnel who were involved in the fire recovery program following the 2003 and 2006-07 bushfires.

Groups such as The Wilderness Society²¹ believe that the advent of water bombing aircraft removes the need for broad scale fuel reduction burning, but whilst water-bombing can slow or hold fires, it takes fire-fighters on the ground to completely extinguish them. In forests where fuels accumulate to dangerous proportions in the absence of adequate fuel reduction burning, large, uncontrollable bushfires are inevitable.

- **The difficulty of maintaining the road and access track network** given that the majority of the land base is being managed for conservation purposes by park managers intent on channelling visitors onto major roads and reducing disturbance by limiting other opportunities for access. It is also understood that in some regions of the state, the funding available to Parks Victoria field staff is barely sufficient to pay wages and keep vehicles running. Even on State forests there is difficulty in properly maintaining the access network given the lack of funding now being generated from a declining timber industry.

Reduced or poorly maintained track access mitigates against the conduct of fuel reduction burning and limits the ability to quickly attack bushfires, so is a critically important prevention activity.

Restoring the balance between fire prevention and suppression

If fire prevention is to return to adequate levels, the Victorian government will need to permanently commit considerably more resources to fuel reduction burning and maintaining the access track network than it has for several decades. This could conceivably involve trade-offs between expenditure on some aspects of fire suppression. However, fires will always occur and there will always be a need to devote considerable resources to both prevention and suppression.

In the mid-1990s, when Victoria's public lands were being managed with a more equitable balance between fire prevention and suppression, a University of Melbourne study estimated that the State was gaining \$24 of benefit from averting wildfire loss for every \$1 spent by the then responsible Department (DSE predecessor).²² It would be interesting to see the results of a similar study of the current fire management program in which expenditure is weighted heavily towards suppression.

International fire expert Steven Pyne addressed the question of appropriately balancing fire suppression and prevention in a recent book:

*'Down-sizing suppression forces will mean upgrading the staff for prescribed fire and fire research. Dampening the exorbitant costs of once-a-decade mammoth fires will see funds funnelled into higher annual expenses for environmental monitoring. There is, in brief, little reason to believe that fire's management will ultimately be less expensive than fire's suppression. Whatever configuration Australia adopts, fire won't go away, and neither will the outlay for administering both its application and its removal.'*²³

²¹ The Wilderness Society's 6-point Bushfire Plan, *Wilderness News*, Issue No. 173, Winter 2008 (p.13)

²² *An Economic Evaluation of Bushfire Prevention and Suppression*, by J. Bennetton and P. Cashin, Research Paper No. 598, Department of Economics, University of Melbourne (1997)

²³ *The Still-Burning Bush*, by Stephen Pyne, Scribe Publications (2006), pp.114-115

Addressing the RC Terms of Reference (TOR)

The IFA notes the Terms of Reference for the Royal Commission as set out in the official notice of establishment of the Commission and appointment of the Commissioner.

TOR No.1:

The causes and circumstances of the bushfires which burned in various parts of Victoria in late January and February 2009 (“2009 Bushfires”)

1.1 Fire causes

The IFA recognises there will always be sources of ignition with the potential to start bushfires. These can be natural (i.e. lightning) or human activities, including arson.

We are not yet in a position to make a definitive statement about the causes of each of the fires into which the Commission is enquiring. This information will become available from forensic investigations in due course. Nevertheless, it is clear that there were many different causes, including:

- Lightning strikes are believed to have caused numerous fires in the January and February period including the Bunyip Ridge Fire, the Dargo White Timber Spur and Wilsons Promontory fires, and a cluster of small fires in the Bunyip area, Gippsland and in Melbourne’s water supply catchments.
- Arson is confirmed or suspected to have caused the Delburn complex fire, the Murrindindi Mill (Kilmore East-Murrindindi Complex) fires,
- Power line failure is believed to have been a cause of the Kilmore – East Kilmore (complex) fire, as well as fires at Coleraine, Horsham, and Beechworth –Library Road.
- Discarding of a lighted cigarette caused a fire near the main Beechworth²⁴ fire and is suspected to have caused the Daylesford and the Eaglehawk²⁵ fires.
- Carelessness with machinery or power tools are suspected to have caused the Narre Warren – Dandenong Ranges fire²⁶.

Lightning-caused fires

Realistically, little can be done to minimise the occurrence of lightning strikes, although experience in Western Australia has demonstrated that the likelihood of fires being ignited by lightning is reduced in forest fuels less than four years old²⁷. Countering lightning-caused fires relies on having the capacity to quickly detect them and the ready availability of suppression resources to quickly respond both from the air and on the ground. Clearly this response can be greatly assisted by fuel reduction strategies which have reduced the capacity of fires to quickly spread.

There is evidence that the control of lightning fires in Victoria during the 2008-09 fires season was more effective than in recent seasons. The significance of lightning-caused fires is that they often occur in very remote locations where access is difficult thereby making them very difficult to control once they grow to

²⁴ <http://www.bordermail.com.au/news/local/news/general/north-east-man-on-arsoncharges/1438422.aspx?src=rss>

²⁵ <http://www.theaustralian.news.com.au/story/0,25197,25026941-2702,00.html>

²⁶ http://en.wikipedia.org/wiki/2009_Victorian_bushfires

²⁷ *Quantifying the effectiveness of fuel management in modifying wildfire behaviour*, by McCaw L. Gould J. and Cheney P. (2008) Can be accessed: http://knowledgeweb.afac.com.au/_data/assets/pdf_file/0005/19445/1230_McCaw.pdf

a moderate size. They also often occur in multiples arising from the same storm event and can therefore stretch suppression resources and hence join and grow to massive proportions. This was the case in both 2003 and 2006-07.

Prior to the current protracted period drought, lightning on average caused about 1/3 of the forest fires each season Victoria and these were responsible for about 2/3 of the total burnt area²⁸. However, these statistics have escalated as the drought has lengthened. Without some relief from the drought, the significance of lightning-caused fires can be expected to increase further.

All of this supports the wisdom of a huge increase in prescribed burning to reduce fuels and therefore mitigate lightning ignitions and their spread. At the same time, the strength of fire-fighting resources must be maintained, or even increased in drought years to match the increased risk.

Electrical fires

Faulty powerlines have been implicated in past major Victorian bushfires including Ash Wednesday in 1983. These fires led to the implementation of a safety program backed by legislation, including the development of enforceable standards for tree clearance near powerlines. In addition programs to put powerlines underground and to insulate powerlines in particular situations have been effective on a small scale, but funding for these programs now appears to have been reduced.

During the 1990s clearance standards and other measures were reduced in a large number of fire-prone rural and urban areas in proximity to houses and areas where people live (most obviously in areas subject to the 2009 fires). Powerlines remain a high to extreme risk across a very large area of Victoria and this is a major issue which was dealt with in some detail by the Victorian Auditor-General in a major study in 2003²⁹.

Human sources

The issue of whether it is possible to minimise other human sources of ignition is of utmost importance, especially the minimisation of accidental or deliberate ignitions on extreme fire danger days. Experience suggests that professionally-conducted fire prevention education programs are useful in minimising the occurrence of accidental fires, but will not eliminate them. Nor do they have any impact of the incidence of arson.

Discouraging or apprehending arsonists or people who carelessly cause fires, particularly on days of extreme fire danger, is notoriously difficult. Accidental fires are seldom examined and insufficient effort is devoted to educating people about how their actions are causing fires, perhaps with the exception of camp fires. What is getting done about preventing vehicle exhausts in long grass from starting fires for example?

Most arsonists are repeat offenders, but are rarely caught and convicted for their offences. These are criminal acts that need to be dealt with by the full weight of the law, but prison terms are rarely effective where perpetrators are suffering a mental disorder. The development of improved approaches to monitoring, targeting and discouraging known offenders is clearly a high priority.

²⁸ Department of Sustainability & Environment – Fires and other emergencies: www.dse.vic.gov.au

²⁹ Victorian Auditor General's Report into Fire Prevention and Preparedness (May 2003) – Powerlines and wildfire mitigation recommendations. Can be accessed at: www.audit.vic.gov.au

The Department of Sustainability and Environment is accumulating information on ignition sources and their significance from across different jurisdictions and agencies. However, there appears to be fundamental differences in the collection, accuracy and rationale for the data and this needs to be properly addressed. There is considerable long-term data for public land.

Recommendations on the issue of fire causes:

1. The Victorian government should significantly extend programs of fuel reduction in remote forests so as to minimise the occurrence of problem bushfires caused by lightning.
2. The Royal Commission should call for a review and a report on the extent of implementation of the 2003 Auditor-General's report into bushfire mitigation by power companies.
3. The Royal Commission should examine the adequacy of community education, regulations and enforcement programs aimed at minimising the occurrence of arson.
4. The Victorian government should oversee the set up of consistent definitions and standards between agencies for defining bushfire causes; and should set up a single body with the task of maintaining a comprehensive historical data base of bushfire causes across all jurisdictions and land tenures.

Fire circumstances

The IFA considers that the circumstances associated with these fires were such that serious damage was inevitable, and indeed predicted that they would occur. In our view, the contributing circumstances were:

- (i) Inadequate fuel reduction programs over a long period in bushland in the fire areas resulting in the accumulation of heavy fuel loads.
- (ii) A lengthy period of below-average rainfall, leading to the drying out of fuels.
- (iii) High temperatures and low humidity leading to a high fire hazard (ie. a high likelihood of a fire starting and quickly spreading).
- (iv) Very strong winds, resulting in heavy spot fire development and massive rates of spread.
- (v) Wind changes that alter the direction of fires and create chaotic conditions for fire-fighters.
- (vi) Multiple fire causes.
- (vii) People and their assets located within heavy bushland fuels, poorly prepared for high intensity fire and in many cases unaware of warnings.

The most important message from this list is that only three of the six factors [(i), (v) and (vi)] can be manipulated by authorities to minimise the risk of these events re-occurring.

Recommendation on the issue of fire circumstances:

The Royal Commission must emphasise that there are only three ways in which future bushfire disasters can be minimised:

- through extensive prescribed burning for fuel reduction;
- by minimising the potential causes of fire; and by
- improving the preparedness of communities living in bushland areas.

TOR No. 2:

The preparation and planning by governments, emergency services, other entities, the community and households for bushfires in Victoria, including current laws, policies, practices, resources and strategies for the prevention, identification, evaluation, management and communication of bushfire threats and risks

The IFA believes that Victoria currently lacks a fully effective, integrated system of bushfire governance and mitigation, and is particularly concerned at the long term shift away from a philosophy of managing bushfire through active land management to an ‘emergency response’ model that is hugely expensive without improving outcomes.

Further to this, we contend that aspects of pre-season planning by bushfire management agencies and the general public could be improved.

2.1 Bushfire management on public and private lands

Like other states, Victoria has fire-prone lands that are under both public and private management. However, there is no common system that applies across the whole of this land to recognise the fire risk or to mitigate it. Consequently, there is confusion about responsibilities and accountability in relation to managing bushfire risks, particularly in urban fringe areas such as those affected by the 2009 bushfires.

On public lands, the responsibility and accountability for the long-term sustainable health and vitality of the natural environment is variously assigned to different government agencies in Victoria without any overall coordination. The Department of Sustainability & Environment (DSE), Parks Victoria, local government authorities, catchment management authorities, and Melbourne Water each have their own policies and approaches to bushfire management or are covered by separate legislation.

