



**SUBMISSION ON BEHALF OF THE
BUSHFIRE COOPERATIVE RESEARCH
CENTRE**

**SENATE SELECT COMMITTEE ON
AGRICULTURAL & RELATED
INDUSTRIES**

**INQUIRY INTO BUSHFIRES IN
AUSTRALIA**

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1. Introduction

As your Committee would be aware, under Australia's Federal Constitution the six State and two 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.

Commonwealth, State and Territory governments, and the peak industry body (the *Australasian Fire and Emergency Service Authorities Council – AFAC*) increasingly work co-operatively in undertaking fire related research, formulating agreed national positions and providing advice on forest, woodland and grassland (bush) fire safety and building standards.

Fire in our landscape

In the wider Australian community, fire is increasingly regarded as a part of the environment with large forest and woodland fires being understood to occur periodically, both prior to and since European settlement. In northern Australia, few years pass without large areas being burnt. These fires generally have a comparatively low economic impact due to the limited population density and the dispersed nature of built assets. Increasingly however, the greenhouse implications of these fires are being better understood.

In southern Australia however, large fires often have significant economic and social impacts. The 2002-03 and 2006-07 fire seasons in south-eastern Australia, and most particularly the 2008/09 season were bad, with very significant areas of forest burnt during the summers, major asset losses occurring, very high suppression costs being borne and complex incident management arrangements being required. The tragic 2009 Victorian 'Black Saturday' fires have again highlighted the negative impacts that bushfires can have on our nation.

2. Bushfire Related Research

From the early 1980s budgetary restrictions and changing corporate priorities saw the research capacities of many of Australia's rural fire, and park and forest management agencies decline significantly. By the early to mid - 1990s agencies, particularly in southern Australia, were confronting increasing urbanisation, 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.

The *Bushfire CRC* was established in July 2003, with the strong support of AFAC and its member agencies, 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.

Prior to the establishment of the *Bushfire CRC*, effectively no social science or policy-related research 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.

The introduction of social research

At the commencement of the *Bushfire CRC* 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 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 bushfire management.

Knowledge to reduce the bushfire risk

Much of the work of the current *Bushfire CRC* has been 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.

Research with an impact

Australia's first, nationally coordinated, multi-disciplinary bushfire research program has had an impact. New decision support tools have been implemented in areas such as smoke management, aerial suppression, prescribed burning, community engagement, fire weather forecasting, volunteerism and fire-fighter health and safety. Important research is well advanced on the role and behaviour of fire in a range of ecosystems including the tropical savannas of northern Australia and of the relationship between eucalypt decline and fire regimes.

In tandem with researchers, fire and land management agencies have gained a significantly improved insight into the way people face the bushfire threat. Central to this research is the need for a better understanding of what drives human behaviour before, during and after a bushfire. And industry now looks to the *Bushfire CRC* for advice on better materials for building houses, fencing, water tanks and other structures.

The *Bushfire CRC* is one of the largest current CRCs with more than 30 partners - including 13 research institutions spread across Australia and New Zealand.

At the outset the fire and land management industry was concerned that the *Bushfire CRC's* priorities should be determined by it and not by researchers. By the time of an independent *3rd Year Review* it was conceded that a more balanced industry/researcher relationship was appropriate. Changes were made, with one of the most recent demonstrations of the improved working relationship being the research team that was able to quickly be put into the field in the wake of the recent devastating Victorian bushfires.

One of the key reasons for establishing the *Bushfire CRC* was to address the serious and growing national shortage of bushfire related researchers. One of the *Bushfire CRC's* most important achievements is the fact that post-doctorate fellows and post-graduate students

now number over 80. While many have gone on to find employment within agencies greater opportunities are currently being pursued to ensure that this enhanced research capacity is not squandered.

Research with a national focus

With the formation of the *Bushfire CRC*, and while its scope covers only part of the total nationally identified research need, the industry now has a genuinely national point of focus and a much wider acceptance of the need for research. The injection of the Commonwealth funding has enabled the State-based agencies and the wider industry to commit over three times this funding in cash and 'in-kind' to create a critical mass of research that focuses on this important national priority.

3. The Management of Landscape Fire in Australia

A nation shaped by fire

It has been estimated (COAG 2004) that these days, in an average year, around 50 million hectares of Australia are affected by fire. 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.

