

16 January 2013

Committee Secretary
Senate Standing Committees on Environment and Communications
PO Box 6100
Parliament House
Canberra ACT 2600
Australia

Dear Sir/Madam

Inquiry - Recent trends in and preparedness for extreme weather events

The Bushfire CRC welcomes the current Senate Committee investigation into *recent trends in and preparedness for extreme weather events* and is pleased to have the opportunity to provide input and comment.

It believes that the review has the potential to make a valuable and timely contribution to current attempts to focus the nation's response to the most fundamental environmental problem currently confronting both the nation and the international community.

After providing a brief, general background in relation to the current constitutional and institutional arrangements for managing landscape fire, in one of the most fire-prone regions on Earth, this submission briefly addresses the relevant inquiry terms of reference from a related, research perspective.

In concluding these introductory remarks can I assure you that the Bushfire CRC remains ready to assist your Inquiry, as appropriate, in its important task.

Please don't hesitate to contact me should you require more information regarding the material below or indeed in relation to other matters. I can be contacted at the above address or on (03) 9412 9600.

More general information about the Bushfire CRC and its current research programs can be found at <http://www.bushfirecrc.com/>.

Yours faithfully,

Chief Executive Officer
Bushfire Cooperative Research Centre

1. Introduction

As Committee members 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*) have been increasingly working 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.

From the early 1980s budgetary restrictions and changing corporate priorities had seen 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. New Zealand was, and remains an active participant in the work of both AFAC and the Bushfire CRC.

2. Landscape fire

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 and this summer's Tasmanian and New South Wales events again highlight the negative impacts that bushfires can have.

It has been estimated (Russell-Smith *et al.* 2007) that between 30 million and 70 million hectares of Australia are affected by fire annually, seasonal fluctuations being largely responsible for the considerable variation.

Over 90 per cent 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).

3. Preparedness for extreme weather events

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.

As Mr Jim Gould, Principal Research Scientist of CSIRO told the Royal Commission that followed Victoria's *Black Saturday* fires:

'...Because bushfire cuts across many management and scientific disciplines, because fire affects so much of the country, and because the risks to life and property are public and political issues, the breadth of opportunities for relevant, needed research is nearly unlimited. The great challenge is perhaps not so much what to do next as it is what to leave out in a limited budget climate....' (page 394 – final report).

Again, and as many committee members would be aware, the 2012 special report of the Intergovernmental Panel on Climate Change 2012 - *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation* - provides the latest, authoritative assessment of recent trends and projected changes in extreme weather events. The report also considers possible adaptations to these predicted changes.

Translating globally observed phenomena to regional and more local level consequences remains very much a work in progress.

In late 2007, a joint report prepared by CSIRO, the Australian Bureau of Meteorology and the Bushfire CRC (*Bushfire Weather in Southeast Australia: Recent Trends and Projected Climate Change Impacts*) concluded that the number of very high and extreme fire weather days could increase between 4-25 per cent by 2020 and 15-70 per cent by 2050 across parts of south eastern Australia. The changes would be greatest in the inland and relatively less along the coast and in Tasmania.

During the first seven years of its operation, one of the four major research programs conducted by the Bushfire CRC (*Managing Fire in the Landscape*) saw the establishment of long-term research sites and experiments across alpine areas of Victoria, New South Wales and the Australian Capital Territory. These sites have been designed to provide data to underpin efforts to model the impacts of climate change on fuel loads and the trade-offs between fuel management and water yield.

Following the Victorian *Black Saturday* bushfires of February 2009 the Australian Government granted the Bushfire CRC an extension of federal funding to examine the national issues arising from the tragedy.

Together with continuing funding from partner organisations, this led to a new research program that builds on the outputs of the first seven years of work by the Bushfire CRC. Current research is designed to give communities and fire managers a solid basis to better prepare, manage and respond to severe bushfires. While the focus remains largely on bushfires the research, particularly in the areas of understanding risk and communication, is of direct relevance to all natural hazards.

Specific climate change related research projects funded more recently through the Bushfire CRC are listed in attachment 1 (while a more general overview of the Bushfire CRC's ten years of operation is briefly provided at attachment 2).