On rural private lands the responsibility for bushfire management lies with land owners, with the Country Fire Authority (CFA) playing only a very peripheral role. There is no state policy to ensure high standards of management and so there is generally a variable level of preparedness amongst property owners beyond basic requirements. If a property owner is motivated enough then he/she will be properly prepared perhaps even to the point of having equipment to enable them to attack a fire. On the other hand, where there is no interest by the owner or the land has no intensive agriculture, nothing is generally done to prepare response arrangements.

For urban areas like townships, there is an involvement by the CFA in overseeing minimum requirements for prevention works enforced through municipalities, but these are not focused on fuel in areas of private bush but on maintaining grass – accordingly, the greatest bushfire risk linked to fuel accumulations near houses is often never effectively mitigated. In addition, nothing is generally done on roadsides containing native bush, apart from verge maintenance. Consequently there are countless areas of excessive fuels in pockets of native vegetation amongst these semi-urban and rural areas. Obviously, this current approach is not effectively managing the fire threat to the community.

Further distorting the problem on private lands, is that insurance policies covering fire damage enable the insurance provider to levy a direct charge on the policy holder, which is then required to be passed on to the CFA who provide the fire protection service. While it seems that no-one has ever tried to quantify how much money is collected from fire insurance policy levies, it is clear that nowhere near this amount is contributed to the CFA. Of greater concern is that there are no policy concessions given to property

owners who carry out prevention works and provide their own fire-fighting and protection systems. This means that those who insure adequately and act responsibly are paying for the CFA's services, while properties without buildings and landowners who are apathetic, contribute nothing. This must be changed so that the costs of providing fire protection services on private land are borne more equitably.

Summary of the complexity surrounding bushfire management across the landscape

There is considerable confusion over the responsibilities and accountabilities related to bushfire management across the landscape. This stems from archaic legislation including definitions of land categories that have been long out-dated by social and administrative changes since they were drafted. This confusion is evident in the following summary of the current administrative arrangements.

Statutory responsibilities and bushfire management on private lands

- The Metropolitan Fire and Emergency Services Board (MFESB) have responsibilities for fire suppression in the Melbourne CBD and inner suburban areas.
- The Country Fire Authority (CFA) has responsibilities for fire suppression on freehold land in the country area of Victoria which was defined under S.14 of the *CFA Act* 1958. This incorporates major regional centres, farms, and about 60% of the Melbourne Metropolitan Area including the eastern suburbs beyond Croydon and Vermont South, the Dandenong Ranges, the Cities of Dandenong and Frankston and their surrounding municipalities, and Melbourne's outer western suburbs.
- Unlike on public lands, there is no Code of Practice governing bushfire management in areas under the responsibility of the CFA or MFESB.
- Local government administrative instruments governing bushfire management on private lands are Fire Prevention Notices issued under the *Country Fire Authority Regulations 2004* (Regulation No. 108). These instruments are used primarily in relation to grassfire hazards, and have seldom been used to deal with forest fuel hazards on private land.

Statutory responsibilities and bushfire management on public lands

- Victoria's public lands comprise about 7 million hectares, or about one third of the state. The determinant for responsibility for fire management on public land rests in the definition of the Fire Protected Area (FPA) which is defined under section 62(2) of the *Forests Act* 1958. In accordance with this, the Secretary of the Department of Sustainability and Environment (DSE) has responsibility for fire prevention and suppression in the FPA.
- The definition of the FPA in the *Forests Act* 1958 is confusing and so accountabilities relating to the FPA are not clear. For a variety of reasons (largely historical), large areas of public land in Melbourne's northern and north eastern fringes (that were directly affected by the fires of 7th February 2009) are not part of the FPA.
- The definition of FPA is not well understood by the public or in some cases even by the government bureaucracy. Areas that are not unequivocally recognised as part of the FPA are not subject to fire prevention activities such as fuel reduction burning as there is no clear legislative responsibility.
- The Department of Sustainability & Environment (DSE) is the responsible fire authority on the public lands that comprise the FPA. However, on those areas of the FPA managed by Parks Victoria, the *National Parks Act* 1975 prevents DSE from conducting fire prevention activities unless they are approved by Parks Victoria.
- While Parks Victoria have power of veto over bushfire prevention activities and some suppression activities on lands that they manage, there is no mechanism by which they can be held accountable for adverse bushfire outcomes on land under their management.

- Much of the land managed by Parks Victoria is not part of the FPA. On these areas, the CFA and the MFESB are the responsible fire authorities DSE does not conduct fuel reduction burning activities in areas managed by PV that are not in the FPA. Similarly, neither the CFA nor MFESB conduct fuel reduction activities in these forested areas.
- Bushfire management activities on public land are subject to the *Code of Practice for Fire Management on Public Land* (Revision 1, 2006) which creates an imperative and applies standards to the conduct of activities such as fuel reduction burning.
- Until the recent launch of the “Living with Fire: Victoria's Bushfire Strategy” (December 2008), the Victorian Government had not attempted to establish clear lines of responsibility and accountability for bushfire policy, planning and outcomes across public land tenures in Victoria. This had made it impossible to identify where the system has failed in the event of a fire disaster, and therefore difficult to develop a focus on improvement. Under this situation, conflicts arose over management actions and priorities, and it was difficult to appraise the success of management programs or initiatives.
- Neither DSE nor Parks Victoria are subject to regular independent audit and public reporting of actual outcomes compared with objectives and targets. Unless this is done, the community has no way of knowing whether fire management funds are being spent effectively or whether they are in fact sufficient.

Clearly we are a long way from having a legislatively-based system that underpins a rational assignment of responsibility and accountability for bushfire management across the landscape.

Requirements for practical improvement

Clearly, despite shortcomings, bushfire management on public lands is far superior to that currently being practiced on private lands carrying native vegetation. This may reflect an underestimation of its importance which is surprising given that it is heavy fuels on private lands close to housing and community infrastructure that generally poses the greatest threat to human life. Accordingly, much of the protective benefit of conducting activities such as fuel reduction burning on adjacent public lands is lost if there are no complementary measures undertaken inside the boundary fence.

Up until now, the rationale for fuel reduction has been overly influenced by pressure to implement perimeter works on the public land boundary yet ignoring the same risks or higher threats on adjacent private land. This needs to change, but will mean bringing private forest under a similar fuel reduction burning regime as on public land and possibly treating it more frequently if it is near built assets than would be the case if it was a remote site. Unfortunately there is no obvious candidate to take responsibility for this. CFA volunteers have only a limited capacity to carry out time-consuming burning in private bush. While land owners, particularly new arrivals, may well resist on philosophical grounds or because the lack the expertise, equipment, or manpower required to control and patrol burns for several days.

The CFA has until now only engaged in small-scale burning in private bushland. This has generally been in cooperation with land owners assisted by members of the local brigade. Overwhelmingly, CFA burning has been concentrated in grass and stubble. There are also plantation industry brigades but they have generally tended to assist DSE on adjacent public land burns. Unfortunately, there is currently no system to plan private land burns, register them, notify that they are being ignited, or monitor them until they are safe. There also is no structured program of CFA support to private land burning apart from the issuing of permits during the fire danger period. Clearly, there is a significant divide between burning on private and public lands that should not be allowed to continue.

Ideally, the system used by DSE to manage public land burning needs to be extended to guide safe burning in private bushland. This would include access to local weather forecasts, registration of the burn location, the time of ignition and when it is no longer smoking and has been declared safe – all very basic requirements. There is also a need to communicate to the neighbourhood about smoke – is it a burn or a fire? Lots of things would have to be worked through, but even then it is difficult to envisage more private land burning getting done as it is costly, very time consuming, and has risks. For this to become a reality, CFA management has to be appropriately skilled, focussed and resourced to give more support to private bushland burns, and DSE would have to be encouraged to provide more guidance.

2.2 *Land management versus emergency response*

The IFA has grave concerns about the trend in Victoria to increasingly treat bushfire management as a separate ‘emergency response’ rather than as an integral component of land management responsibilities in accordance with the philosophy that had prevailed since fire emergencies (including the 1939 ‘Black Friday’ catastrophe) sparked a realisation that the best way to mitigate fire was to use it against itself.

It is appreciated that this situation has slowly evolved since the 1980s in response to a complex raft of political and social changes which have progressively reduced the commitment to traditional methods of forest and fire management. The resultant decline of activities such as fuel reduction burning has gradually consigned the state to increasingly severe bushfires, undoubtedly exacerbated by long term drought, which have only increased the need to bolster suppression forces. This need is only being further entrenched by changing demographic patterns which have put more people at risk in fire-prone urban fringes and the political realities of dealing with this.

Unfortunately, the ‘emergency response’ model is typified by huge expense without any great improvement to bushfire outcomes when compared to the mitigating the frequency of severe mega fires by reducing fuels before the event. The rise of ‘emergency response’ at the expense of declining levels of preventative action can be represented by a public health analogy whereby efforts to prevent problems by vaccinating and encouraging better lifestyles are diluted in favour of a greater focus on surgery to treat cancers. Very few would support such an approach to public health and this should also be the case regarding bushfire management.

The reality that we have firmly arrived at this place was confirmed by events just prior to the 2008-09 fire season when the Victorian Government announced that it would reject the recommendation of its own Parliamentary Inquiry to triple the amount of fuel reduction burning, but then soon after announced the deployment of two Elvis water-bombing helicopters to Victoria for the fire-season. The reported cost of these helicopters is \$60,000 per day on stand-by and \$15,000 per operational hour. At the height of the emergency on February 7th, weather conditions were such that these helicopters were unable to operate.

If the Royal Commission results in a re-evaluation of the current direction of Victorian bushfire management – as we hope it does – the situation will realistically improve only slowly.

The agencies responsible for managing Victoria’s public lands (DSE and Parks Victoria) have undergone significant structural and philosophical changes over the last 25 years and continue to be subject to constant reorganisation. This has destabilised them and diminished staff morale. A major issue is that, policy development, management planning and decision-making have become increasingly remote from the natural environment, and there is a decline in knowledge and understanding of the role and application of fire in the landscape. Personnel have to a large degree been centralised into offices in large towns and urban centres which has had a subtle but significant effect on their awareness of fire services and bushfire management.

This has implications for how fuel reduction is done now, what could be done in the future, and the systems that could enable it to be delivered. As the grazing of domestic livestock has now largely been banned from public lands, increasing fuel reduction translates to more autumn or spring burning.

DSE have managed prescribed fuel reduction burning on public land for a long time, and also manage other fire applications for silvicultural purposes. They are experienced in this and operate at a reasonable scale across the state in a wide variety of risk profiles in terms of vegetation and terrain. Their operations regularly attract attention due to smoke and other nuisances, the occasional escape, and for not achieving designated burn area targets. Seldom are their efforts praised. However, there are solid roots and strong and robust support systems for planning and implementation that could form a firm basis for a more extensive burning program with additional personnel and resources.

In our view, the level of prescribed fuel reduction burning must be significantly increased. It also needs to be re-targeted to better balance the protection of assets and lives in more populated areas with the continued treatment of remote areas prone to lightning. At the moment the program is largely skewed towards very remote locations with the lowest population and least assets. This should be readjusted, although it is acknowledged that moving closer to the populated areas will not always be appreciated. Burning closer to populated areas carries a much higher risk, requires more cooperation from neighbours, and may well precipitate community objections on a scale not previously accepted.