Over 90 percent 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 is found in the temperate, more densely populated southern region of Australia with high fire danger generally occurring between December and March.

There are significant differences between 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 kilowatts per metre. During bushfires in the mountain forests of southern Australia maximum intensities can reach up to 100,000 kW/m. (Tolhurst 2004).

Changes in Fire Seasons and Land Use

The El Niño-Southern Oscillation (ENSO) is considered to be playing a major role in the now almost 13 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.

Over the longer term, the area subject to regular fire in Australia has declined somewhat over the past several decades as a consequence of changed land-use patterns, fire suppression practices and, and in many areas as a result of the cessation of traditional burning by aboriginal populations. In southern Australia, urban attitudes to the use of prescribed fire in more recent years have also been a factor in the decline in its use

Reports, recommendations and recurring themes

The period 1998-2009 has seen an unprecedented level of scrutiny of the management of bush (wild) fires in Australia. Yet despite all the reports and recommendations, many fundamental issues appear to remain unaddressed. As an example, over two and a half million hectares or over one-third of Victoria's public land has been burnt by wildfire since late 2002.

More recently, there does seem to be some recognition that escalating suppression costs may, at least in part, be linked to the falling rates in the use of prescribed fire.

From these State and Federal Inquiries a number of recurring themes have emerged. These include:

- Declines in the resourcing of park and forest management.
- The limited use of prescribed fire.
- The growth and increasing value of assets in the rural-urban interface zone.
- Declining rates of 'volunteerism'.
- Reductions in the level of fire behaviour/fire weather expertise in relevant agencies.
- The increasing focus on fire fighter safety, risk minimisation and the adverse impact of the legal system on fire management.
- The escalating use of technology.
- The impact of climate change.

Climate and fire

In relation to this last matter Australia's fire researchers and bushfire agencies clearly have much work to do if they are to sufficiently understand the probable influence of climate change on the nation's level of bushfire risk. The climate change debate is a complex one and, in the context of bushfires, must also be viewed in conjunction with the nature of Australia's native vegetation. Much of this vegetation has a complex evolutionary relationship with fire. Fire has been part of these environments for tens of thousands of years and much native flora and fauna remain dependent on it in various ways. Science must continue to assess the implications of a hotter world and an increase in fire.

Smoke from bushfires, and more particularly smoke from the use of prescribed fire, is increasingly viewed in some quarters as further adding carbon dioxide and other Greenhouse gases to the atmosphere. As with much of the science associated with climate change, however, the story is more complex. New vegetation that establishes following a fire invariably grows vigorously, generally locking up considerable quantities of carbon. Similarly, any contributions to global warming that may result from prescribed fires must be balanced against the global warming effects of more frequent and more intense bushfires that will occur in the absence of the strategic use of prescribed fire.

Building a diversity of knowledge

The work, over the past six years, of the *Bushfire CRC* has also seen the development of an increasing focus and appreciation that guaranteeing community safety requires a diversity of knowledge and an understanding of the many social processes that shape and ultimately determine a community's resilience to bushfire.

The wide range of related issues that have been under study include research into gender and vulnerability; the law and its implications for public/fire agency interactions; the arsonist's rationale; the influence of the media; the role of economics in bushfire management and decision-making; understanding declines in fire brigade volunteerism; bushfire safety policy and its implementation; and the effectiveness of community education and risk reduction schemes.

4. Issues Confronting Australia Over the Next 10 – 20 years

Issues identified by COAG in 2004

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 acting on 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.

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.....

The Inquiry went on to recommend (page 87) 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 said:

.....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.

A number of similar themes were pursued by the almost concurrently conducted 2003 House of Representatives (Nairn) Inquiry.

“A culture of improvement by research”

More recently, a 5th Year Independent Review of the *Bushfire CRC* (conducted late last year) concluded that:

The (Bushfire) CRC has played a leading role in initiating or further developing a culture of ‘improvement by research’ evident in all the agency representatives interviewed.

The Executive Summary of the Review Report concluded: *“The Panel has been greatly impressed by the quality of science and by the rate of adoption of research results evident in the Bushfire CRC.”*

The Panel also said it was impressed with the close association between the industry’s peak body (the *Australasian Fire and Emergency Service Authorities Council - AFAC*) and the *Bushfire CRC*.