4. Global warming and landscape fire

Australia's fire researchers and bushfire agencies clearly have much work to do if they are to sufficiently understand the influence of climate change on the nation's level of bushfire risk. The scientific issues associated with climate change science are complex 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 multi-faceted evolutionary relationship with fire. Fire has been part of most Australian 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 resulting changed fire regimes.

A related consideration sees smoke from bushfires, and more particularly smoke from the use of prescribed fire, as being 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 again 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 in many ecosystems.

More specifically, it has been estimated that a change in only 10% of the carbon stored in the soil would be equivalent to all the anthropogenic CO₂ emitted over 30 years (Kirschbaum, 2000). The influence of fire on the carbon balance of montane and sub-alpine ecosystems in Australia is virtually unexplored but is clearly of importance given the extent of the ecosystems concerned, their carbon density, and their sensitivity to both fire and climate. Current Bushfire CRC funded research is designed to provide baseline data on carbon cycling from key vegetation types in the sub-alpine region of NSW, and to further elucidate the drivers of carbon flux in soils.

Other implications that flow from a changing climate and consequential more extreme weather events include:

- The likelihood of increasing event 'cross-over', such as more frequent and more intense heat waves leading to conflicts between advice to vulnerable people to rest and to stay indoors, while at the same time remaining alert to the threat of bushfires;
- Heat wave impacts on the availability and efficacy of volunteer fire fighters; and
- A merging of northern and southern hemisphere fire seasons leading to a lessening of the effectiveness of the current mutual support arrangements (particularly between North America and Australia).

5. Reports, recommendations and recurring themes

The period since the late 1990s has seen an unprecedented level of scrutiny of the management of bush (wild) fires in Australia. Yet despite a plethora of reports and recommendations, many fundamental issues appear to remain only partially addressed. 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.

Virtually all these Inquiries have attempted to address, at least in some detail, the likely impact of climate change on the nation's landscapes.

These State and Federal Inquiries have also raised a number of other recurring themes. These include:

- Declines in the resourcing of publicly-owned park and forest management;
- Reduced levels of use of prescribed fire;
- The growth and increasing value of assets in the rural-urban interface zone;
- Declining rates of 'volunteerism';

- 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; and
- The need for on-going fire-related research.

In August 2010, a national Inquiry by the Australian Senate described itself in its final report as the nineteenth major bushfire-related inquiry to be conducted in Australia since 1939 and the third to be conducted federally since 2003.

In evidence to that Inquiry Professor Peter Kanowski (an author of a 2004 national Inquiry, the first such Inquiry in the nation's history) said that his (2004) Inquiry had identified...

....a repeated cycle of response by governments and the community to major fire events: first, suppression and recovery processes are always accompanied by assertions, accusations and allocations of blame, even while the fires are still burning; second, inquiries are established and report; third, recommendations are acted upon, to varying degrees; fourth, the passage of time sees growing complacency and reduced levels of preparedness... and the cycle begins again with the next major bushfire event....(2.14)

6. Conclusion

Faced with the reality of climate change, Australia has perhaps reached a critical stage in the evolution of its approach to the management of landscape fire.

In an award-winning essay, written within days of Victoria's *Black Saturday* fires, the *Australian National University* historian, Professor Tom Griffiths sought to remind his readers of how Judge Leonard Stretton's seminal Inquiry in Victoria in 1939 had sought to adequately find words to describe how '*...rampant flame had scourged a country that considered itself civilised...*', and how Stretton went on to define '*...an active, half-conscious denial of the danger of fire, and a kind of community complicity in the deferral of responsibility...*'

Griffiths observed that "*...In the seventy years since 1939, we have lived through a revolution in scientific research and environmental understanding and we have come to a clearer understanding of the peculiar history and fire ecology of these forests. We have fewer excuses for innocence. We knew this terrible day would come. Why, then, was there such an appalling loss of life?*"

The need to continually reassess and monitor Australia's approach to landscape fire has never been more pressing and effective, co-operative national and international initiatives have a critical role to play in this process.