We certainly do not advocate any reduced emphasis on fire suppression although we would be confident that over time the need for overly expensive suppression technology would be reduced under a regime of more extensive and frequent fuel reduction.

The management of fire in Victoria must be seen as a shared responsibility. The roles of land managers and emergency response agencies need to be complementary, not separated and duplicated. It would not be cost-effective or practical for land management agencies to possess enough fire-fighters to control all fires occurring on their land. Therefore, the availability of emergency first response crews (including professional fire-fighters and volunteers) to assist and bolster the fire response capacity of land managers is essential. However, volunteers take time to be assembled and are mostly limited to indirect attack and burning-out operations from established roads.

On the other hand, no emergency service, especially one with a high reliance on volunteers, can hope to undertake effective large scale programs of fire preparedness and prescribed burning for damage mitigation. The work is too time-consuming and technically demanding, and involves very long lead times. Knowledge and experience are required to protect ecological and cultural values while achieving burn objective.

We further recognise that proposals to increase the amount of fuel reduction back to or beyond formerly attainable targets would be bitterly opposed by sections of the community who have become conditioned to regard forests as sacrosanct. Accordingly, there is an urgent need to quantify and communicate the tangible benefits of fuel reduction burning in terms of fire preparedness, fire suppression, and post-fire forest recovery. These benefits can be expressed in terms of reduced loss or damage to assets, lives and natural and economic land values including water, wildlife, timber, apiary, recreation and tourism.

Fuel reduction burning generates major savings from reduced suppression costs and savings in post-fire recovery expenditure. This is because fires will always be smaller if prescribed burning is applied. The effects of this are felt even on the severest fires and no doubt from these fires of 2009 there will be case studies showing how the community has benefited. However, there are limitations as not all native vegetation and forest can be treated, and the right weather and resources play a part.

Although there is a mountain of anecdotal evidence stretching back for decades showing the value of fuel reduction burns, fully-documented evidence in relation to mitigating severe fires such as those in 2009 is rare. However, following the 1983 Ash Wednesday fires, the successful survival of several small settlements was attributed to the mitigating affect of recent fuel reduction burns.³⁰

2.3 Pre-fire season planning

The most vital aspect of a coherent and powerful response to any emergency situation is the capacity to accurately comprehend the nature of the risk and prepare accordingly. After 12 years of drought, warmer and drier than normal conditions in the preceding winter and spring, there should have been an expectation of a very difficult fire season in 2008-09.

The IFA understands that an analysis of fire season potential was issued by the Bushfire CRC in late September 2008 following national consultation and review. This is a relatively new initiative designed to focus attention on the emerging bushfire risk at a time when agencies and the public have sufficient time to prepare.

Predictions for Victoria were for above average levels of fire potential due to prolonged drought, with the largest potential in forests and in southern Victoria, and considered likely to get worse if there was less than normal follow-up rainfall. In October 2008, this attracted considerable media attention and would hopefully have boosted preparations from this point up to and including the January and February period.

It is clear that the availability of such a readily accessible and highly publicised predictive analysis, there should be no excuse for being unprepared by January or February. We are aware that as the fire season began to bite, a raft of preparedness measures were brought forward to make sure the significance of the season was not misplaced or overlooked. However, a detailed knowledge of what was done and how appropriate it was is beyond the scope of this submission. Nevertheless, we believe that it will be pertinent for the Royal Commission to seek answers to the following questions:

- Was advice of the potential for a damaging fire season acted on and did it strongly improve the response to the fires of January and February 2009?
- What was done by the responsible fire agencies that made a difference to the response to the January and February 2009 bushfires?

If evidence is uncovered of a lack of understanding, resourcing, or progress with sound preparedness measures leading up to January and February 2009, then identifying clearer trigger points and thresholds will be a major priority for the future.

It is clear that good rains in November and December 2008 delayed the onset of the worst fire conditions and reduced the magnitude and duration of the worst of the fire season. This early rain and the lack of any significant fires until late January may have also been a factor in people insufficiently preparing their properties. It is likely that the losses of life and property during the 2009 fire season could have been much worse without the benefit of these early summer rains. However, the ability for major fires to still occur after summer rainfall might need further reinforcement amongst the general public.

We further believe that the admirable concept of an early analysis of the potential of the upcoming fire season, should be strengthened to also introduce clearer concepts of the resource implications for fires in areas where significant life and property is likely to be threatened. This would be a simple but significant

³⁰ *Effectiveness of Fuel reduction Burning*, by R. Rawson, P. Billing and B. Rees, Department of Conservation, Forests and Lands Fire Research Report No. 25, Victorian Government (1985)

step in improving the Bushfire CRC's new system and would give more appropriate weighting to the planning, preparedness, and responses needed for protecting life and property. This would extend the reach of the analysis beyond just the fire agencies to the general public residing in those fire-prone areas.

Recommendations on preparation and planning for bushfires:

1. The Victorian government must be made aware that there is a need for a broad and integrated landscape-based approach to bushfires (including on both public and private lands), and that this must be recognised in legislation and policy.
2. Procedural obstacles such as the requirement for land manager permission should be removed so DSE can be fully responsible and accountable for all fire management outcomes on public land for which they are responsible, including areas managed by Parks Victoria. The scale of the programs has to be fully funded and accountability mechanisms must be clear.
3. The Victorian government must clarify how fuel reduction burning to protect assets and life is to be increased in forested areas on private land to match its increased use on public land.
4. The government must establish a clear fire management policy, objectives and key performance indicators which will apply across all land tenures in Victoria. This should include modifying the Code of Practice for Fire Management on Public Land so that its application can be extended to private lands.
5. The policy must enunciate that prevention, preparedness and damage mitigation is as important as suppression and that all system components must be equally supported.
6. The overall policy goal must be to minimise the occurrence of large, high intensity bushfires, recognising that this will also minimise damage to all community and environmental values.
7. There is a need to rebuild the numbers of trained and experienced government land management agency staff, stationed in the bush, and able to plan and apply prescribed fire to achieve the necessary level of burning, as well as contribute to fire suppression.
8. Bushfire CRC pre-fire season predictions should be extended to include a methodology to quantify the risk to populated areas to enable better planning and preparation for risks to life and property
9. The funding of CFA fire services on private land should be increased by ensuring that a greater share of fire insurance policy levies is contributed directly to the CFA, and devising a way to ensure that uninsured landowners also contribute to a service from which they expect help during emergencies.

TOR No. 3:

All aspects of the responses to the 2009 bushfires, particularly measures taken to control the spread of the fires and to protect life and property, including but not limited to immediate management, response and recovery

3.1 Prior to February 7th

It is not generally appreciated that there were hundreds of fires across Victoria in the period prior to 'Black Saturday', with all but two that we know of having been successfully contained or controlled by the morning of 7th February 2009. This includes the fires in the Delburn complex in Gippsland which destroyed houses and a large area of valuable commercial forests. This situation was pivotal to the events of 7th February when fire danger conditions deteriorated to the worst many firefighters had experienced.

Most of the fires in the weeks prior to 7 February had started from lightning in remote areas including many in light fuels in areas recently burnt in 2003 and 2006-07. That most were rapidly and successfully controlled during the first attack phase demonstrates response efficiency and effectiveness. However, the fatigue engendered by these earlier efforts affected the capability of firefighters to sustain their effort.

The two going fires on the morning of February 7th were:

- The Bunyip Ridge fire – the damage potential of this fire was very significant and considerable effort had gone into publicising its likely threat and warning residents in the Fire Potential Impact Zone. Ultimately, the outcome of the Bunyip Ridge fire compared to other new fires on 7th February was much better in terms of the asset protection, protection of life and importantly work done by firefighters and their own safety.
- The remote White Timber Spur fire in the mountains behind Dargo in Gippsland. Before 7th February the potential of this fire was calculated and communicated as not likely to threaten communities largely because it was burning in very low fuels in an area burnt in the 2006-07 season. Few resources were deployed to this fire and it eventually burnt through about 16,000 hectares of forest.

The IFA believes the fire agencies deserve some credit for accurately recognising the respective threat of these two 'going' fires prior to February 7th and taking steps that ultimately reduced the damage to life and property from the Bunyip Ridge fire, and allowing valuable resources to be deployed to more critical areas by minimising resource deployments to the White Timber Spur fire.

We believe the Royal Commission should acknowledge this as the overall resourcing position could otherwise have been managed very differently which would most likely have resulted in far less asset protection and thus far greater loss and damage than ultimately occurred.

3.2 On February 7th

Immediate Management and Response

On 7th February 2009 there were a large number of new fires throughout the afternoon, and a considerable amount of confusion about which fires were spreading compared to those that were controlled. There were reports of smoke sightings from contained fires and there was uncertainty on the

extent and actual direction that fires had spread during the day. This is of paramount importance. There was scant capacity to report long distance spotting from fires, and this exacerbated the problems. The weather forecasts were essentially unchanged. We believe the weather forecasts for this period in January and February need to be examined against the actual conditions to highlight the importance of the accuracy and timeliness this service has to all aspects of firefighting and to all aspects of loss of life and property.

A lot hinged on the nature of the wind change which altered the direction of going fires on 7th February. Experienced firefighters understand this feature but the public probably has very limited comprehension of the danger and complexity of this type of change. There are major challenges in this for the future - to find ways to make improvements when weather conditions like this return. There should be an emphasis on the requirement to continue to implement fire weather services at the level necessary to cope with extended hectic periods and days such as on and around 7th February 2009.

Measures Taken to Protect Life and Property, and to Control Fires.

The Total Fire Ban declarations, including the timely and well delivered warning by the Premier, meant that the fire agencies and much of the public were at least aware of the situation and this should have triggered reminders about their own fire plans. The views from people claiming not to have been sufficiently aware or who believe they should have had something different is beyond the scope of this submission but is a matter to examine in light of the circumstances at the time. For example we now know where the fires occurred, it could be that on the day this was not understood or not communicated in a manner that was easy to understand and to comprehend exactly what and when these fires burnt. We raise one caution in that it is not reasonable to use a current understanding of the events to draw conclusions on what should have been done on these aspects - it is necessary to examine what was known at the time or was reasonable to predict to answer some of these matters for there never will be a system that works backwards to past events.

On the subject of measures to control fires and protect life and property there are a number of principles and perspectives to discuss alongside of what actually occurred. On extreme days like the 7th February 2009 it is well understood by firefighters that the attack on any fire, regardless of the resources and how they are applied and the initiatives and risks taken, has its lowest chance of success. On this morning all firefighters knew the worst they would face in their lifetime of firefighting was perhaps just hours away. They were better equipped and better trained than has been the case previously and were briefed specifically about the dire forecasts, the high likelihood of major fires, the utmost importance of a rapid first attack and above all maintaining firefighter safety. Being a Saturday meant that every CFA tanker would be fully crewed with volunteers with relief crews also pencilled in.

It is well known from the history of such extreme days that should major fires occur they are killers of firefighters and of the public. There are obviously limitations on such days to suppression efforts, to human endurance and to the very existence of life itself. The response on these days would only be successful if the fires started in a location that could be detected early, that had a rapid response and a response in considerable strength in the first minutes, not the first hours. Everything possible would be thrown into the firefight but it would not be enough to stop some of the fires - but it might in the course of the fires save assets and lives. During the course of the Commission if what was saved can be revealed this would be an important outcome as this shows asset protection and indeed some suppression efforts were effective.