The critical issues

In the light of bushfire experiences in southern Australia in recent years and the firming science associated with global warming, and having now suffered the largest and most devastating bushfire in the nation’s history, it would seem critical that Australia:

- Continue the nationally-focussed, end-user driven research that has been underway over the past six years;
- Build on the growing links between Australian researchers and their international colleagues, and the related institutions;
- Ensure that its national policies and strategies for the year round management of its large, and fire-prone forests, woodlands and range lands and its multi-layered urban planning system in the urban interface zone are underpinned by rigorous science and an awareness and understanding of relevant overseas trends and experiences; and
- Has an on-going capacity to undertake related specific tasks at the request of the federal, state and territory governments and third party inquiries (such as the current Victorian Bushfires Royal Commission).

A research agenda to 2020

Over the past 18 months a future research program (to 2020 and beyond) has been developed by the industry within a context that sees few communities in fire-prone areas around the country believing that they are successfully managing their forests, woodlands and rural areas and the inherent fire threat associated with them. Changes in philosophical and organisational approaches to wildland areas over the last 40 years, the expansion of urban populations into the hinterland, and more recently the uncertainties associated with climate change present current decision-makers with considerable dilemmas.

The AFAC-led proposal, currently before the Federal Government, followed a realisation by agency CEOs that the industries’ current way of doing things was not sustainable – not economically, not environmentally and not socially.

The proposal has been designed to address the broad areas of risk management, carbon, water, biodiversity, and the role of planning and local government in fire management. Developing a better understanding of 'community resilience' (including 'volunteerism'), structural fires, incident management, and the use of technology also feature. In the light of the recent 'Black Saturday' fires and the current Victorian Bushfires Royal Commission, a revisiting of the proposed research themes and priorities has been flagged in the proposal as possibly being appropriate, once the Commission has completed its deliberations.

The proposed *CRC Fire – Environment and Society* has been designed to answer questions such as:

- How do communities make decisions about their behaviour before, during and after fires?
- Why do these decisions often change at the last minute with often tragic results?
- What will the impact of climate change be on ecosystems and fire's role in the landscape?
- Where will the next generation of firefighters come from (given that the average age of volunteers is increasing)?
- How to reduce the level of bushfire risk for given levels of investment and resourcing by governments and the wider community.

Research themes such as prescribed burning, which were dealt with by the *Bushfire CRC*, have now reached the stage whereby the difficult policy development work is now proceeding – that is, balancing competing community expectations.

5. The International Dimension

Links, support and collaboration

For many decades there has been a growing recognition, across the Pacific Ocean, that there are many wildfire management similarities between North America and Australia, and regular visits, study tours and occasional officer exchange programs and research collaborations have occurred.

As well as operational and logistical support arrangements, research links have been growing, both with the US 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 US 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 currently occurring with the US Department of the Interior regarding the signing of a formal research agreement.

At a personal level the current *Bushfire CRC* CEO's commitment to promoting Australia's interests in international forums include:

- Member, and past Chair of the International Liaison Committee for International Wildland Fire Conferences;
- Member, UN – FAO *Fire Management Voluntary Guidelines* - Advisory Group;
- Member, UN International Strategy for Disaster Reduction - Wildland Fire Advisory Group;
- Board Member, International Association of Wildland Fire; and
- Chair, Editorial Advisory Committee - *International Journal of Wildland Fire*.

The proposed *CRC Fire – Environment and Society* (outlined in Section 4, above) has been developed to tackle research projects that will continue to deliver economic and social benefits to individuals, communities and industry throughout Australasia.

Building on the work of the *Bushfire CRC*, the successful establishment to the proposed CRC should see Australia well placed to continue to play a leading and constructive role within the wider international wildland fire community.

6. Future Possible National Tasks and Issues

National Tasks

Of its nature a CRC is primarily an end user-focussed research organisation. Australia's two most recent national Inquiries, and particularly the 2003 House of Representatives (Nairn) Inquiry, identified a number of tasks that it recommended be addressed at the national level. Many of these fall outside the currently funded research brief of the Bushfire CRC.