7. Sources include:

Australian Senate (2007). *Conserving Australia: Australia's national parks, conservation reserves and marine protected areas*. Report of the Legislative and General Purpose Standing Committee. Commonwealth of Australia. 354 pp.

Australian Senate (2010). *The incidence and severity of bushfires across Australia*. Report of the Agricultural and Related Industries Select Committee. Commonwealth of Australia. 255 pp.

Bushfire CRC (2009). *Victorian 2009 Bushfire Research Response Final Report*. Bushfire Cooperative Research Centre. Melbourne, Australia. 388 pp.

- Commonwealth of Australia (2003). *A Nation Charred: Inquiry into the Recent Australian Bushfires*. Report of the Select Committee into the recent Australian bushfires. The Parliament of the Commonwealth of Australia. 459 pp.
- Council of Australian Governments (2004). *Report of the National Inquiry on Bushfire Mitigation and Management*. Australian Government. Canberra. 415 pp.
- Doogan, M. (2006). *The Canberra Firestorm. Inquests and Inquiry into Four Deaths and Four Fires between 8 and 18 January 2003*. Vol I (412pp) and Vol II (228pp). ACT Coroners Court.
- Griffiths, T. (2009). *We have still not lived long enough*. 'Inside Story' website (February 16th 2009. <http://inside.org.au/we-have-still-not-lived-long-enough/> (The essay won the Alfred Deakin Prize in the 2009 Victorian Premier's Literary Awards).
- Hennessy, K., Lucas, C., Nicholls, N., Bathols, J., Suppiah, R., and Ricketts, J. (2005). *Climate change impacts on fire-weather in south-east Australia*. CSIRO Marine and Atmospheric Research, Aspendale, Victoria, 34 pp.
- Hoggett, J. (2005). *The Use and Value of National Parks: Does More Mean Worse?* Institute of Public Affairs, Melbourne. Background Paper. 15 pp.
- Kanowski PJ, Whelan RJ and Ellis S (2005) *Inquiries following the 2002–2003 Australian bushfires: common themes and future directions for Australian bushfire mitigation and management*. Australian Forestry **68**:76–86
- Kirschbaum, M.U.F. (2000) *Will changes in soil organic carbon act as a positive or negative feedback on global warming?* Biogeochemistry, **48**, 21-51.
- McLennan, J., and Birch, A. (2005). *A potential crisis in wildfire emergency response capability? Australia's volunteer firefighters*. Environmental Hazards, **6(2)**, 101-108.
- McLeod, R. (2003). *Inquiry into the Operational Response to the January 2003 Bushfires in the ACT*. ACT Government, Canberra. 273 pp.
- Milovanovich, C (2003). *Coronial Inquiry into the Circumstances of the Fire(s) in the Brindabella Range in January, 2003*. NSW Coronial Court, 20 pp.
- Parliament of Victoria (2008). *Inquiry into the Impact of Public Land Management Practices on Bushfires in Victoria*. Report of the Environment and Natural Resources Committee. Parliament of Victoria. 283 pp.
- Parliament of Victoria (2010). *Report of the 2009 Victorian Bushfires Royal Commission*. Volumes 1 – 3. Parliament of Victoria. 1141 pp.
- Pyne, S. (2006). *The Still-Burning Bush*. Scribe Short Books, Melbourne, Australia. 137 pp.
- Russell-Smith, J., Yates, C.P., Whitehead, P.J., Smith, R., Craig, R., Allan, G.E., et al (2007) *Bushfires 'down under': patterns and implications of contemporary Australian landscape burning*. International Journal of Wildland Fire **16**, 361 – 377.
- Smith, R.P. (2005) *Report of Independent Review of Circumstances Surrounding Eyre Peninsula Bushfire of 10th and 11th January 2005 (Wangary Bushfire)*. 95 pp.
- Tolhurst K.G. (2003) *Ecological effects of repeated low-intensity fire in a mixed eucalypt foothill forest in south eastern Australia. Summary report (1984–1999)*. Research Report No. 57. Department of Sustainability and Environment, Victoria. 101 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.