Probability of First Attack Success.

The major determinants of fire response success would be the size of the fire at the time the first firefighters arrived and the fuel it was burning in. This is because the fires would be expected to spread very rapidly - on this day roughly at an average speed of between 10 to 20 km per hour in a normal amount of grass and about half that rate in an average amount of fuel in a forest. This speed is difficult to keep up with across country even using the best firefighting equipment. Regardless of this challenge, the heat from this type of head fire is so high as to be almost impossible to attack in grass. In a forest with an average amount of fuel any attack on a headfire would be out of the question simply due to the heat and a defensive asset protection strategy becomes the only workable option.

Development of Spot Fires.

Beyond the slim chance of a successful attack on the fire edge, the most difficult and dangerous factor is the amount and distance of spotting under such extreme conditions. Even isolated trees in a grass fire and along a roadside would send a blast of embers hundreds of metres and sometimes kilometres to start new fires. Here in lies one of the most deadly factors of such fires. Firefighters are trained to comprehend this risk and so know that their own lives are at stake and what to do to survive but most of the public do not have this understanding. The complexity and risks of this are impossible to describe to them, particularly where there are multiple fires, crowning head fires and when there are wind changes that cause fires to hook savagely.

Human Response.

How the public has responded in the past and in these events to this sort of fire behaviour is something the Royal Commission is to consider carefully as well as how the firefighters from the fire agencies and others in support have responded. Humans innately flee when even though it might be understood that to run away is reckless. Fleeing from fire on foot or under the worst possible driving conditions historically ends in tragedy for too many. One fire or another catches up with people attempting to flee. On a roadside there is usually too much fuel so there is little chance of surviving the heat in a vehicle unless some form of clearing can be found.

The policy to minimise casualties on foot and on the road is to leave early otherwise stay and defend in a well prepared building. Fire agencies provide this information to the public and promote it in many ways and at every opportunity right up to the response phase. It does depend on people making good decisions, being on the one hand thoroughly prepared or on the other hand deciding where they are safer and going to that location early.

The response phase of a fire should not consider fleeing blindly but going to a safe location. The question of what is a safe location in such fires has to be answered. This is essential in community education and in each persons fire plan. In order to further reduce the risk, safe locations have to be identified locally. This should be included in an individual's fire plan. It should also be understood that there is no absolute guarantee of safety in any locations where there are bushfires – even in locations that have the tag of 'refuge' or 'safety zone'. We have seen all sorts of opportunistic or improvised safety zones. They can be a person's home, or some other place when the exposure to heat is less than 3KW/m² which is the safe level for humans. The sorts of safe places or fire refuges are not simply a fire proof building or bunker. Reducing the risk to the public is still about educating them and convincing them about the risks and how to act in a safe manner.

Factors Contributing to Fire behaviour

The Royal Commission will no doubt be told by many people that the high temperatures on 'Black Saturday' were the dominating contributor to the fires. However, by itself, temperature is only one contributor to fire danger. The other critical factors are heavy dry fuels and strong winds. These in turn are the factors leading to spot-fire generation and the subsequent interaction between merging fires. The following points are relevant to the suppression response.

- The capacity to suppress bushfires under the conditions on 7th February is small.
- Where fuel loads are reduced fires will spread more slowly and suppression can be effective at higher levels of fire danger.
- Under extreme weather conditions fires will be unstoppable if the fuel is continuous. Only bare or recently burnt ground will actually stop a fire. These areas need to be large enough to absorb the impact of embers blown over the fuel-less area by high winds. This may be several 100 metres in grasslands and several kilometres in forests.
- Prescribed burning in dry forests can remove sufficient fuel to stop fires. The treatment can be effective for up to 2 years before there is sufficient continuous fuel to carry a fire.
- Broad area prescribed burning applied across the landscape will slow fire spread and in places stop the head fire thereby reducing the extent of the fire even under extreme weather and will make subsequent suppression easier.

The IFA considers that all of the factors likely to cause a bushfire disaster were present at the time of the 2009 fires:

- It was extremely hot and dry, and there were very strong winds;
- Inadequate fuel reduction had been done;
- There were multiple fires;
- The seriousness of the situation was not fully appreciated by the community.
- Communities were ill-prepared.

Recommendations regarding aspects of the responses to the 2009 bushfires:

1. There should be recognition on the improvement in controlling multiple lightning strike fires since the 2006/07 season and that the number of fires controlled prior to 7th February was a major achievement. There should also be due recognition of the bravery of firefighters on 7th February and that they achieved a lot in asset protection and the saving of lives under terrible conditions and at considerable risk to their own lives.
2. Investigate the significance of the lightning strikes that occurred prior to 7th February that were within areas burnt in the 2003 and 2006/07 fire affected areas and the influence on subsequent spread and control.
3. The weather forecasts for this period in January and February need to be examined against the actual conditions to highlight the importance of the accuracy and timeliness this service has to all aspects of firefighting and to all aspects of loss of life and property.
4. The mechanism around which Fire weather services can be made more accessible to the public particularly the characteristics of severe bushfire days and the risks associated with wind changes.
5. That linked to weather forecasting, fire behaviour prediction systems be given stronger support and predictions used more widely, including making predictions available to the public to clarify what could happen once a fire has started.
6. An analysis of the preparedness and damage caused by the Delburn fires a week or so prior to 7th February should be used as a measure of the effectiveness of warning systems and asset protection.
7. Appropriate documentation explaining the complexity of the fire behaviour and events of the 7th of February should be made available for public education.
8. In considering the 'Black Saturday' fires, greater weight should be placed on what was known at the time or could have been known rather than what is now known in hindsight.

TOR No. 4:

The measures taken to prevent or minimise disruption to the supply of essential services such as power and water during the 2009 Bushfires

The IFA is not in a position to comment on the immediate problem of disruption to power or water supplies, but we note that the high intensity fires on Melbourne's water supply catchments will have significant impacts on water quality and catchment yield.

The management policy adopted for Melbourne's water catchments is high risk³¹. It is based on closed catchments, early warning and detection, fire breaks and a fire fighting force. However, we believe that this reliance on reducing the possibility of ignition, immediate suppression response, and strategic firebreaks is insufficient if it is not coupled with fuel management.

³¹ http://thesource.melbournewater.com.au/content/whats_new/whats_new/20090130.asp

There has never been any doubt that if catchment forests were left long unburnt, eventually they would burn intensively. It is estimated that in February 2009, 100% of the mature and old growth ash forests within the Wallaby Creek catchment were killed and 50% of the mature and old growth ash forests within the O'Shannassy catchment were killed including the Australian mainland's top ten tallest trees³². In addition, much of the regrowth in the Armstrong Creek catchment was killed, half of Tarago catchment and $\frac{3}{4}$ of Maroondah catchment burnt³³ but at a lower intensity in the days after 7th February. Apart from loss of forest values, this will almost certainly lead to problems of erosion and stream and reservoir sedimentation during the next winter, and in the longer term to about a 3% reduction in catchment yield³⁴.

Fuel reduction burning in the most critical water producing mountain and alpine ash forests within these catchments is not generally practically feasible as, when conditions are suitable for burning these forests the surrounding mixed species forests would burn intensely. What is possible and required is fuel reduction burning in the mixed species forests to assist in preventing fire from reaching the ash forests. This is feasible and has been undertaken for the first time during the last few autumns. There is an urgent need for the practice to be significantly increased.

It should be noted most of the Maroondah catchment which had not been burnt since 1939 burnt in week following February 7th. However it burnt under mild weather conditions and light winds. While there was still crown scorch on most of the mixed species, largely attributed to such dry fuels and high fuel loads, most of the mixed species forests will quickly recover. Much of the ash forests also burnt with a relatively low intensity so that only a small proportion was killed.

This is quite remarkable over such a large area where it had the potential to cause complete stand death in areas such as the Black Spur. The end result was almost a perfect fuel reduction burning for ash forest types. The Royal Commission should examine this from a fire behaviour and catchment protection viewpoint in terms of the water quality implications of the low intensity burn to form a view on whether greater fuel reduction and fuel modification practices are required within the catchments themselves.

Recommendations regarding disruption to essential services:

1. Victoria's policies for the protection of water catchments need to be reviewed in light of the damage suffered to Melbourne's catchment forests during the 2009 bushfires.
2. The Royal Commission should investigate the circumstances under which the Maroondah catchment burnt in terms of fuel loads and weather conditions in order to inform future fuel management in catchments dominated by eucalypt forests of ash species.

³² Bret Mifsud is one of Australia's leading authorities on tall trees. Personal communication

³³ http://www.melbournewater.com.au/content/bushfires_in_catchments/bushfires_in_catchments.asp

³⁴ Based on proportion of catchment supply to Melbourne and using Summary results from Mien R. (2008) *Potential impacts of forest management on streamflow in Melbourne's water supply catchments*, Summary report for Department of Sustainability and Environment Wood and Water Project - Action 2.21 (May 2008)

TOR No. 5:

Any other matters that [the Commission] deem appropriate in relation to the 2009 Bushfires.

Bushfire-related research

In Australia in an average year around 29 million hectares are burnt by bushfires. With seasonal fluctuations however, this area can vary to four times greater or less than this average. For example, in 1974/75, 115 million hectares or 15% of Australia was burnt.

Around 90% of the area of Australia burnt by fire each year is found north of the Tropic of Capricorn, with burning occurring during the 'dry season', generally between April and November. Most of the remaining burnt area (around three million hectares) is found in the temperate, more densely populated southern region of Australia with high fire danger generally occurring between December and March.

Significant differences feature in terms of the types of fires that occur in northern, and in southern Australia. Northern Australian fires tend to occur in savannah woodlands and in hummock grasslands. The amount of fuel in these environments is generally limited and the weather conditions in the dry season are generally stable. Maximum fire intensities in these situations rarely exceed 20,000 kW/m. During bushfires in the mountain forests of southern Australia maximum intensities can reach up to 100,000 kW/m.

The El Niño-Southern Oscillation (ENSO) has been responsible for a 12+ year long drought in much of southern Australia. Since 2000 southern Australia has experienced fire seasons that have been as dramatic as have been seen in the 200 years since European settlement.

Under Australia's federal constitution, State and Territory governments are responsible for instituting their own regulatory arrangements for the protection of life, property and the environment, and have the primary responsibility for delivering emergency services, including fire protection and management to the community.

Bushfire-related research capacity

1. From the early 1980s budgetary restrictions, changing corporate priorities and philosophical approaches to the management of public land saw the research capacities of many of Australia's rural fire, and park and forest management agencies decline significantly. By this time Australian bushfire related researchers of international standing numbered less than half a dozen, with over half of those being over 50 years of age.
2. By the early to mid - 1990s agencies, particularly in southern Australia, were confronting increasing urbanisation of bushland areas, prolonged drought and global warming, increasing strains on forested water catchments, declining rates of volunteerism and concerns about their continued ability to adequately manage fire.
3. Commonwealth, State and Territory governments, the CSIRO and the peak industry body (now known as the Australasian Fire and Emergency Service Authorities Council – AFAC) were starting to work co-operatively in the development of building fire safety codes, and in undertaking limited fire related research, formulating agreed policies and providing advice on forest, woodland and grassland (bush) fire safety.