These identified 'tasks' include:

- the establishment of a 'single, fuel classification system';
- the development of private property based fuel management monitoring systems for use by local government;
- the establishment of an auditing system for the management of fuel loads on both publically and privately-owned land;
- the development of risk-based access standards for the nation's public lands, and similar standards for 'water access and availability';
- the development of standards relevant to the movement of fire fighting equipment during declared emergencies;
- the establishment and maintenance of a national data base for key fire related parameters including fuel conditions and the level of fuel management, areas burnt by all forms of fire and agreed measures of intensity/severity (to these could be added the monitoring and reporting of the annual greenhouse impacts of fire regimes);
- the monitoring of pest plant and animal problems following wildfire events;
- developing a national approach to the interface between the legal system and the responsibilities of Incident Controllers, and in relation to the impact of occupational health and safety legislation and the performance of fire agencies;
- the standardisation of cross State boundary support arrangements, and mutual support arrangements generally;

- reviewing the financial impacts borne by volunteers and their employers and exploring taxation related and other ways of reducing these impacts;
- developing a national approach to the insurance arrangements applying to volunteer firefighters;
- further national coordination and resourcing of fire management related aircraft services;
- a greater involvement of fire and land management agencies in the national mapping program;
- the development and implementation of a 'national strategic radio system', improved mobile data services and related enhancements to improve safety on the fireline;
- a greater nationally co-ordinated approach to land-use planning, building and maintenance standards in fire-prone areas;
- the development and implementation of fire related education and awareness programs;
- strengthened and more co-ordinated capabilities in relation policy development; and
- long-term approaches to the development and enhancement of fire research professionals.

However, action is underway in relation some of these recommendations at least partially, either following the completion of *Bushfire CRC* related research and/or through the agency of the peak industry body, AFAC.

The 'yet to be evaluated / implemented' list is however, lengthy and gives rise to a consideration as to what currently missing mechanisms are needed nationally.

National Issues

Notwithstanding the establishment of the current *Bushfire CRC* some six years ago, some residual tensions have remained within the wider research community as to the relative balance that should exist nationally between efforts to better understand 'bad' as opposed to 'good' fire. This situation may be viewed as a symptom of 'healthy' debate – keeping alive a range of views. Alternatively the situation could be viewed as a reflection of a maturity yet to be achieved within research and policy circles.

Similarly, the extent to which the current bushfire related research efforts should be broadened to encompass other aspects of 'emergency management' continues to exercise the minds of some, if not all of the current *Bushfire CRC's* stakeholders. Some broadening of the current focus is contained within the *CRC Fire – Environment and Society* proposal. Clearly however, there is a limit as to what can be achieved with the current level of available funding.

These, and related matters continue to be considered within AFAC forums, and in discussions with government and the wider community.

What can be said with some confidence however is that in a country where so much of the landscape burns every year, bushfire is still too often regarded as a local issue. From a community fire management perspective that may make sense, but to gain a deeper understanding of the bushfire threat we must continue to co-ordinate and support the best

national and international scientific minds and cultivate a new generation dedicated to this issue.

7. Recommendation

Much of the Australian environment

- **has been and continues to be shaped by fire;**
- **continues to experience bushfires that have dramatic social and economic consequences.**

International scientists and policy makers look to Australia for guidance on the management of landscape fire.

THEREFORE:

It is imperative that the nation commit to an on-going fire and land management agency-led research capability that is able to meet its future needs.

8. References

Council of Australian Governments (2004). *Report of the National Inquiry on Bushfire Mitigation and Management*. Australian Government. Canberra. 415 pp.

Tolhurst, K.G. (2004). *Changing our Perception of Fire in the Environment*. Paper presented to the National Conference of Parliamentary Environment and Public Works Committees, Lorne, Victoria. 8 pp.

Are Big Fires Inevitable? A report on the National Bushfire Forum 27 February 2007, Parliament House Canberra.

Appendix

1. Background to the current *Bushfire CRC*

The *Bushfire CRC* was established in July 2003 following devastating fires around Sydney in December/January 2001/02. It is one of the largest CRCs with over 30 partners across Australia and New Zealand.

Following growing concern about management of landscape fire, Australia's then national government agreed, in 2003, to the establishment of a Bushfire Cooperative Research Centre. The new CRC became one of 56 public-private research centres operating in Australia at the time. The formation of the *Bushfire CRC* was, and remains, a major initiative of fire and land management agencies in Australia and New Zealand (New Zealand sometimes enters joint arrangements with Australia in areas relevant to its own national priorities). For the first time all relevant jurisdictions had a collectively agreed, co-ordinated approach to fire research.