Tolhurst, K.G. (2007). *Submission to the Parliamentary Inquiry into the Impact of Public Land Management Practices on Bushfires in Victoria*. 14 pp.

Victorian Government (2003). *Report of the Inquiry into the 2002 – 2003 Victorian bushfires*. Victorian Government. 334 pp.

Victorian Lands Alliance (2010). *Fuel reduction burning in southern Australia's forests: A review of its effectiveness as a bushfire management tool*. Victorian Lands Alliance. 26 pp.

Wareing, K. and Flinn, D (2003). *The Victorian Alpine Fires January-March 2003*. Department of Sustainability and Environment, Victoria. 292pp.

**Attachment 1 – Recent climate change related research projects funded by the Bushfire CRC
include:**

- A Climate for Change? Fire Management's Capacity To Adapt To Climate Change: An Institutional Perspective;
- Effective Communication for Community Adaptation to Bushfire in a Changing Climate: A Toolkit for Local Government;
- Bushfire Planning With Climate Change;
- Integrating Spatial Planning with Bushfire Risk And Emergency Management in The Context of Climate Change: Critical Literature Review - Stage 1;
- Relative Importance of Fire Regimes, Environmental Gradients and Climate Change for Rainforest Distribution in the Sydney Region;
- Climate Change And Fire in the Queensland Wet Tropical Forest;
- NSW Bushfire Weather Under the Influence of Climate Change; and
- Mind the Policy Gap: Planning for Fire Risk and Emergency Management in the Context of Climate Change.

For more details see: <http://www.bushfirecrc.com/>

Attachment 2 – Background - The Bushfire CRC

The Bushfire CRC is part of the national Cooperative Research Centre program that has operated since 1991, under successive federal governments. The CRC program was designed to facilitate ‘...end user driven research collaborations (that would) address major challenges facing Australia. CRCs pursue solutions to these challenges that are innovative, of high impact and capable of being effectively deployed by the end users...’

The Bushfire CRC was established in July 2003, with the strong support of the industry’s peak body which is now known as the *Australasian Fire and Emergency Service Authorities Council (AFAC)*. The Bushfire CRC’s formation followed devastating fires around Sydney in December/January 2001/02. It is one of the larger current CRCs with over 40 partners - including 18 research institutions spread across Australia and New Zealand.

All the fire and land management agencies of Australia and New Zealand are members of the centre as well as many universities and research organisations. In addition, several international organisations are involved either through a formal Memorandum of Understanding (MOU) or through less formal arrangements or research links.

The formation of the Bushfire CRC was, and remains, a major strategic initiative of fire and land management agencies in Australia and New Zealand. For the first time all jurisdictions have a collectively agreed, co-ordinated approach to fire-related research, with consequential benefits at State and national levels.

Relevant Inquiries by COAG (2003), the Senate (2010) and the Victorian Bushfires Royal Commission (2010) have all recommended the continuation of a nationally focussed bushfire research program.

The Commonwealth’s component of the Bushfire CRC’s funding ceases on the 30th of June 2013. Early in 2012, and reflecting the Bushfire CRC’s success, States, Territories and New Zealand committed to continuing to contribute funding to the Bushfire CRC up until at least 2014.

In view of this support, and the direction bushfire research has taken in recent years, and in the hope that the Commonwealth would renew its commitment to a national bushfire research program, the Bushfire CRC’s Governing Board has been examining the possibility of transitioning the CRC into an on-going Institute – a move that the Board saw as consistent with COAG’s 2011 *National Strategy for Disaster Reduction*. The Board, with the support of current Bushfire CRC stakeholders, envisaged the Institute providing the essential natural hazard related research, with swift research utilisation, for full implementation ‘on the ground’ being seen as a key component in the success of the national strategy.

The current Bushfire CRC model, as refined over the past nine years, is considered to work well, as demonstrated through its strong industry support, and demand for, and uptake of its research outputs.