4. A *Bushfire Cooperative Research Centre* was established in July 2003, with the strong support of the industry's peak body AFAC, the support of Ministerial Council linked *Forest Fire Management Group* and a majority of the park and forest management agencies around Australia. Its formation followed bushfires around Sydney in December/January 2001/02, and two earlier unsuccessful attempts to establish a CRC.
5. Prior to the establishment of the Bushfire CRC, effectively no social science or policy-related research capacity was occurring in Australia. Some individual agencies were still doing some research, but traditionally this was occurring in the areas of fire science and fire fighter health and safety, with some ecologically related research being done in a few park and forest agencies.
6. At the time of the establishment of the Bushfire CRC the IFA understands that none of the researchers involved in the community safety program had previously worked with bushfires. Without the advent of the Bushfire CRC it is unlikely that relevant social research would yet be occurring in Australia in any substantial way. The work in this area that has been completed to date is unique to the fire industry, both in Australia and internationally, with its focus on community safety as a key component of fire management.
7. Much of the work of the current Bushfire CRC (and of agencies such as the Department of Environment and Conservation in WA, and the CSIRO) is aimed at finding ways of reducing the level of bushfire risk for given levels of investment and resourcing by governments and the wider community. While much has been learnt over the last few decades about the management of fire in eucalypt dominated ecosystems, and in grasslands, much remains to be understood. The behaviour of bushfires under extreme conditions (dry fuels, single digit humidity, high temperatures and strong winds), the effects of certain types of atmospheric instability, the impact of climate change, and the behaviour of humans in emergency situations (both fire-fighters, and of affected residents) are just a few of the areas where much remains to be done.
8. The IFA understands that the current Bushfire CRC is one of the largest current CRCs with over 30 partners - including 13 research institutions spread across Australia and New Zealand.
9. One of the key reasons for establishing a nationally coordinated bushfire research program was to address the serious and growing national shortage of bushfire related researchers. To date, one of the *Bushfire CRC's* most important achievements, in the IFA's view, is the fact that post-doctorate fellows and post-graduate students now number over 80. While some have gone on to find employment within agencies greater opportunities must be found however, if this enhanced research capacity is not to be squandered.
10. The performance of the *Bushfire CRC*, over its first six years of operation, has not been without problems. Achieving, and maintaining consensus as to research priorities, among such a relatively large group of stakeholders, is but one of the challenges the organisation has faced. Of particular concern to the IFA has been the difficulty the CRC has encountered in attracting sufficient numbers of high standard post-graduate students into the CRC's Program A (*Safe Prevention, Preparation and Suppression*). This problem would appear to pre-date the CRC however, and seems linked to the relative unpopularity of mathematics and science at secondary school level over the past two decades. This matter, as it relates more generally to the skills currently available inside land management agencies, is addressed elsewhere in this submission.

11. On balance however, the IFA has been generally supportive of this first national attempt to deliver coordinated bushfire-related research. The IFA was particularly heartened by the findings of an independent review of the first five years of the CRC's operation (the review report can be found on the *Bushfire CRC's* website).

An International Dimension

12. As well as the strengthening links between research organisations across Australia and New Zealand, Australia's international research links have been growing, both with the U.S. and Canada, and more recently, with the assistance of the UN's Food and Agriculture Organisation, with Europe. Currently, formalised research agreements with the *Bushfire CRC* exist with:

- The University of California, Berkeley - College of Natural Resources – Centre of Fire Research and Outreach. U.S.A.;
- The U.S. Department of Agriculture – Forest Service;
- The Albert-Ludwigs University, Freiburg, Germany;
- The Desert Research Institute, Nevada. U.S.A.;
- The Fraunhofer Institute for Atmospheric Research, Garmisch. Germany;
- Forest Fire Research Institute at the University of Coimbra, Portugal; and with
- The Faculty of Ciencias Forest at the University of Chile.

Negotiations are understood to be currently occurring with the U.S. Department of the Interior regarding the signing of a formal research agreement.

13. In an introduction to his most recent book (*The Still Burning Bush*), the international wildland fire commentator Stephen Pyne says “*Australia is among the world's fire powers. It has fires, fire institutions, fire scholarship, and a vigorous fire politics. Only America has invested a comparable fraction of its national culture into the subject, so what Australia has to say about fire matters far beyond its own shores*”.
14. Having studied and written about wildland fire around the globe, Pyne concludes that while Australia is one of the “Big Five in fire science” its fire management problems have been growing in recent decades. Having paid previous generations, and particularly those who worked in forest and fire management in the post Second World War decades high praise, Pyne finds much of concern in some more recent trends.
15. The first non-parliamentary national inquiry into bushfire mitigation and management since federation reported in 2004. The Council of Australian Governments (COAG) Bushfire Inquiry was wide-ranging in its scope and made 29 recommendations. In responding to the COAG Bushfire Report, the Australian governments (Commonwealth, State and Territory) attached considerable importance to the responsible management of landscape through the application of appropriate fire regimes to reduce the severe bushfire impacts on communities, property and the environment. In doing so the Governments acknowledged the probable added complexities associated with climate change.
16. In its final report the COAG Inquiry said (page 86) that:

..... *The Inquiry considers that developing and sustaining a critical mass of innovative researchers—at a higher level than has historically been typical—is necessary if its vision for bushfire mitigation and management in Australia is to be realised.....*

..... *The partnerships between researchers and research users that are fostered by the Cooperative Research Centre model are a critically important foundation for future work.....*

..... *maintaining and enhancing research priority-setting mechanisms and research structures that represent and encourage real partnerships between researchers and research users. The Inquiry notes the value of models such the Cooperative Research Centres and the Australian Research Council's key centres and networks in this context.....*

17. The Inquiry went on to recommend (page 87) that:

.....*that the Australian Government, in partnership with the States and Territories and relevant research organisations, develop a strategy for sustaining bushfire research and capacity building, in the context of a risk-management approach to bushfire mitigation and management.....*

In making this recommendation the Inquiry went on to comment that:

.....*Maintaining sufficient research capacity beyond the term of the Cooperative Research Centres is also problematic, and action must be taken if research is to continue to adequately inform bushfire mitigation and management.*

Conclusion

While the IFA is not formerly a *Bushfire CRC* stakeholder, a number of its members are active, as a consequence of their employment, in many of the CRC's forums.

The current *Bushfire CRC* has focused on the present challenges facing the industry. At AFAC forums over the last eighteen months agency CEOs and land and emergency managers have expressed the view that this commitment is insufficient to meet the demands of the future. A consensus has emerged that current land and emergency management practices are not sustainable in a changing world. The IFA shares this view.

To better position Victoria (and Australia) in terms of fire management, AFAC and its constituent agencies have formulated a proposal that is currently before the Federal government proposing that it join with the industry in securing the future of a nationally focussed and coordinated research program for at least the next seven to ten years.

The proposed research program is designed to address the broad areas of risk management, carbon, water, biodiversity, and the role of local government in fire management. Developing a better understanding of 'community resilience', structural fires, incident management, and the use of technology also feature in the bid. Successful bids are expected to be announced by the Federal government in July 2009 (it is understood that in the wake of the recent Victorian bushfires the Federal government has been advised that industry proposes to revisit the current priorities and program weightings contained in its current bid).

In the meanwhile it is understood that AFAC and the *Bushfire CRC* are continuing to strengthen international research collaboration to both broaden the scope of the future Australian research program and to widen the opportunities available to individual researchers. This on-going commitment to research and this evolving international collaboration will enable Australia to continue to play a leading and constructive role in the international wildfire and emergency management community. The IFA supports the general thrust of the current efforts of the AFAC led consortium and the efforts of individual agencies (including the CSIRO and several universities) in continuing to focus on Australia's bushfire-related research needs.

TOR No. 6 :

The preparation and planning for future bushfire threats and risks, particularly the prevention of loss of life.

Our response to this TOR is already covered under previous TORs and under TOR No. 8

TOR No. 7:

Land use planning and management, including urban and regional planning.

Municipal Planning Schemes applying to private lands already contain Fire Hazard Overlays which require specified setbacks, hazard reduction works, and provision of, for example, water supply for firefighting. This occurs within the constraints of the Native Vegetation Framework.

Planning Permit applications for proposed building are administered by municipalities in accordance with the Planning & Environment Act. Where bushfire is likely to be an issue, a municipality has discretion to refer applications to the Country Fire Authority, and/or the Department of Sustainability & Environment or Parks Victoria if proposed buildings are close to public lands.

Recommendation re land use planning and management:

1. There is considerable scope for a more uniform approach to requirements that would achieve rural and rural-fringe housing better able to be defended against bushfire.

TOR No. 8:

The fireproofing of housing and other buildings, including the materials used in construction

Regardless of house design, the best ways to increase the chances of it surviving a bushfire are:

- to have adequate separation between it and large quantities of combustible fuels; and
- the presence of able-bodied adult/s to extinguish small embers that could otherwise ignite and destroy the building.

8.1 House design

The IFA is aware that this issue has been the subject of reviews and research for many decades in Australia, in particular by the CSIRO, with studies based on the impacts of the Hobart fires in 1967 and the Ash Wednesday fires in 1983. Furthermore, there is an Australian Standard (AS 3954) which deals with the requirements for building houses in a fire-prone environment. As long ago as 1987 a wildfire house survival meter was produced by the CSIRO's A.A.G. Wilson enabling a person or organisation to calculate the likelihood of a house with specific features surviving a wildfire attack.

The essential design elements that improve the survival prospects of a house are:

1. Floor and floor space:

- Houses should be built on a concrete slab rather than with a suspended floor (stilts, stumps etc).
- If houses do have a suspended floor the sub-floor space to be enclosed to prevent build-up of flammable material and entry of burning embers.
- The supports for a suspended floor house to be made of non-combustible material (steel, brick, stone, etc).

2. External walls:

- External walls to be non-flammable (steel, galvanised iron, brick, masonry, concrete, etc).
- If the external walls are timber, vegetation to be kept away from the walls by at least 2 metres, by use of a non-flammable (eg cement path or pebbled) strip.

3. Windows:

- Openable windows to be fitted with a gauze screen made of corrosion-resistant metal with a maximum aperture size of 1.8 mm.
- Windows not fitted with such a metal screen to be fitted with toughened glass.

4. External doors:

- All external doors to be tight fitting and fitted with weather strips to prevent entry of burning embers.

5. Vents:

- Air vents and weepholes to be fitted with corrosion-resistant metal gauze spark guards with a maximum aperture size of 1.8 mm.

6. Roof:

- Roofs to be made of non-flammable material with no gaps³⁵ (galvanised iron, steel).

³⁵ http://www.churchilltrust.com.au/res/File/Fellow_Reports/Arnol%20Chris%202007.pdf This Churchill fellowship report is worth considering for its insights into fire-fighting in other countries.

- The junction of the wall and the roof to be sealed with metal gauze spark guards with a maximum aperture size of 1.8 mm to prevent entry of burning embers into the roof space.
- Rotary roof ventilators to be fitted with metal gauze spark screens with a maximum aperture size of 1.8 mm.
- Roof-mounted evaporative air conditioners to have the openings to the cooling unit fitted with metal gauze spark guards.

7. Eaves:

- All eaves to be enclosed and the gaps between the rafters sealed.

8. Service pipes:

- Water pipes to the house to be metal if above ground and buried to a depth of >300mm if PVC

9. Gutters and downpipes:

- To be fitted with corrosion-resistant metal spark guards which can also act to prevent build-up of flammable material.