The financial year 2007/08 saw the completion of the sixth of the seven-year life of Australia's first attempt to focus nationally on its bushfire related research needs. Together with its Bushfire CRC Partners the fire and land management industries are benefiting increasingly as a number of current research projects reach advanced stages, while others with longer term horizons are now comprehensively established.

From the earliest days of the *Bushfire CRC* it has been the industry (the fire and land management agencies) that has largely determined the research priorities. Toward this end the *Bushfire CRC* is strongly supported by, and coordinates closely with the industry's peak body - *Australasian Fire and Emergency Service Authorities Council (AFAC)*. Through a joint annual conference and associated workshops, and close year-round liaison with various specialist AFAC working groups, strong links between researchers and agencies have evolved. Institutional links have also been established with other CRCs (including Tropical Savannas Management, Desert Knowledge, Aboriginal Health, Spatial Information, CO² and Forestry) and, as outlined in Section 4 - above, with related international research groups in Europe and North America.

From the *Bushfire CRC's* perspective it is its move into social science related fire research that represents perhaps the newest feature of Australia's current 'landscape fire' related research priorities. This somewhat belated, but welcome move owes much to the success of earlier US work, and in particular to the strategic approach taken as part of the development of the US National Wildfire Coordinating Group report in 2001, *Burning Questions – A Social Science Plan for Federal Wildland Fire Management*.

The annual total cost of fire to Australia is approximately 1.15% of GDP or \$8,500M, 85% of which is attributed to fire suppression or management activities and about 15% in direct losses. Indirect impacts to agriculture, grazing, water availability and quality, soil erosion, and disruptions to industry are likely to increase this by a factor of between 2 and 3, making fire a significant economic issue (as an example, a four and half hour disruption to electricity services on 16 January 2007, caused by a bushfire which interrupted the main electricity feed from NSW to Victoria, affected some 700,000 customers including 70,000 businesses and was estimated to cost the economy \$500M.). And these are tangible costs. The

psychological and related impacts of fires and their aftermath (as currently being explored by the Victorian Bushfires Royal Commission) add another highly significant dimension.

A recent conservative analysis, derived from publically available information, and subsequently independently validated, has estimated that the economic value for the current *Bushfire CRC* research program is in the range of \$119M–450M net present value, depending upon the discount factor, analysis period and included impacts used.

2. Research highlights

The work of the *Bushfire CRC* to date has seen a number of significant achievements that are now assisting with better fire management outcomes. These include:

2.1 Aircraft

- *Bushfire CRC* research into the effectiveness and efficiency of aircraft in fire fighting operations that highlighted the importance of using them in first attack on a fire.
- Based on this research successive federal governments have had the confidence to become more involved in the funding of this aspect of bushfire management. And, for example, more aircraft were deployed on Victoria's 'Black Saturday'. As big a tragedy as this day was, the aircraft combined with ground forces were used in the most effective and efficient way.

2.2 Volunteers

- *Bushfire CRC* research has stimulated discussion within agencies' senior management groups and within Volunteer Associations' executives concerning the enhancement of the quality of the volunteering experience; the improvement of the effectiveness of brigade leadership; and the lowering volunteer resignation rates.
- A number of agencies have reviewed, or are in the process of reviewing, their current training opportunities for volunteers to develop their people-management and leadership skills. Several agencies have also reviewed how they deliver volunteer management and support services to their volunteers in regions and districts.
- In terms of potential younger volunteers, agencies are increasingly emphasising the *what's in it for me?* aspects of volunteering — career enhancement, new skills, new friends, personal development (not at the expense of community safety and community contribution aspects however). And web-pages dealing with volunteer recruitment are increasingly 'state of the art'.
- The numbers of women volunteering as firefighters have steadily increased in recent years as 'muscle-based' stereotypes about the requirements of firefighting wither. The increased inclusion of women into volunteer firefighting promises to significantly broaden the pool of available recruits and improve the service levels as well as the viability of many brigades. Fire agencies are progressively addressing

disadvantages women encounter with personal protective equipment, and the use of operational equipment, vehicles and buildings.

2.3 Householder Safety

- In February 2006, and following completion of significant, related research by the *Bushfire CRC*, AFAC, in collaboration with the Australian State and Territory fire agencies released a position paper that was designed to provide guidance to house holders in relation to both their individual safety, and the protection of their homes in the event of a bushfire.
- In the light of Victoria's 'Black Saturday' fires AFAC has established a policy review mechanism that will consider, in conjunction with the Victorian Bushfires Royal Commission, what additional research and/or policy refinement may be appropriate.