During its nine years of existence, three independent assessments of the Bushfire CRC have been conducted, the last being in April 2012. The federally appointed CRC Committee Chair, Neville Stevens AO, advised the Bushfire CRC that his most recent review found that Bushfire CRC:

- Demonstrates sound governance and committee structures that effectively involve stakeholders, researchers and end users;
- Has a high level of interaction between end users and researchers from determination of the scope of research projects through monitoring progress and in using results;
- It undertakes social and technical research of high quality that is valued by end users;

- Manages research progress in a sound manner but with sufficient flexibility to take account of opportunities emerging during a research project;
- Operates a successful post graduate program that supports students and integrates them into the work of the CRC and that of the CRC participants;
- Receives strong support from stakeholders and end users, at very senior levels, to the CRC; and
- Provided evidence based research which was supporting positive cultural change within the participant organisations.

The Bushfire CRC's current research agenda has been designed to primarily investigate the issues arising from the tragic *Black Saturday* bushfires. The program contains three main program areas:

Understanding the Risk - Fire is complex, possibly the most complex from a management and community perspective, of the natural disasters. The factors involved in mitigating the risk are sometimes in conflict with the other values that at-risk residents seek. The work in this program seeks to understand the underlying risk exposure of the community and the things it values.

The program comprises three sub-programs:

- Understanding community expectations;
- Risk assessment and decision-making; and
- Fuels and risk planning in the interface.

Communicating the Risk - In the detailed dissection of the events of 7 February 2009 by the *Victorian Bushfires Royal Commission* it was clear that many warnings were not received in a timely or usable way. Although some of this was linked to operational factors that are not the subject of research, there are clear gaps in knowledge of how to effectively communicate in emergency bushfire situations. Many of the questions are cross disciplinary.

This program focuses on the communication of risk and threat: how are warnings and information best communicated and, for example, which media should be used?

This program has two sub-programs:

- Effective communications; and
- Human behaviour under stress.

Managing the Threat - The final program of the current research agenda is addressing the case where the risk has translated into a direct threat. This program is considering extreme events such as 7 February 2009; these events are irregular and not as well understood as more routine ones.

This program has three sub-programs:

- Incident co-ordination;
- Fire in the landscape; and
- Suppression, surge capacity, and occupational health and safety.

The Royal Commission into the 2009 Victorian bushfires, like many federal and state Inquiries before it, concluded that Australians do not know enough about living in one of the most fire-prone regions on Earth and that more needed to be done to address this issue.

Despite all that has been learnt people still make fatal decisions, houses still get burnt, fire-fighters are injured and incident management systems sometimes fail.

During a process that was designed to help define future research needs, fire agency CEOs acknowledged that they did not have the tools and knowledge to meet the future needs of the industry and the community it serves, given the expected impacts of climate change.

The future research program directions developed by the industry acknowledges 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 wild land 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.

Obviously the relationship between the community and landscape fire is multi-dimensional and it is the complexity of meeting the related challenges that led the Bushfire CRC's Governing Board to propose the establishment of an on-going fire research Institute – in part as a legacy to the pioneering work conducted by the Bushfire CRC.

The Institute's brief would be to create safer and more resilient communities through improved management of fire incidents, improved health and safety in the workforce, clearer community messaging and more targeted community education campaigns.

The details of the future research program would be developed by researchers and partner agencies and involve:

- biological and environmental sciences including ecology, botany, atmospheric, hydrology, and forest science;
- physical sciences including physics, chemistry and mathematics, meteorology and spatial science;
- social sciences including psychology, sociology, anthropology, geography and urban planning; and
- Information technology, mechanical engineering, fire engineering and civil engineering.

It is anticipated that future research programs would expand on current projects and branch into new fields including engineering and aviation, legal and policy areas, economics, communications and media, incident management, global change impacts, occupational health and fatigue management, human physiology, epidemiology, history and cultural studies, data management, and general public health.

As for now, the important component of the Bushfire CRC's funding that is provided by the Commonwealth ceases at the end of June this year.

For nearly ten years the Bushfire CRC has worked closely with the fire and land management agencies across Australia and New Zealand, providing the science that allows them to better prepare for and manage fire seasons like the one we are currently experiencing.

The situation beyond June 2013 is currently uncertain. Ideally the work of better coming to terms with Australia's fire-prone landscapes will continue in a way that accords with both the importance and the urgency of the task.