Many of these design requirements are included in the revised Building Code for bushfire areas. While this approach is fundamental to preparedness, it largely applies to new buildings or renovations so there is no system currently available to identify the adequacy of preparation of an already existing house.

In addition to designing new buildings which gives them a known rating, there is an urgent need for all existing buildings to be assessed for bushfire preparedness and defendability. Currently, fire-fighters only discover the design preparedness of a house when they enter a property. By then it may be difficult to escape if the access is inadequate or if a building cannot be defended. This situation could be greatly improved if a simple system of marking the bushfire rating of properties was developed. This could either be applied by fire-fighters during the response phase or rated during community preparedness. During a fire it would make a significant difference to asset protection, public safety, and fire-fighter efficiency and safety.

8.2 Landowner safety

In addition to this existing information on houses and buildings, there is a lack of publicly-available accurate information about safe locations for humans in severe bushfires. In the absence of this, some landowners may have unrealistic expectations about their survival chances if they remain in their home or building. Accordingly, some people may have been encouraged them to adopt unsafe responses to fire, or to adopt responses that merely show they are doing something (are seen to be acting responsibly) but when it may not actually stand-up to the impact of a severe bushfire.

Factors that will save human life have to be provided to the public. This should include education programs at schools and fire awareness campaigns, plus responsible information about survival in the sorts of fire plans that people are being encouraged to develop for themselves. This must include information about other locations (apart from well-prepared buildings) that are known to be safe.

Radiant heat is the factor that kills most in bushfire. Fire-fighters are equipped and trained to be conscious of radiant heat protection and they know their airway must also be protected from inhaling hot dry or warm moist air. Since the Linton fatalities in 1997, fire-fighters are trained in the use of survival blankets, water sprays, and heat shielding on their vehicles and about where best to maximise the chance of survival. They are taught a simple rule of thumb - that a safe location in the open must be at least four times the flame height away from the fire. This training seems to be enabling fire-fighters to better recognise the risks. It includes practical demonstrations of survival drills and experience with and without

sprays and other equipment, and importantly, is based on human physiology and the heat emissions from flames³⁶.

Humans have a very low tolerance for radiant heat on bare skin with the typical pain threshold being equivalent to about 3 to 4 KW/m². This is a very low level of heat in a bushfire – considering that high intensity bushfires emit 80 to 100KW/m² of radiant heat which can be sufficient to melt glass. A person exposed to just 10 KW/m² will generally die without their clothes being destroyed. The fact that many people are not educated about the dangers of radiant heat is evident in news footage of bushfire events, including Black Saturday, when many of the general public were observed in close proximity to flames whilst wearing shorts and singlets.

The concept of a bushfire bunker has gained a lot of publicity since the 2009 bushfires – bomb proof or bullet proof, all it has to be is fire proof and that can be achieved by going underground. A few people used bunkers or well-constructed cellars to survive these fires, but sadly (as mentioned above) not enough was made known about how they work and how quickly they can be constructed.

Bunkers could be installed at home or at a school but improvised, readily available radiant heat shelters can assist people to survive. Dams, drains, creeks, quarries, gravel pits, culverts and mine tunnels have all been used successfully in the past. Some people have also driven into bare paddocks to survive. Many people survived on sports ovals³⁷. That so many people survived, largely in improvised safe locations gives weight to the need to better promote how to survive and what to use. Why so many perished needs to be examined carefully and acted-on accordingly.

The use of shallow underground shelters to survive severe bushfires arose in the early 1900s in the remote forests of Victoria when it was observed that wombats survived bushfires by simply digging a hole and crawling into it. Wider application in the wake of multiple fire fatalities in 1926 and 1932 was strongly resisted, but by 1939 many sawmill settlements had primitive dugouts, many of these in the forests not far from Marysville.

The earliest documented report of a dugout saving lives (5 men) in a forest fire was in 1932 near Powelltown but it is known there were earlier accounts³⁸. Evidence to Judge Stretton in 1939 about the hopeless situation for families in some sawmill towns caught-up in the conflagrations and the contrast to situations where dugouts did save families was compelling. So the difference between life and death came down to a dugout and just about any primitive design worked in those severe fires.

The earliest dugouts were little more than a trench dug in the ground with a few sheets of corrugated iron dragged over it and covered with soil – a wet blanket covered the entry. After 1939 dugouts were well designed and provided in their hundreds in bush settlements and at forest work sites. They were generally made from local materials which might account for their deterioration. Few usable dugouts remain in the bush today.

Dugouts or bunkers could be simply and cheaply constructed using a backhoe to dig a trench in a clearing and backfill a covering with earth. More elaborate designs using concrete or brick might appeal to some home owners as a bolt hole, perhaps doubling as a wine cellar - that would be one way to sit out a bushfire safely.

³⁶ *Firefighter Safety Zones*, by BW Butler and JD Cohen, International Journal of Wildland Fire 8(2) 73-77 (1998)

³⁷ Marysville is the prime example and as far as we know no-one on the oval perished during the fires which therefore requires investigation as to the circumstances under which large scale evacuation took place just prior to the fire front approaching.

³⁸ *Forest fire and funeral pyre – tragedies in the Victorian bush*, by P. Evans Victorian Naturalist 121(3) 89 -98 (2004)

As recently as 2005, measures on Fire Refuges in Victoria were reviewed by the OESC and this identified that fire refuges provided after the 1983 fires had largely been removed by municipalities, exposing people to greater risks.³⁹ In many instances, only the signs indicating the location of these refuges had been removed. This needs to be reviewed, including identifying other safe locations.

The IFA does not have specific experience on the use of bushfire bunkers. However we know that

- Bunkers below ground level accumulate carbon monoxide particularly if smouldering combustion persists in heavy fuel around the bunker.
- Bunkers beneath houses will practically ensure death of the occupants if the house burns.
- Bunkers away from the house will be effective but there are probably better alternatives.

It is understood that several people died during the 2009 bushfires whilst in home-made bunkers or other locations where they presumed they would be safe. This also needs to be examined to better inform the safe design of bushfire shelters.

8.3 The Stay and Defend or Leave Early policy

Since the 2009 bushfires, much has been said and written about the veracity of the current ‘stay or go’ directive to householders in fire-prone areas.

The IFA support this policy, but only so long as it is properly enunciated so people do not evacuate en masse under relatively benign conditions. There are many examples, particularly in the USA, where people have been evacuated en-masse and there has been extensive house loss under relatively mild burning conditions.

However, we would emphasize that its successful application is highly dependent on landowners and householders being able to accurately assess the chances of saving their house and ensuring their own survival. They must also have a realistic idea of what is required to prepare a home for survival and the physical effort required to actually save it as the fire passes through. This should also include an understanding of situations and circumstances in which it will be almost impossible to save houses. Clearly, there is considerable amount of public education required.

We would like to stress that survival in an intense forest fire is not easy and the preparation required to protect a home or township imbedded in tall forest entails vegetation removal and modification that is incompatible with many people’s expectations of life in a bush setting. Within the town or close to homes, flammable eucalypts should be cleared or replaced with lower-flammability exotic deciduous hardwoods. Home surrounds need to be bare or irrigated lawns. Gardens should be dispersed and un-mulched. In towns, vacant blocks and council lands must be maintained in a low fuel state. The surrounding forests should ideally be prescribed burnt every 5 years.

People should stay only if they are fit, prepared to put up with chaotic and dangerous conditions, and if their dwellings have been well prepared, and clearly understand what is going to burn around them. Otherwise they should leave, but they should leave early, not wait until the last minute.

If it is not possible to leave town early, then the safest place is in a vehicle on a large grassed area like a sports oval. They should stay inside their vehicle until the fire front has passed. They should have woollen blankets for protection from radiant heat, a good supply of water and fire resistant clothing (not synthetic) as well as face protection. They should be aware that they must not expect to be able to return

³⁹ *Fire Refuges in Victoria – Policy and practice*, Office of the Emergency Services Commissioner (2005)

to their homes for some time, due to emergency vehicles and debris (sometimes live power lines) on the road, smoke, and general chaos.

The passage of a fire front is relatively fast but its intensity and residual duration is dependent on the amount of flammable material of all kinds close to a house. People preparing to stay must expect their house to catch alight somewhere. Their subsequent ability to survive and protect the house will be largely dependent on how soon after the flames pass that they are able to venture out and extinguish any burning parts of the house. In addition, they must be prepared to stay and scout for ember ignitions for several hours after the fire has passed.

- If the house is surrounded by only grass tall flames will last only 5-10 seconds but sparks and wind-blown burning debris may make conditions untenable for several minutes.
- If the house is surrounded by a 20 metre wide clearing and the surrounding forest carries less than 8 t/ha of available fuel, tall flames from the forest fuels will last around 2 minutes but the smoke heat and sparks from residual fuels burning in the forest will make it difficult to work outside the house for 10 – 15 minutes.
- If the house has heavy fuels close to it including garden beds mulched with deep litter or wood chips, residual burning and blown embers will make it impossible to carry out any effective suppression for more than 30 minutes after the fire hits, and practically guarantees destruction of the house and death of the occupants unless there is a fireproof refuge very close by.

Houses which have been properly prepared have the best chance of survival. This means at least a 20 metre non-flammable zone (mown lawns, gravel) around the house, no overhanging trees, no shrubs against the walls, no mulched garden beds and fuel stores, gas bottles, wood heaps and rubbish or thick bush tidied away well before the fire arrives and garden shed on the south or east side of the house.

Even if the house is well-prepared externally, residents in fire prone areas who opt to stay with their house should have a prepared safe haven inside: one room in the house which has been prepared to be as fire-safe and smoke-free as possible in which the family can shelter while the fire front goes through.

Experience shows that in severe bushfires, buildings are usually ignited from ember attack to the exterior rather than direct contact with flames. Embers are driven against the building by very strong winds as the fire passes. Everything that is flammable close to the house will ignite. For example it is now known and has been the subject of research since the Canberra fires of 2003, that wooden paling fences popular in urban situations between houses ignite readily and burn fiercely. Tinder dry flammable paling fencing propagates bushfires through urban areas and this ignites and destroys houses that otherwise are defensible. This is a major concern and requires changes to fencing requirements. No flammable fences should be built around new properties or replaced at existing properties. Non-flammable fencing should be used in residential bushfire-prone areas.

The IFA has also had experience with sprinkler or other water-delivery systems for house protection. These can drench the house roof and walls and the immediate surrounds before a fire arrives and will minimise the flammability of a house. However, sprinkler systems cannot be relied upon as the sole means of survival or protection. This is because:

- in bushfires water pressure can drop and electric power supply fail;
- bushfires are often associated with gale force winds which make sprinklers less effective;
- winds can come from either the north to north west or the south to south west, depending on whether a cool change has occurred; and

- water evaporates rapidly so the rate of application has to be increased under severe fire conditions.

In severe fires boosted water pressure is required so that users have an adequate stream when all are drawing on it to save their property and need more pressure to counter heat and wind. Whether it is a reticulated supply, tanks or a dam, provision for boosting pressure has to be provided and on days when severe fires are likely, booster pumps independent of electricity, should be made ready. In addition to booster pumps, additional provision needs to be made for filling fire tankers rather than using mains so filler pumps have to be made ready at convenient static water supplies.