2.4 Vehicle Safety

- The 2005 *Bushfire CRC* research trials conclusively demonstrated that even sheltering inside a vehicle can be a high risk strategy. There are many factors which come into play which can make survival very difficult in certain situations - not least the increased use of plastic in vehicle manufacture, which appears to reduce the level of protection afforded by many newer model vehicles.
- Nonetheless research conducted by the *Bushfire CRC*, AFAC, and its member fire agencies and the CSIRO has found that any members of the public, who find themselves on the road during a bushfire, stand a better chance of survival by taking shelter inside their vehicle, rather than fleeing on foot.

2.5 A Greater National Focus

- An independent 5th Year review of the *Bushfire CRC*, completed late last year concluded that:

The (Bushfire) CRC has played a leading role in initiating or further developing a culture of 'improvement by research' evident in all the agency representatives interviewed.

- As outlined in Section 5 of this submission, the *Bushfire CRC* has signed a 'Memorandum of Understandings' that provide for the conduct of joint fire research with a number of overseas agencies and with severally overseas based research.
- The *Bushfire CRC* has also played a significant role in the development and promulgation of the United Nation's *Voluntary Guidelines for Fire Management*, which were developed following a recommendation of the *International Wildland Fire Summit* which was held in Sydney in 2003. The Voluntary Guidelines were subsequently endorsed by the 8th Session of the United Nation's FAO Committee

on Forestry in March 2007, and by the 4th *International Wildland Fire Conference* in May 2007.

- Earlier this year, the *Bushfire CRC's* CEO was invited to participate in an independent review of the *US Joint Fire Science Program*. Since its inception ten years ago, the JFSP has funded some 413 research projects, across more than 90 colleges and universities. The CEO's involvement in the recent review provided an opportunity to benchmark the current *Bushfire CRC's* program in terms of its quality, innovation, strategic direction, and its emphasis on producing outputs that meet Stakeholder needs.

2.6 The Use of Prescribed Fire

- Changes in climate will almost certainly result in changes in fire frequency and severity, *Bushfire CRC* research is increasingly showing. This finding has many implications for fire and land managers in how the land is managed, how resources are allocated and in setting current and future planning priorities.
- *Bushfire CRC* research is, at a national level, demonstrating how all fires – prescribed fires and bushfires, from the Top End to the Southern Alps – carry implications for biodiversity.
- Building on the few earlier studies, long term research sites across the high country of Victoria, New South Wales and the ACT are already demonstrating the critical impacts of fire on water quality and yield in both the short and long-term. Short-term increases in yield are offset by reductions in quality (for example, the siltation after fire affects rivers and water storages). Long-term reductions in yield from regenerating forests pose considerable risks to flows in major rivers and to residential water supplies (it is currently estimated that, as a result of the 2003 and 2006 fires in the Australian Alps, water flows into the Murray Darling Basin will be reduced by at least 10%, for several decades).
- The same high country research has also shown the critical impacts of fire on both the short and long term carbon balance of ecosystems. The effect of fires on soil carbon is emerging as one of the great unknowns in the global carbon cycle. This research on soil carbon will provide an essential knowledge base for community, industry and government bodies developing Emissions Trading Schemes.

2.7 Smoke Management

- While there is a general acceptance within the community of smoke generated by bushfires, smoke generated from prescribed fires, often lit sometime outside the declared fire danger period, and under stable atmospheric conditions, can cause considerable criticism of the land managers/agencies/governments involved. The effect smoke has on visibility, human health and on 'greenhouse gas' emissions are all matters that can be subject to adverse comment.
- The further development and refinement of meso-scale meteorological modelling, that can be used to predict the likely smoke impacts of prescribed fire, has

considerably assisted fire and land management agencies with this important aspect of bushfire, and ecosystem management. Reliable, site-specific information now sees, for example, agencies igniting a burn a few hours earlier or later than planned with the resultant smoke being diverted from populated areas. Similarly, the lighting of burns under less stable atmospheric conditions (which would see smoke carried aloft and dispersed at altitude by stronger upper winds) is, at times, and despite the 'burn control' problems this can cause, becoming better able to be considered.