Rural fire agencies normally use tankers in bushfire situations, and rarely use pumpers as these have no capacity to work a fire edge or to move between assets, nor for that matter move anywhere. Fire agencies should not place pumpers on mains to extract water in bushfires without first boosting those mains. Pumping from a main results in cavitation and drastic pressure and flow problems that is impossible to recover from – so more houses burn. Contingency plans to boost water mains on severe fire danger days are required in bushfire risk areas.

The IFA maintains that sprinkler systems can only be regarded as back-up to other measures such as good preparation of the house surrounds, and residents being equipped and able to fight spot fires, and preferably having a safe haven into which they can retreat if necessary.

- Sprinklers can also reduce the amount of work to wet down around a building and can be left operating when the fire approaches and people move inside.
- Fires can damage engine-driven pumps and pipes
- Reserves of water to protect the house from a tank or dam have a finite use and in drought years this reserve is likely to be depleted.

In other countries with severe fire problems there are other options for the protection of assets in addition to or as alternative to the use of large volumes of water. These are simple physical barriers using foils, better use of mineral earth barriers and heat shielding, and selected application of water based longer term barriers using small quantities of chemical retardants, gels, and foams. They have advantages as they are basically a once-only treatment that reduces the effort in patrolling properties for ignitions and provide much better and reliable barriers to heat than water sprays. There are also some advantages in this for fatigue management as it substantially reduces the continual application of water where properties are under threat for days. The efficient use of water also needs to be promoted – at present this is missing from fire asset protection.

Recommendations re the fire-proofing of houses and other buildings:

1. Develop a simple system of rating asset protection requirements to be applied at the entrance to all existing rural properties to improve the efficiency and safety of the asset protection fire-fighting. This would add something more practical to existing properties that will never otherwise benefit from the intent of the design requirements in the revised building code.
2. Develop plans for reticulated water supplies that enable the boosting of that service on extreme fire danger days and encourage a greater reliance on private water supplies for asset protection through independently-powered fire-fighting pumps
3. Develop standard procedures for a greater diversity of options for asset protection in addition to water sprays, such as physical barriers that are more reliable and can be used by firefighters and property owners.
4. Develop new fencing standards for high bushfire risk settlements to prevent the propagation of bushfires through residential developments via paling fences.
5. Review the need for fire refuges and have a methodology in law (rather than with municipalities) that identifies the requirements for safe design as well as siting and usage standards. Have fire refuges and safe locations promoted in education material and in communities in fire-prone locations.
6. Develop information on the use of existing woollen or high tech heat blocking blankets for safety and survival and encourage these measures to be included in individual fire plans, including their use with regard to fire refuges (either naturally occurring or man-made). Consider funding the replacement of existing woollen fire survival blankets with superior hi-tech fire survival blankets.
7. Provide simple information on fire bunkers or dug outs and other places that are known to naturally provide safety during a bushfire, reinforce this to communities and check that these features are identified in residents fire plans so that if the house is destroyed the occupants have a better chance of survival.

TOR No. 9:

The emergency response to bushfires

This has been dealt with earlier in this submission.

TOR No. 10:

Public communication and community advice systems and strategies

The 2009 bushfires demonstrated that many people living at the urban/rural interface in Victoria have a serious lack of understanding about bushfire behaviour, preparedness, damage mitigation and the action to take in the face of a fire threat.

Fire agencies have devoted considerable effort has been devoted to bushfire education over many years. However, we believe there are three issues:

- Education about bushfire does not start early enough (ie. in primary school) and is not reinforced through all levels of childhood and tertiary education. Fire behaviour, bushfire preparedness and fire survival should be taught to Victorian children in the same way that public health and water safety issues are confronted.
- Community education programs have not been very effective.
- Bushfire education (at any Level) will not be effective unless it associated with regular practical exercises and demonstrations.

It is significant that the Victorian Premier personally advised the public of the potential severity of the bushfire threat in the days before 'Black Saturday', adding to warnings provided by the Bureau of Meteorology and reinforced by the heads of all fire agencies. These warnings were either not heard and acted upon successfully or otherwise, not heeded or fully understood. This is a common problem in any warning system where human behaviour has to be significantly altered from normal to get the right safety outcome. For example, in spite of these and other warnings, tourists were visiting high risk areas around the state and were going about their activities largely unaware in places like Marysville on the day of the fire.

It is also revealing to review news footage of the fires to see the totally inappropriate dress of many people trying to deal with fires, or escape them. They clearly had never been trained on this most basic aspect of bushfire survival. Sadly this type of behaviour always attracts TV coverage, reinforcing stereotypes - shorts, tee shirts and thongs, standing on a roof with a dribbling hose, howling wind and the fire not far away. This has to change. Given this demonstration of bushfire knowledge it is highly probable that most people have no concept of what constitutes fuel for a bush fire, how it burns, or what is involved in extinguishing it.

However, people cannot be expected to understand fuel reduction or the need to reduce hazards around their home if government agencies do not reduce fuels on nearby lands under their control. Prescribed burning for fuel reduction provides a practical demonstration of fire behaviour under mild conditions.

We believe the government must address three requirements:

- Examine all aspects of the current systems of providing information/messages/warnings and determine how they have been developed and how successfully they work.
- Investigate the fundamental information/messages/warnings that the community must receive, and make changes accordingly.
- Examine the most effective way of getting this information/message/warning across, so that people reduce the risks to themselves and modify their behaviour accordingly?

The development and implementation of an effective education strategy has been studied over the years and is now well understood. There are four key points to be met:

- The audience comprises different segments of the community, each of which needs to hear a message slightly differently or delivered slightly differently,
- Different audiences respond preferentially to different media, so it is necessary to define the way in which the message will be delivered to each audience segment.
- Some types of information must be repeated and reinforced so often that they become instilled and behaviour becomes instinctive,
- The effectiveness of the program in changing behaviour must be measured, and if it is not working the strategy re-designed.

Recommendations regarding public communication and community advice:

1. That the Victorian government engage professional communications and human behaviour experts to work with them in the design, implementation and monitoring of a revised and upgraded bushfire education program re-focusing on the essentials of survival.(noting that DSE has had such expert staff for some years now, so their message is not getting through).
2. That the curricular for primary and secondary schools be updated to include fire history, science, preparedness, and bushfire survival. Parental and community reinforcement is a vital aspect for success of this strategy.
3. That the Toolangi Forest Discovery Centre – which is already a well- located forest education facility – be modified and extended as a bushfire education facility. It already introduces school students to the impact and influence of fire in the natural environment. This program, which includes both on-site teaching and visits to schools, requires further and ongoing government support and expansion to increase students receiving this education first hand in the forest.
4. That the CFA and DSE websites are revised to provide a consistent and accurate understanding of which fires are currently or likely to be a threat and eliminate any confusion about where fires are in the landscape.
5. Promote appropriate behaviour and clothing in asset protection and bushfire survival by residents.
6. That the CFA and DSE organise practical exercises for residents in bushfire prone areas and invite key community leaders to participate in the field application of prescribed fire.

TOR No. 11:

Training, infrastructure and overall resourcing needs.

The issue of the safety concerns with plastic or fibre glass heat shielding on fire tankers was raised by David Packham at the Linton Inquiry where 5 firefighters died on a tanker that ran out of water and was then burnt-over. A similar tanker nearby was saved by a small amount of water. The evidence David provided appears not to have been acted upon by the Coroner. That and other evidence from more recent testing of tankers and these substances has to be re-examined. The CFA has lost a number of tankers this summer due to catching on fire but fortunately no-one has been killed.

Further training requirements centre around the asset protection phase of firefighting as this activity exposes fire-fighters to great risks and currently is poorly covered in training materials. From a public land perspective the resourcing of seasonal fire-fighters needs to be assessed to see that their skills are maintained and in non-fire season and they are engaged in genuine fire control measures such as track clearing, removing dangerous trees, fuel reduction burning etc.

Large numbers of fire-fighters were called in from interstate and internationally to meet the peak demands including those specific to longer- term forest fire-fighting. This is very costly as well as logistically difficult and delayed process. Resourcing of seasonal firefighter numbers, one of the lowest paid professions in the country, has to be more aligned to seasonal risks, managed more transparently and based on relevant predictors, thresholds and trigger levels and those firefighters engaged in preparedness works if not fighting fires. Reliance on seasonal fire-fighters employed for (say) 20 weeks per year is problematic because, despite some attempts at payments to encourage return, there is a struggle to attract top candidates and retain those who could build-on previous experience.

The move to contract plant and non- replacement of DSE dozer operators means that during fires, a significant proportion of plant operators are inexperienced in a forest environment, having worked on open paddock freeway, road and dam construction. They are therefore unable to perform to a high standard and be familiar with hazards. There is a training issue for plant operation in a forest environment. Some of the most experienced operators are from the timber industry which have been or are being forcibly removed from the bush in places like Portland, the Otways, the Wombat Forest, parts of East Gippsland, and the river red gum forests by government policies.

DSE has many experienced field fire-fighters nearing retirement, and while 2003, 2006-07 and 2009 have provided excellent experience for young staff, there has been a lack of succession planning and mentoring, partially due to budget constraints, and partially due to a reliance on fixed term recruitment. It has been suggested that a large number of staff in the IECC (Melbourne headquarters) have commenced with DSE since the 2006-07 fires and had little previous experience. A major fire disaster is not the ideal training ground for staff. This requires an assessment of the experience and capabilities of professional fire-fighters in terms of capacity to fill key positions.

Recommendations re training, infrastructure and resourcing needs:

1. Tackle the issue of the safety concerns with plastic or fibre glass heat shielding on fire tankers.
2. Examine the resourcing of seasonal fire-fighters to see that their skills are maintained and in non-fire season are engaged in genuine fire control measures such as track clearing, removing dangerous trees, fuel reduction burning etc.
3. Explore improved accreditation for volunteers to ensure they reach minimum standards for both safety and fire understanding. There is resistance to accreditation and training among some volunteers, particularly older and therefore more experienced people.
4. Examine future volunteer resourcing in light of the changing demographics of many rural areas. With much off-farm employment of family members, it is becoming increasingly more difficult to rely on local volunteer fire-fighters for fast initial fire attack.
5. Assess the experience and capabilities of professional fire-fighters in terms of capacity to fill key positions such as Level 3 controllers.
6. Critically examine the availability of experienced machinery operators familiar with bush work, the local conditions and ability to work in day and night in rugged forested terrain.
7. Examine whether the State Budget money allocated for fuel reduction burning is “new money” or “relabelled” base funding. The State budget just released has a significant amount of fuel reduction burning funds, but its origins are not yet clear.

APPENDICES



The role of fire in Australian forests and woodlands

Forest Policy Statement No. 3.1

The Issue

Fire is critical to the maintenance of biodiversity and ecological processes and contributes to the distinctive nature of Australian forests and woodlands. At the same time, uncontrolled fires pose a serious threat to human life, property, community assets and forest values including water, wood and biodiversity. Large-scale high intensity fires, often referred to as firestorms, have periodically inflicted major losses on the community since European settlers arrived in Australia. Inappropriate fire regimes may also threaten ecological values. In most Australian forests, complete fire exclusion is neither feasible nor ecologically desirable. Forest managers must therefore seek to understand the role of fire and to manage it in ways that complement broad objectives for land management.

Background

Fire is one of the most important factors in the ecology of Australian forests and woodlands. Charcoal deposits in lake sediments and pollen evidence indicates that forest fires have occurred periodically since Tertiary times, more than 16 million years before present. Aboriginal people have inhabited much of the continent for more than 40 000 years and over this period have used fire as a management tool for cooking, hunting, maintaining access and for spiritual reasons. The landscapes that European colonists and their descendants have come to recognise as being distinctively Australian have been fashioned by fire over many generations of aboriginal burning. Lightning causes a substantial number of bushfires, and is likely to have been an important source of ignition in pre-historic times. Bushfires are a characteristic feature of forests and woodlands throughout Australia. At one extreme, extensive areas of grassy forest and woodland in northern Australia burn annually or every few years. In contrast, tall moist forests in southern Australia may experience high intensity fires at irregular intervals of decades or even centuries. Between these extremes combinations of frequency, intensity, season, scale and patchiness of burning characterise various fire regimes.

Fire regimes are influenced by environmental factors including climate and weather, topography, soils, and the characteristics of the vegetation itself. In many forest landscapes, fire regimes have changed dramatically in the last two centuries as a result of agriculture and urban development, changes in land management practices, legislative restriction of the lighting of fires, and organised fire control.

Occasional extreme events such as prolonged droughts and severe fire weather conditions can greatly increase the scale and intensity of fires beyond what is experienced in an average season. The effects of extreme bushfire events on human society and the environment can be profound.

Fire plays an important role in a number of ecological processes within forests and woodlands. Heat, smoke and ash provide triggers for germination of many plant species, and a number of eucalypts regenerate best on ash seedbeds produced by burning. Fire regimes affect nutrient cycling processes in forests, and fire is instrumental in mobilising some elements into inorganic forms that are available for uptake by plants. Fires also result in loss of nutrients from forests and woodlands in the form of particulates in ash and smoke, and volatilisation. Stand development processes including recruitment, mortality, senescence, hollow formation and litter accumulation can be substantially influenced by fire, with resulting effects on structure, density and composition of understorey and overstorey layers.

For this reason there is often a direct relationship between fire regimes and structural features of the vegetation that determine habitat condition and population densities of many fauna species. In some environments, fire regimes play an important role in determining the ecotone between different vegetation types including rainforest, eucalypt forest, shrubland and grassland.

Excluding fire from naturally fire prone forests and woodlands can result in conditions quite different from those that have historically given rise to these ecosystems. Altered fire regimes may be linked to changes in ecosystem health and vitality, regeneration patterns, weed invasion and occurrence of pests and diseases. Fire exclusion is also very likely to increase the risk of large-scale high intensity bushfires. While such fires are an important trigger for regeneration in some forest and woodlands, they can also have adverse effects including loss of heterogeneity in vegetation structure, temporary increases in stream sedimentation, and persistent reductions in stream flow from forested catchments.

Fires in forests and woodlands can produce very large quantities of smoke and release significant amounts of greenhouse gases. Heavy concentrations of bushfire smoke can inconvenience the community and cause significant economic loss if the use of airports and major roads is restricted. At a national scale, fire regimes have considerable scope to influence greenhouse gas emissions and carbon balances and need to be managed accordingly. It is likely that these global issues will increase in prominence in the years to come.

Policy

The Institute of Foresters of Australia (IFA) advocates the need for a better appreciation of the important and complex role that fire plays in the evolution and maintenance of Australian ecosystems, including the collection and analysis of comprehensive scientific information and the effective distribution of information to policy makers, land managers and the community.

The IFA recognises that:

- fire is an agent of ecological change which has an important and on-going role in maintaining biodiversity and ecological processes in Australian forests and woodlands;
- the ecological effects of fire vary according to the season, frequency, intensity, scale and patchiness of burning in a landscape;
- forest fires can have effects that are significant at local, regional and global scales

The IFA considers that:

- State, Territory and the Australian governments have a responsibility to provide adequate resources for and coordinate research into the behaviour, environmental effects and social impacts of bush fires;
- A decision to deliberately exclude fire from naturally fire-prone forests and woodlands as an extreme fire regime that can have adverse consequences for ecosystem condition in the longer term;
- communities, agencies and governments should foster cooperative arrangements in relation to understanding and managing the impacts and use of fire in Australian ecosystems;

Further information

Bradstock, R., Williams, J. and Gill, M. (2002). *Flammable Australia - fire regimes and biodiversity of a continent*. Cambridge University Press. 462 pp.

Gill, A.M. (1975) Fire and the Australian flora: a review. *Australian Forestry* 38, 4-25

Gill, A.M., Groves, R.H. and Noble, I.R. (1981) Fire and the Australian Biota. *Australian Academy of Science*. 582pp

Luke, R. H. and McArthur, A. G. (1978). Bushfires in Australia. Australian Government Publishing Service, Canberra. 359 pp.

Pyne, S. J. (1991). Burning bush - a fire history of Australia. Henry Holt & Co., New York. 520 pp.

<http://www.bushfiresrc.com>

(Policy approved 16 November 2005)

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Managing fire in Australian forests and woodlands

Forest Policy Statement No. 3.2

The Issue

In most Australian forests and woodlands weather conditions occur every year during which, given sufficient fuel, bushfires can be virtually impossible to contain. Uncontrolled fires pose a serious threat to human life, property, community assets and forest values and these potential impacts need to be minimised by effective management. Fire also plays an important role in the maintenance of biodiversity and ecological processes and is an essential tool for silviculture and forest management. Forest managers are required to integrate a broad range of fire-related issues and to implement management programs that address objectives related to natural resource management and community protection.

Background

Management of fire in forests and woodlands is principally governed by legislation passed by State and Territory governments. This may include general legislation relating to fires in rural areas, as well as specific provisions in the legislation that governs the management of public native forests, conservation reserves and plantations. The Commonwealth Environmental Protection and Biodiversity Conservation Act imposes requirements in relation to fire management activities. Common law provisions also impose a duty of care on forest owners and managers with regard to fire.

Planning for fire management requires systematic assessment and analysis of the threat of bushfires to forest and community values. Hazards and risks associated with bushfires are addressed through strategies for the prevention of, preparedness for, suppression of and recovery from fire. Fire prevention activities include public education and awareness programs, minimising the risk of fire outbreaks from forest operations and recreation activities, enforcement of fire regulations, and thorough investigation of the cause of fire outbreaks.

Preparedness involves the management of fuels, detection of fires, provision of firefighters, equipment and communications systems, access and infrastructure and development of response plans to be activated in the event of unplanned fires. Collaboration between forest managers and other agencies responsible for fire management in rural areas is important in ensuring that resources are used efficiently and that the response to fire emergencies is effective and well coordinated.

Forest management agencies have a requirement to maintain an effective workforce available for fire management tasks, and to allocate sufficient resources to this task in order to meet their duty of care to the community, volunteer firefighters, and their own employees. Safety of personnel must be a paramount consideration in all operations associated with fire suppression or the planned use of fire.

Forest fire suppression is a difficult and dangerous task that requires well trained and experienced firefighters together with appropriate equipment and effective management systems, such as the AIIMS Incident Control System. The ability to conduct backburning during wildfire suppression operations requires specialist skills and considerable experience, which is most effectively gained by involvement in prescribed burning programs.

Prescribed burning is the planned application of fire under specified environmental conditions to meet particular management objectives. Prescribed burning is an important tool for forest

management and is used for a range of purposes including forest regeneration, site preparation, fuel reduction and habitat management.

Scientific studies have demonstrated that the speed and intensity at which a forest fire burns is related to the amount and arrangement of fuel comprised of leaves, twigs, bark and understorey shrubs. In many eucalypt forests, the amount of fuel increases with the time since last fire, and may continue to accumulate for several decades. Prescribed fire can be used to reduce the amount of accumulated fuel, thereby reducing the intensity and difficulty of suppression of unplanned fires, and minimising likelihood of severe damage to forest values. Prescribed burning can also have an important role in providing heterogeneity of fire regimes at a landscape scale.

Fire management programs should be based on the best available information about fire behaviour, the role of fire regimes in the environment, and the influence of fire on communities and society. This requires a commitment to ongoing research in a range of disciplines, and a commitment to technology transfer to ensure that new information is made available to decision makers and practitioners. Scientifically-based decision support systems are an important tool for integrating a wide range of information and can assist managers to make consistent and transparent decisions about complex issues. Decision support systems are currently being used for smoke management and to plan the use of prescribed fire for biodiversity conservation.

There is a need for forest managers to engage the community during the development and implementation of fire management programs, particularly where publicly-owned forests and woodlands are involved and forest adjoins urban and settled areas. Fire-related issues likely to be of interest to the community include asset and environmental protection, risk management, and the relationship between bushfire smoke and human health. Effective communication and consultation with the community leads to greater support for fire management programs, and ensures that knowledge available within the community is made available to forest managers.

Policy

The Institute of Foresters of Australia (IFA) advocates the need to actively manage fire in Australian forests and woodlands in a comprehensive, integrated manner that considers risks, ecological and forest management requirements as well as the protection of life, property and other assets.

The IFA recognises that:

- Fire plays an important role in the maintenance of Australian ecosystems but uncontrolled fires pose a serious threat to life, property and forest values;
- Prescribed fire is an effective tool for managing fuel accumulation, maintaining ecosystem processes and achieving silvicultural outcomes in forests and woodlands;
- Comprehensive fire behaviour knowledge is critical to the effective management of fires in forests and woodlands.

The IFA considers that:

- Management plans for forest and woodland landscapes should recognise the important ecological role of fire and provide strategies to ensure that fire regimes are compatible with broad land management objectives and ecological characteristics;
- Forest managers have a responsibility to minimise adverse impacts on society caused by uncontrolled forest fires, and should allocate adequate resources to manage fire risk in an effective and safe manner;
- There is a need to manage the accumulation of flammable litter and understorey fuels in strategic areas of forest in order to limit the intensity and difficulty of suppression of fires;

- Effective communication and consultation between forest managers and other stakeholders is critical to successful planning and implementation of fire management activities;
- Effective communication and awareness of the general public that fire is an important part of the landscape is essential;
- Forest fire suppression requires active involvement of well trained and experienced forest land managers who have considerable experience in prescribed burning.

The IFA supports:

- The use of the AIIMS Incident Control System and inter-agency agreements to facilitate co-ordinated management of wildfires, including resource sharing, standardisation of training and equipment, and mutual aid during fire emergency situations;
- The development and use of scientifically-based decision support systems to inform forest fire managers during strategic planning, resource allocation and operational decisions;
- The development of performance indicators to provide meaningful information about the effectiveness of fire management in terms of environmental, social and economic outcomes.

Further Information

Bradstock, R., Williams, J. and Gill, M. (2002). Flammable Australia - fire regimes and biodiversity of a continent. Cambridge University Press. 462 pp.

Burrows, N. D. (2004) Implementing fire mosaics to prevent large wildfires and enhance ecosystem health. Proceedings of the 11th Annual AFAC conference. Perth. pp 19-25.

Cary, G., Lindenmayer, D. and Dovers, S. (2003) Australia Burning: Fire Ecology, Policy and Management Issues. CSIRO Publishing. 268 pp.

Cheney, N. P. (2004) The role of land management agencies in protecting the community from bushfire. Proceedings of the 11th Annual AFAC conference. Perth. pp 13-18.

Luke, R. H. and McArthur, A. G. (1978). Bushfires in Australia. Australian Government Publishing Service, Canberra. 359 pp.

Pyne, S. J. (1991). Burning bush - a fire history of Australia. Henry Holt & Co., New York. 520 pp. <http://www.bushfirecrc.com>

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